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Memory Avoidance by Older Adults: When "Old Dogs" Won't Perform Their "New Tricks"

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Abstract

Learning often involves a transition from responding based on an effortful initial strategy to using a faster and easier memory-based strategy. Older adults shift strategy more slowly compared with younger adults. I describe research establishing that age differences in strategy shift are impacted not only by declines in older adults' learning but also by their volitional avoidance of memory retrieval. I also discuss the factors that influence older adults' memory avoidance, including their understanding of the available strategies' relative efficiency, accuracy, and effortfulness, as well as age differences in the preference for a consistent strategic approach. Last, I consider the implications of memory avoidance for older adults' everyday functioning. This research demonstrates that volition and choice must be taken into account when studying cognitive performance and aging.

Keywords

cognitive aging, strategies, metacognition, learning

When learning to read, children sound out the phonemes within each word, whereas skilled readers recognize words instantly by sight. When I drive to a new place, I follow a map or GPS until I have the turns memorized. We streamline everyday tasks by replacing an early and effortful approach with one that takes advantage of experience and memory. New memory-based skills are developed and utilized throughout our lifetimes. This raises the question, are "old dogs" as able to acquire and execute "new tricks"?

Early perspectives reasonably focused on older adults' ability to acquire new information. Substantial evidence has documented age-related declines in acquisition, particularly when older adults are asked to bind together or associate different pieces of information (Kausler, 1994; Naveh-Benjamin, 2000). Age differences in strategy transitions were therefore typically attributed to a memory deficit, whereby older adults fail to use retrieval strategies until they have gained the information needed for memory retrieval (e.g., Jenkins & Hoyer, 2000; Touron, Hoyer, & Cerella, 2001, 2004).

In this article, I will demonstrate that declines in the use of memory strategies are impacted not only by older adults' reduced ability to learn information but also by their volitional avoidance of retrieval. This finding represents a departure from exclusively bottom-up mechanistic explanations of strategy shift, whereby learning determines strategy use, by also acknowledging top-down metacognitive determinants of strategy choices (see Logan, 1988, and Rickard, 1997, for a broader consideration of this issue). I will also discuss factors that influence older adults' reluctance to use memory strategies and will consider the implications of memory avoidance for older adults' everyday functioning.

Memory Performance Versus Utilization

Older adults do not proceed to use memory strategies after having learned the information required for memory use. This pattern occurs in various laboratory tasks. I will particularly concentrate on findings from the noun-pair lookup task (Hertzog & Touron, 2011; Hertzog,

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Touron, & Hines, 2007; Hines, Hertzog & Touron, 2012; Touron, 2006; Touron & Hertzog, 2004a, 2004b, 2014; Touron, Swaim, & Hertzog, 2007). In the noun-pair task, participants must initially search a lookup table full of noun pairs (i.e., *dog-spoon*) to determine whether a target noun pair matches a pair in the table or is a rearrangement of words from pairs in the table (i.e., *dog-potato*). Over time, participants learn the pairs and are able to respond using retrieval. Strategy use in laboratory tasks such as this is typically measured using strategy self-reports. After each trial, participants report which strategy they just used. Strategy reports allow us to precisely track strategy transitions and are validated by comparisons with behavioral measures such as response times and eye movements (e.g., Touron, Hertzog, & Frank, 2011). Discrepancies between older adults' memory ability and memory-strategy use have also been shown in alphabet arithmetic (Touron & Hertzog, 2009) and alphabet verification (D. F. Frank, Touron, & Hertzog, 2013), tasks that are characterized by a shift from computation to memory retrieval of problem solutions, as well as in tasks involving novel phrases embedded within reading passages (Rawson & Touron, 2009). In each case, older adults continue to "compute" after the material is memorized, such as by continuing to calculate known answers to equations or continuing to rely on initial but incorrect interpretations of novel phrases.

To illustrate these patterns, Figure 1 compares changes in memory-test accuracy (bottom panel) with changes in memory-retrieval use (top panel) over the course of training in the noun-pair task. Memory tests present the target noun pair but no lookup table, so participants are required to use the memory-retrieval strategy. Older and younger adults are equivalent in test accuracy after 35 repetitions of each noun pair, but older adults are less likely to use retrieval throughout the task (Touron & Hertzog, 2004b).

