

A Lifetime of Learning

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Older adulthood is often portrayed as a time for slowing down—whether by choice, as we retire to live closer to loved ones or in a more agreeable climate, or by necessity, as our recollections of information new and old become increasingly foggy. Recent research in *Psychological Science* suggests, however, that this fog may not arise as an inevitable result of normal aging. Instead, wrote Karra D. Harrington (The University of Melbourne) and colleagues, undetected neurodegenerative diseases such as Alzheimer’s and other forms of dementia may bias measures of how brains change with age, leading researchers and society at large to underestimate the cognitive abilities of healthy adults ages 65 and older.

“Given the relevance of the findings from this study to individual and societal attitudes about aging and the ramifications of those attitudes for the health and well-being of older adults, it is vital that models of cognitive aging be reconsidered from the context of preclinical neurodegenerative disease,” Harrington and colleagues explained.

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The researchers examined how undiagnosed early neurodegenerative disease may bias measures of older adults' cognitive abilities. Their study involved 199 people ages 65 to 89 who were participating in ongoing studies at the Knight Alzheimer's Disease Research Center. To participate in this particular study, individuals had to have an initial clinical dementia rating of 0 (out of 3) and to have undergone three procedures in a previous study at the center: a PET scan and a spinal tap, both of which can be used to measure dementia biomarkers in the fluid around the brain (in this case, amyloid- β and tau), as well as a structural MRI, which can be used to detect decreases in brain volume and thickness associated with various forms of dementia.

Participants completed an assessment of their cognitive abilities at the beginning of the study and then once annually for an average of 6 years. Within 2 weeks of each appointment, they also provided a blood sample and a cerebrospinal fluid sample and received additional neuroimaging. Each participant attended the assessments with a friend or family member, which allowed the researchers to interview both parties about changes in the participant's cognitive abilities over the past year.

Overall, older participants were more likely to start the study with dementia biomarkers and greater neurodegeneration. Throughout the course of the study, each additional year of age was found to correlate with reduced processing speed, working memory, and semantic memory—but when the researchers looked only at participants without dementia biomarkers, these effects disappeared, and individuals' episodic memory was actually found to improve with age.

“This information should be used to inform expectations of older adults at the broader societal level, to enhance self-care practices for older adults, and to encourage clinicians to seek explanations for failing cognition in older adults,” Harrington and colleagues wrote.

That's not to say that aging doesn't cause changes in cognition, but research is increasingly demonstrating that, in healthy adults, these differences may be less about memory loss and more about how our brains' priorities change as we age.

(Re)learning what to learn

Age-related declines in memory and other cognitive processes get so much focus, wrote APS Fellow Margaret E. Beier (Rice University) in a recent article in *Current Directions in Psychological Science*, it's a wonder people over 30 are still working, learning, and generally enjoying their lives. But of course they are.

“Although the narrative of decline with age may align with personal experiences of forgetting names and difficulty keeping up with new trends, this narrative does not jibe with equally salient personal experiences of productivity and development through the life span,” Beier continued. “In daily life, people continue to be productive contributors to society as they age, and some become increasingly productive.”

There is no indication that job performance worsens with age, she added, and many people do not attain

leadership positions until middle age or older adulthood, two realities that reflect our capacity for lifelong learning. In fact, in healthy adult samples, much of the difference may come down not to a decline in ability—what we *can* do—but to a shift in motivation—what we *will* do.

Older adults are capable of rallying their attentional resources as well as, and sometimes better than, young adults. But they do so selectively.

Metcalfe et al. (2015)

This process isn't a matter of intellectual laziness, but rather the result of one of the most fundamental aspects of learning: combining our existing knowledge with information from our environment in order to "learn what to learn," wrote Rachel Wu (University of California, Riverside) in *Current Directions in Psychological Science* in 2019.

"Understanding what to learn is difficult when both relevant and irrelevant information compete for attention," Wu explained. "Determining what to learn is important because learning relevant information helps the learner achieve goals, whereas learning irrelevant information can waste time and energy."

As we age, our sense of what is worth learning narrows drastically, usually based on what has been important in the past, she continued.

In infancy, everything in our environment could be a potential source of essential information. We quickly acquire basic patterns from the environment in an open-minded way and use this information to learn more, such as learning about people, and then using people to learn more about the world.

Children continue to explore their environments openly and can be guided via patterns in the environment and by observing other people's actions, such as through explicit teaching, Wu wrote, but later in life, we begin to gravitate more toward exploiting our environment by leveraging our existing knowledge to shape our circumstances.

This can allow us to become and remain more efficient, but it is a balancing act, Wu noted. Although prior knowledge may help us in familiar, static environments, it can also hinder us in new situations where the same strategies are less effective, when environmental changes necessitate adaptation. When we do not adapt to new situations, Wu said, we become dependent on others to help us, which can be problematic, especially in old age.

For adults, who do not prioritize learning new skills to adapt, because learning can be challenging and not so enjoyable in the short term, this can eventually translate, for example, to difficulty in learning (or feeling motivated to learn) how to use newer technologies such as smartphones and online banking platforms that, for many, have become necessities of modern life.



