

Outsourcing Memory in Response to an Aging Population

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Abstract

With baby boomers entering old age and longevity increasing, policymakers have focused on the physical, social, and health needs of older persons. We urge policymakers to consider cognitive aging as well, particularly normal, age-related memory decline. Psychological scientists attribute memory decline mainly to cognitive overload stemming from age-related reductions in sensory capacities, speed of cognitive processing, and the ability to filter out irrelevant information. Even in the absence of decline, however, memory is imperfect and forgetting can be especially consequential for older adults. For example, forgetting to take prescription medicines is an age-related problem largely because older adults tend to ingest many more prescription drugs. We propose that policymakers focus on increasing environmental support for memory that can reduce the burden on cognitive resources and thus improve recall. In providing environmental support, policymakers need to pay careful attention to potential age-related changes in physical and cognitive capacity, as well as behavior.

Keywords

cognitive aging, aging and memory, medication adherence, aging and spatial navigation, environmental support for memory

By 2030, about one in five Americans will be 65 or older, a substantial increase from the one in eight today (http://www.aoa.acl.gov/Aging_Statistics/index.aspx). In response to aging populations, the World Health Organization (2007) issued a guide for age-friendly communities that addresses recreational, transportation, housing, and health needs of older persons. We propose that policymakers also act to reduce harmful effects of normal, age-related memory decline.

Age predicts outcomes on many, although not all, tests of memory (West, Crook, & Barron, 1992). Psychological scientists attribute age-related memory decline primarily to cognitive overload resulting from three types of age-related reductions: sensory capacities (e.g., hearing and vision), speed of cognitive processing, and the ability to filter out irrelevant information (Hoyer & Verhaeghen, 2006).

Older adults could improve their memories through individual actions designed to mitigate age-related declines. Hearing loss is associated with memory decline at older ages (Lindenberger, Scherer, & Baltes, 2001), and older adults could partially offset age-related hearing loss by wearing hearing aids. They could engage in aerobic exercise: Exercise is associated with improved cognitive

functioning in older persons, including better memory (Colcombe & Kramer, 2003). They could use memory aids such as written reminders to prompt recall. They could use evidence-based training techniques to boost memory.

However, older Americans do not tend to engage in these actions. Most older adults who could benefit from hearing aids do not wear them (Wingfield, Tun, & McCoy, 2005), and many are sedentary (Matthews et al., 2008). Use of written reminders may not increase with age (Schryer & Ross, 2013); also, reminders are easily overlooked or mislaid. Finally, evidence-based memory training techniques are limited in availability, difficult to learn, and often ignored subsequent to training (Rebok, Carlson, & Langbaum, 2007).

Although policymakers could instigate educational campaigns and incentives to encourage useful individual actions, these interventions are likely to be insufficient. Older persons often view memory decline as an inevitable,

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irreversible consequence of aging (Hummert, Garstka, Shaner, & Strahm, 1994). Individuals who hold this belief are unlikely to strive to improve their memories (Bandura, 1989). Other factors that limit the potential benefits of individual actions include income, education, and health, as well as concerns about vanity or stigmatization. For example, some older persons oppose wearing hearing aids because they believe that it would make them feel or appear old (National Council on Aging, 1999).

As a supplement to individual actions, we recommend that policymakers promote environmental support for memory. Environmental support reduces people's need to rely solely on their own efforts to remember information. Self-initiated remembering is a cognitively demanding process that becomes more difficult at older ages (Craik, 1994). People have been outsourcing memory to the environment for millennia, with writing, art, photographs, and smartphones providing storage and reminders. We propose that policymakers facilitate outsourcing by explicitly taking memory into account when issuing regulations and guidelines. In this article, we provide examples based on psychological research of how policies promoting outsourcing can lessen the everyday consequences of age-related declines in memory.

Timely External Reminders Help People to Act on Their Intentions

Outsourcing in the form of externally generated, timely reminders reduces the necessity for self-initiated remembering. People often underestimate the value of such reminders. Contrary to expectations, external reminders dramatically help individuals to act on their intentions (Koehler & Poon, 2006). We consider the importance of external reminders in a context of special importance to older persons: remembering to take medications.

Medication nonadherence

Remembering to take medications is an example of *prospective memory* (memory for intended actions). Surprisingly, older persons do not exhibit worse prospective memory than younger adults in everyday life (Phillips, Henry, & Martin, 2008; Ross & Schryer, 2013). However, adults of all ages experience prospective memory failures, and the consequences of this type of forgetting can be more severe in old age. Problems of medication nonadherence increase among older adults because they take many more prescription drugs and their health is more fragile (McDaniel & Einstein, 2007). Medication nonadherence costs billions annually due to avoidable treatment failures, illness complications, etc. (Howren, Van Liew, & Christensen, 2013). External reminders delivered through currently available pill

apps on smartphones are of limited use to older Americans because fewer than 25% of them use a smartphone (Pew Research Center, 2014). In promoting external reminders, policymakers should take into account the competencies and proclivities of an aging population.

Policy recommendation. Policymakers should promote simple technical interventions that provide timely reminders, including commercially available pill organizers with LCD displays and talking alarm clocks that indicate when to take medications and confirm that medications have been removed. Specialized packaging of this sort helps to prevent both under- and overdosing (Morrison, Wertheimer, & Berger, 2000; Park & Kidder, 1996). Not all adherence failures are due to forgetting, but policymakers could improve healthcare and put a dent in health costs by mandating packaging that enhances memory. For example, VA prescriptions targeted at older persons could be provided in specialized containers.