This distinction between older adults' memory ability and memory-strategy use is also apparent when examining strategy use across trials for specific noun pairs. Following the accurate retrieval of a pair in a memory test, older adults are more likely to revert to using the scanning strategy for that pair. In separate research, participants were required to first prelearn noun-pair matches to a criterion, and older adults were particularly likely to revert back to scanning when the task began (Touron & Hertzog, 2004b). These findings demonstrate that older adults do not use memory retrieval even after they can retrieve successfully and indicate that older adults are reluctant to use the memory-retrieval strategy. Following the earlier driving example, this would be similar to an older adult continuing to rely on a map or GPS after having traveled a route many times and knowing it well. What factors might lead to such a choice?

Even more compelling evidence for the claim that older adults choose effortful strategies over memory retrieval has come from studies that have tested the flexibility of older adults' strategic behavior. Simple interventions can reduce age differences in memory use. Older adults who are offered a modest cash incentive to retrieve in the noun-pair task do so considerably more often compared with those given standard task instructions or only instructions to retrieve (see Fig. 2; Touron et al., 2007). In a separate study using a computation task, older adults used memory more often when they were provided with modest incentives as well as retrieval instructions (Touron & Hertzog, 2009). Older adults can promptly increase their memory use when they are motivated to do so, underscoring that strategy use reflects choice rather than just ability. Thinking back to our driving example, an older adult who used a GPS for well-learned routes might rely on memory instead if a per-use fee were instated by the GPS. We might ask, then, what perceived toll do older adults avoid paying when they are reluctant to rely on their memories?

Task and Strategy Mental Model

Given that older adults' strategy transitions involve choice, what factors might these choices take into account? Decisions about whether or not to shift strategy from an initial strategy to memory retrieval should reflect a participant's understanding of the relative costs and benefits of these strategies.

Strategies often differ in their level of accuracy and efficiency, as well as in the effort needed to use them. Strategy shift might be costly if the required effort to memorize is substantial or if accuracy suffers. The primary benefit of strategy shift is improved efficiency. Expectations about the relative effortfulness, efficiency, and effectiveness of available strategies are elements of the mental model one has for the task. This mental model is constructed during the task instructions, but it is also updated with task experience. Critically, optimal strategy choices depend on having developed an accurate mental task model. That is, a person must understand the strategies' costs and benefits to have a good mental model of the task.

For the noun-pair task, having a correct mental task model includes realizing that memory retrieval is considerably more efficient than scanning and that memory retrieval is similarly accurate to scanning after moderate training. Expended effort is more difficult to objectively measure but should also play a role in strategy choice. In the driving example, one's mental model would include how much time it takes to input a destination versus proceed without the GPS, how well one already knows the route, and how effortful the drive would be using the