Focusing on what matters

These changing priorities may also lead older adults to become less willing or able to put effort into learning “irrelevant mumbo jumbo” like the meaningless word pairs common in studies of memory, further skewing results in the lab, wrote APS Fellow Janet Metcalfe (Columbia University) and colleagues in *Psychological Science* in 2015.

Performance on learning tasks generally decreases with age in adulthood, but when Metcalfe and colleagues presented 89 participants with meaningful general-knowledge questions (e.g., “In what ancient city were the Hanging Gardens located?”), adults age 62 and older not only answered more questions correctly on the first try than participants ages 20 to 31 but were more likely to learn the correct answer after getting a question wrong.

Metcalfe and colleagues also used an electroencephalogram (EEG) to record participants’ brain waves, or event-related potentials (ERPs), while they answered questions, were informed of the correct answer, and were unexpectedly retested.

Young adults showed significantly stronger brain activity in response to feedback and retesting when they gave incorrect answers with high confidence, as opposed to low. Older adults, on the other hand, demonstrated similar ERPs in response to high- and low-confidence errors, suggesting that they paid equal attention to both error types, which may enhance learning, the researchers wrote.

“Older adults are capable of rallying their attentional resources as well as, and sometimes better than, young adults. But they do so selectively,” Metcalfe and colleagues explained. “Older adults may be

particularly motivated to learn the truth, and capable of engaging their attention to this end.”

Michael Ramscar (University of Tübingen) and colleagues further examined how performance on linguistic tasks changes with age. Their study, reported in *Psychological Science* in 2017, involved 40 native German speakers and 40 native Mandarin speakers who were also fluent in German. Half were ages 18 to 25 and half were 38 to 53.

Bilingual and monolingual young adults were found to recall both meaningful (e.g., “baby”-“cries”) and arbitrary (e.g., “jury”-“eagle”) word pairs in German at about the same rates. Older bilingual participants, however, were found to outperform monolingual German speakers on all but the most arbitrary word pairs. Surprisingly, older adults with doctoral degrees were found to recall fewer word pairs than adults with less education.

That pattern may reflect a cognitive cost of learning, Ramscar and colleagues wrote: People with more language experience become less sensitive to word pairs they have come to perceive as arbitrary. Although this process may hinder future language learning, that may simply be the price of linguistic specialization, rather than an age-related cognitive deficit.

“It is notable that the same pattern of learning the informative and neglecting the uninformative is also seen when infants lose their sensitivity to non-native phonetic distinctions in the course of learning a language, when it is not typically seen as cognitive decline,” the researchers explained.

Learning on the job

We develop unique knowledge sets over our lifetimes through our education, work, and leisure activities, making adult intelligence a difficult concept to measure, Beier explained. Generally, though, people’s problem-solving abilities have been found to peak in early adulthood, and although our cognitive processing abilities start to slow down around age 30, our existing knowledge base only continues to grow, as Timothy A. Salthouse (University of Virginia) found in a 2019 longitudinal study of 5,000 adults. At the same time, we tend to shift from an achievement-oriented mindset that may prioritize extrinsic rewards, such as pay raises and promotions, to a more socioemotionally oriented mindset that pushes us to pursue intrinsic rewards, like enjoyment or interest, for their own sake.

Moreover, Beier added, other research has suggested that “as people age, they are increasingly likely to select goals aligned with their existing strengths, adapt their approach to achieving these goals by optimizing the resources that are available to them, and compensate for declines in resources by adjusting their approach or environment.”

Existing knowledge can also be used to support the learning of new information. In two studies of 141 and 199 adults ages 18 to 69, Beier and Phillip L. Ackerman (Georgia Institute of Technology) found that prior knowledge was associated with self-paced learning about financial issues and cardiovascular health after reasoning abilities were accounted for. Notably, older learners learned just as much about cardiovascular disease as did younger learners, and learned more about financial issues.

Self-paced learning may be particularly valuable in a workplace context, Beier added. Allowing people

to learn at their own pace may give older adults the time and space necessary to build on their existing knowledge and more fully process information. Giving older learners ample time to process content to be learned may also avoid activating performance-hindering stereotypes related to age and learning.

“Studies on lifelong learning suggest that, although they may need to expend more effort than younger learners, older learners can and do learn as much as younger learners when they expend that effort,” the researchers concluded.



True or false?

Despite being highly motivated to seek out truth, older adults have also been found to be more susceptible to fake news and other forms of misinformation, wrote Nadia M. Brashier and APS William James Fellow Daniel L. Schacter in a 2020 article in *Current Directions in Psychological Science*.

Older adults’ existing knowledge gives them an edge when it comes to uncovering the truth, and yet Facebook users older than 65 were 7 times more likely to share links to fake news sites, Brashier and Schacter found. Although this pattern can be partly attributed to cognitive decline—older adults are more likely to forget where they learned information, for example—people also tend to become more trusting later in life and therefore struggle more to identify lies, the researchers explained. These cognitive traits, combined with their relative inexperience online, can make older adults more likely to take fake news at face value.

“Cognitive declines alone cannot explain older adults’ engagement with fake news,” Brashier and Schacter concluded. “Interventions in a post-truth world must also consider their shifting social goals

and gaps in their digital literacy.”

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