External Memory Cues Aid Finding Objects and Places

Finding objects and places involves spatial memory. Spatial memory includes information about the layout of one's environment and the location of objects and places within it. Spatial memory errors increase at older ages (Moffat, 2009). We propose two general approaches to outsourcing spatial memory in order to offset age-related declines: environmental modifications and tracking systems such as GPS. Both approaches rely on the use of external memory cues.

Environmental modifications

Distinctive environmental memory cues improve people's ability to find objects and places (Fewings, 2001; Park, Cherry, Smith, & Lafronza, 1990). As an example of such cues, a fresco from a Pompeii bathhouse contains paintings of couples in different sexual positions. Archeologists speculate that the paintings were memory cues for bathers who placed their possessions on shelves beneath the pictures (Royal Ontario Museum, 2015).

Distinctive external memory cues can facilitate wayfinding in more complex environments. Consider large, unfamiliar parking lots. An increase in spatial memory errors in old age implies that older drivers may have more trouble finding their parked cars (Postma, Van Oers, Back, & Plukaard, 2012). To locate their cars in the absence of external memory cues, drivers must create and remember a cognitive map of the parking lot. The bigger or more complex the lot, the more processing resources it takes to

Table 1. Environmental Support for Memories

Problems	Solutions	Specific policy examples
Self-initiated remembering is more difficult for older persons because of cognitive processing demands	Timely external reminders to prompt remembering	VA prescriptions targeted at older persons provided in specialized containers that remind individuals when to take and whether they have already taken medications
Spatial memory errors increase at older ages	Distinctive external memory cues that reduce cognitive overload caused by creating and remembering mental maps	Architectural differentiation of large parking lots and multiple external memory cues for navigating indoor environments such as hospitals and nursing homes
Wayfinding while driving is distracting and taxes the visual processing resources of older adults	Reduce distraction and visual processing demands caused by the need to search for navigational aids such as street signs while driving	GPS technology designed with aging in mind

create and remember a cognitive map (Carlson, Hölscher, Shipley, & Dalton, 2010). Currently, various sections of lots are often physically identical. Architectural differentiation (e.g., painting of pavement and walls in unique colors in different sections of the lot, numbering parking stalls, and providing names for sections that are displayed on highly visible signs) should provide external memory cues that help persons of all ages to find their cars, but it would be especially beneficial for older persons.

External memory cues are similarly useful in indoor environments such as hospitals and nursing homes. Several types of cues in combination help adults of all ages, even those with severe cognitive impairments (Carlson et al., 2010; Passini, Pigot, Rainville, & Tétreault, 2000; Ulrich, Zimring, Quan, Joseph, & Choudhary, 2004). Painting the walls of different areas different colors offers a visual cue that individuals have moved from one area to another and helps them to remember to which area they need to return. Signs with large clear letters placed prominently throughout the building assist wayfinding. Other building features that reduce dependence on spatial memory include clear lines of sight from the entrance to the main areas of the building (e.g., the elevators are directly in front).

Policy recommendation. Policymakers should provide guidelines that incorporate multiple redundant cues for navigation in large parking lots and buildings such as hospitals and nursing homes. Such cues help older adults by reducing the processing demands involved in creating and remembering cognitive maps.

GPS

An age-related decline in spatial memory and route finding has important implications for driving. In the United

States, personal driving is the most common form of transport for adults over 65 (Rosenbloom & Waldorf, 2001). Many older drivers engage in behaviors designed to enhance safety, such as avoiding driving at night (Baldwin, 2002). Nonetheless, older adults experience more accidents per mile driven than all but the youngest drivers and are more likely to die in traffic accidents (Li, Braver, & Chen, 2003). Policymakers could recommend that elderly adults stop driving, but cessation is associated with greater rates of depression, social isolation, and negative health outcomes (Edwards, Lunsman, Perkins, Rebok, & Roth, 2009). Instead, policymakers should advocate solutions that keep older drivers safely on the road.

Accidents involving older drivers are caused by many different factors, but difficulties with wayfinding are likely contributors (Baldwin, 2002). In one study, it was “relatively common” (no percentage provided) for older drivers to report that accidents happened while they were searching for navigational aids such as street signs or addresses (Rothe, Cooper, & De Vries, 1990, p. 201). Navigating while driving taxes the cognitive resources of adults of all ages, but it poses special risks for older adults: The need to divide or switch attention is more harmful to the performance of older than of younger adults (Dingus et al., 1997; Lindenberger, Marsiske, & Baltes, 2000). GPS tracking technology has the potential to reduce distraction by outsourcing route finding. It should help older adults drive more safely on routes already traveled but not well remembered, as well as novel routes when drivers strive to remember directions that they learned before setting off.

Policy recommendation. Policymakers should promote versions of GPS technology designed with aging in mind. Instructions need to be provided sufficiently early

to permit older drivers to process the information and plan their actions. Older adults benefit more from auditory guidance rather than visual-map guidance. Auditory turn-by-turn navigational instructions reduce visual processing demands, lower navigational errors, and enhance driving performance (Baldwin, 2002).

Conclusions

Psychological scientists attribute age-related memory decline to cognitive overload resulting from reductions in sensory and cognitive capacities. There are two general approaches to mitigating age-related declines: train individuals or modify the environment (Charness, Best, & Souders, 2012). We focus on the latter. Environmental support for memory should help adults of all ages remember, but it would be particularly useful to older adults (Table 1 summarizes our argument). Thus, we argue that policymakers should offer regulations that encourage environmental support for memory. We are not proposing that environmental support supplant behavioral interventions to improve individual memory. Rather, we suggest that it is also advantageous to consider changes that facilitate the outsourcing of memory.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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