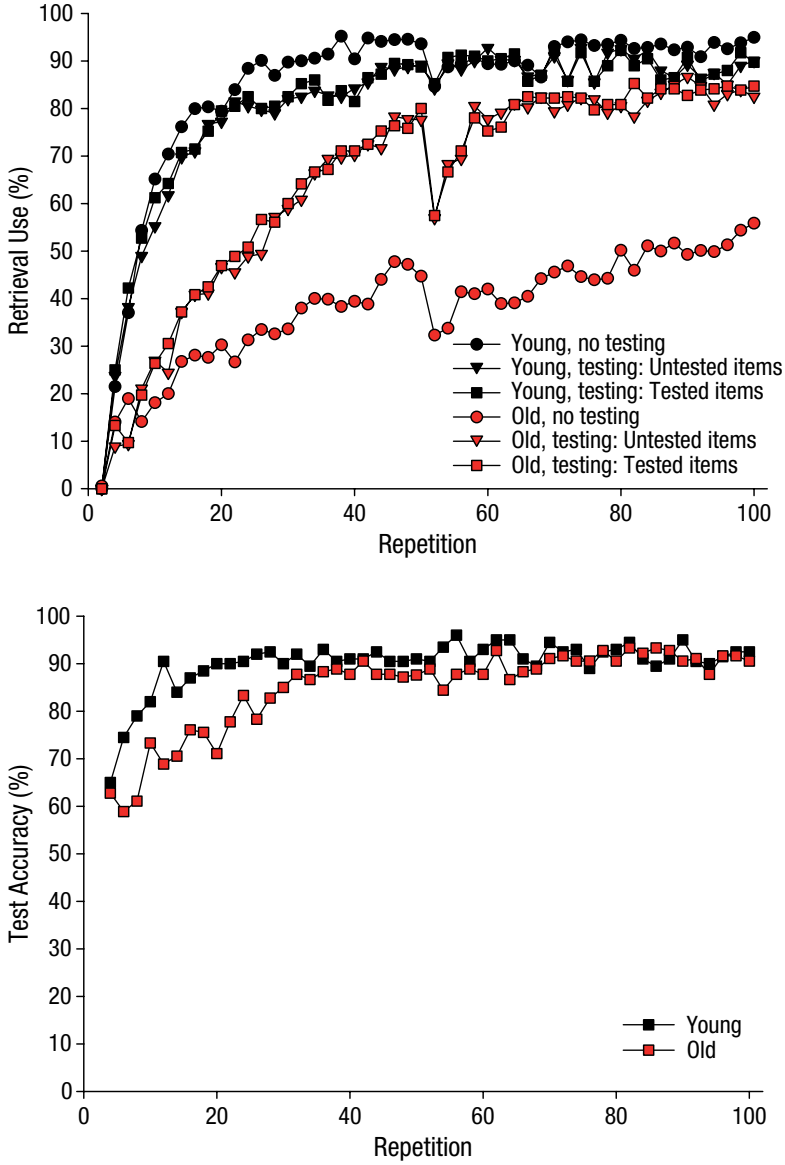

Fig. 1. Data from Touron and Hertzog (2004b). The panel on the top shows increases in retrieval use over training with repetition of noun-pair items for younger adults versus older adults. Retrieval use is plotted as a function of experimental manipulations with versus without memory tests (between-subjects) and, for the condition with memory tests, tested versus untested noun pairs (within-subjects). The inclusion of memory tests increased retrieval use for both the tested and untested pairs, implicating a general benefit, such as increased memory confidence, rather than a specific benefit, such as additional practice. Retrieval use did not differ for tested versus untested items, underscoring that strategy selection is determined by choice factors rather than exclusively by memory strength. The panel on the bottom shows memory-test performance for the tested noun pairs in the condition that completed tests. Adapted from "Distinguishing Age Differences in Knowledge, Strategy Use, and Confidence During Strategic Skill Acquisition," by D. R. Touron and C. Hertzog, 2004, *Psychology and Aging, 19*, pp. 455 (top panel) and 457 (bottom panel). Copyright 2004 by the American Psychological Association. Adapted with permission.

GPS versus one's memory. I will discuss how the mental task model contributes to older adults' memory avoidance by considering each of these elements (effort, efficiency, and accuracy) in turn.

First, manipulating the relative effort required by the available strategies alters older adults' strategy choices (Touron & Hertzog, 2004a). Memory retrieval is chosen more often by older adults when the set of noun pairs to

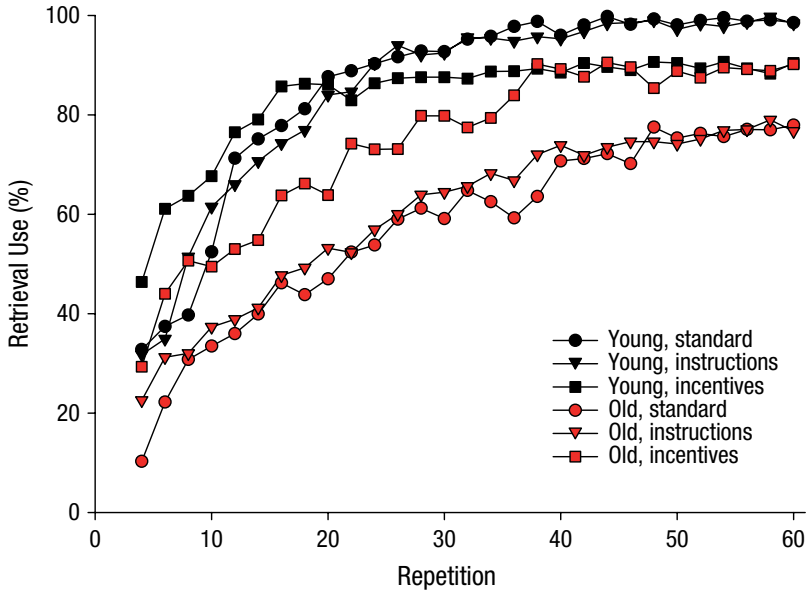

Fig. 2. Data from Touron, Swaim, and Hertzog (2007) showing increases in memory-retrieval use over the course of training with repeated noun pairs for younger adults and older adults. Retrieval use is plotted as a function of between-subjects conditions, which provided either standard task instructions, instructions that the memory strategy was preferred, or instructions that the memory strategy was preferred coupled with modest monetary incentives to use memory. Adapted from "Moderation of Older Adults' Retrieval Reluctance Through Task Instructions and Monetary Incentives," by D. R. Touron, E. Swaim, and C. Hertzog, 2007, *The Journals of Gerontology, Series B: Psychological Sciences & Social Sciences, 62*, p. 152. Copyright 2007 by Oxford University Press. Adapted with permission.

be memorized is smaller and less often when the memory set is larger. Likewise, older adults choose memory retrieval more often when the set of pairs to be scanned (i.e., the lookup table) is larger and less often when the scan set is smaller. Young adults are less affected by the number of items to be memorized or the size of the scan set. Self-rated effort also relates to strategy choice. Compared with young adults, older adults tend to judge memorization to be more effortful, even with manipulations (e.g., prelearning of noun pairs) that improve or equate older and younger adults' speed and accuracy of memory use (Touron & Hertzog, 2004b).

Second, older adults use memory more frequently when they are more aware of the efficiency (speed of responding) advantage it offers relative to the scanning strategy. This awareness is indexed by the difference between individuals' response-time estimates for scanning versus memory retrieval. Failures in the estimation of response times, both for specific trials and when aggregating by strategy, are more pronounced for older adults compared with younger adults. Providing feedback on the relative efficiency of the available strategies increases retrieval use by older adults, and more so than by young adults (Hertzog et al., 2007). However, providing response-time feedback for specific trials does not increase older adults' retrieval use. This suggests that the aggregation of efficiency information into a coherent and correct mental model is impaired with aging (e.g., Touron & Hertzog, 2014).

Third, highlighting that the memory-retrieval strategy is as accurate as alternative strategies increases older adults' use of memory retrieval. Older adults tend to focus on their accuracy rather than speed in cognitive tasks (Hertzog, Vernon, & Rypma, 1993; Ratcliff, Spieler, & McKoon, 2000; Strayer & Kramer, 1994). Older adults who complete memory tests embedded in the noun-pair task (with no lookup table) use retrieval more frequently on the regular trials (that do include the lookup table). Young adults do not retrieve more often when memory tests are taken. As noted earlier, older adults are quite successful in these memory tests, demonstrating that their memory ability is higher than their memory-strategy use. Apparently, successful performance on memory tests is more salient to older adults than successful retrieval in regular trials, and this enables them to form a better model of retrieval accuracy than they create without tests.

These outcomes implicate older adults' confidence in their memory as a factor in their memory-strategy use. Older adults' general rating of memory confidence for the task does correlate with their use of the memory

strategy (Touron et al., 2007; see Lineweaver & Hertzog, 1998, for more general information about aging and memory self-efficacy). Memory confidence can also be examined in detail by using confidence reports that vary in their type and timing. After taking memory tests, older adults report lower confidence compared with younger adults. Older adults (but not younger adults) with lower post-test confidence also retrieve less often (Hertzog & Touron, 2011).

Another type of confidence judgment derives from the source-activation confusion model (Reder & Ritter, 1992), which posits that strategy selection is driven by an immediate feeling-of-knowing (FOK) when one is presented with a stimulus. We compared how decisions to retrieve versus scan on trials correlated with high versus low FOKs. Older adults' FOKs were high and equivalent to young adults' FOKs. However, older adults chose retrieval less often (Hertzog & Touron, 2011). The correlation between FOKs and retrieval use was also weaker for older adults than for young adults. Taken together, these patterns suggest that older adults' avoidance of memory strategies reflects a general lack of memory confidence rather than just specific experience and ability.

All older adults do not show the same degree of memory avoidance, however (Rogers, Hertzog, & Fisk, 2000). In most of our studies, a few older adults have used retrieval quite often (and at levels of comparable to those of our typical young adult samples, which were more homogeneous), while many older adults have used retrieval a moderate amount and some have completely avoided retrieval. To understand these distinct patterns, we conducted an individual-differences study that included no manipulations known to increase retrieval-strategy use (e.g., memory tests; Hertzog & Touron, 2006). In this study, a third of the older adults were profoundly memory avoidant, using no memory retrieval whatsoever. These participants demonstrated the most errant mental models for the strategies and also had lower memory self-concept. Using our driving example, older adults should be most likely to regularly rely on maps or GPS for well-learned routes if they do not accurately judge the time and effort it costs them and the true level of their knowledge, or if they have general concerns about their memory ability.

Strategic Set and Consistency

Older adults' strategy choices might also reflect a preference for adopting a consistent strategic set rather than varying multiple strategic sets across trials. Older adults show less variability in strategy use compared with younger adults. They apparently prefer to shift strategy holistically after they memorize an entire set of items, rather than shifting to retrieval for each item individually following learning (Touron, 2006).

Although older adults persist in using scanning even after having prelearned the noun pairs, as described above, a follow-up study with more extensive prelearning eliminated the age difference in strategy choice (Hines et al., 2012). Critically, however, older adults still showed a bias toward scanning when only half of the pairs in the task were extensively prelearned. Older adults apparently adopted an overall strategic set of scanning despite the fact that only some of the pairs required scanning, again supporting the interpretation that strategy choice, rather than just the degree of learning, drives strategy use.

This bias might indicate a behavioral inertia, whereby older adults are unwilling to deviate from a strategy that has built up a habitual pattern of response. Older adults tend to overuse external task cues and support, such as the noun-pair lookup table, even after they become irrelevant (Spieler, Mayr, & LaGrone, 2006; Lindenberger & Mayr, 2014). Failure to shift might be seen as a reasonable compensatory response to declines in task-switching ability (see Mayr, 2001; Terry & Sliwinski, 2012). However, the bias toward a consistent strategy set seems exclusive to switches to a memory strategy. When participants perform a task involving a shift to a strategy not based on memory, older adults can be even more likely to make strategy transitions than younger adults (D. F. Frank et al., 2013). It appears that older adults are biased against using memory strategies specifically, rather than against strategy shift in general.

Avoidance of memory might be most likely in tasks that involve an overt distinction between strategies. When using memory in reading comprehension (Rawson & Touron, 2009), older adults were able to completely overcome their bias against the retrieval of newly adopted but nonintuitive interpretations of noun-noun combinations (such as *bee-caterpillar*), in contrast to their more perseverant memory avoidance in other tasks. A critical distinction here is that interpretation in reading proceeds more automatically and therefore might be less likely to engage top-down strategy mechanisms.

Memory Avoidance Outside the Laboratory

Memory avoidance could have important implications for older adults' strategy use and functioning in everyday life. Everyday tasks are quite varied and reasonably demand different levels and types of strategic ability and choice. The real world also might not offer encouraging feedback or helpful prompts to use more effective memory retrieval.

We have examined older adults' memory avoidance in everyday tasks using a daily diary approach (D. J. Frank, Touron, & Browne, 2013). Participants reported their performance on and strategic approach to 12 everyday tasks in domains such as technology, wayfinding, and cooking. Older adults used memory strategies less often for frequently performed tasks compared with younger adults. Those who reported more everyday memory failures were particularly unlikely to use retrieval. On the other hand, those who utilized internal mnemonics in everyday life reported using retrieval more often. Such everyday failures and successes might drive or otherwise relate to individuals' overall level of memory confidence. This outlook might help to explain the three categories of older adult memory users (avoidant, moderate, and confident) found in our experiments. That is, we may be seeing through the diaries how everyday experiences determine participants' memory confidence and then rates of memory use in the laboratory. Perhaps, in some cases, these life experiences do provide feedback and incentives similar to the manipulations that impact memory use in our tasks.

Potential Consequences for Late-Life Functioning and Well-Being

Older adults' avoidance of memory retrieval could be problematic for several reasons. First, memory use might provide cognitive exercise that bolsters memory ability. Second, memory use and success might improve older adults' memory self-concept. Third, memory use might allow older adults to engage in activities that memory avoidance would discourage. For example, profoundly memory-avoidant older adults might avoid social situations in which they have to remember names. Given the importance of social networks to trajectories of cognitive aging, such possible consequences should be explored further.

In closing, it should be emphasized that age-related declines in associative memory and their role in slowing the shift to memory strategies should not be discounted. However, it is critical to separate cognitive declines from age differences in cognitive-strategy use when assessing age differences in cognitive performance, particularly when differences in strategic approach are maladaptive and may be easily remedied. Cognitive-aging researchers should continue to establish the impact of memory avoidance on older adults' cognitive-task performance and everyday functioning and well-being, and extend laboratory interventions toward real-world applications.

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