Forget about forgetting – The elderly know more and use it better

Tübingen linguists show time and experience increase cognitive abilities as we age (though speed may decrease!)

Three generations, each with different cognitive strengths. The brains of older people work slower because they have more information to process. Photo: Lyzadanger/creative commons

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What happens to our cognitive abilities as we age? If your think our brains go into a steady decline, research reported this week in the Journal Topics in Cognitive Science may make you think again. The work, headed by Dr. Michael Ramscar of Tübingen University, takes a critical look at the measures usually thought to show that our cognitive abilities decline across adulthood. Instead of finding evidence of decline, the team discovered that most standard cognitive measures, which date back to the early twentieth century, are flawed. “The human brain works slower in old age,” says Ramscar, “but only because we have stored more information over time.”

Computers were trained, like humans, to read a certain amount each day, and to learn new things. When the researchers let a computer “read” only so much, its performance on cognitive tests resembled that of a young adult. But if the same computer was exposed to the experiences we might encounter over a lifetime – with reading simulated over decades – its performance now looked like that of an older adult. Often it was slower, but not because its processing capacity had declined. Rather, increased “experience” had caused the computer’s database to grow, giving it more data to process – which takes time.

Technology now allows researchers to make quantitative estimates of the number of words an adult can be expected to learn across a lifetime, enabling the Tübingen team to separate the challenge that increasing knowledge poses to memory from the actual performance of memory itself. “Imagine someone who knows two people’s birthdays and can recall them almost perfectly. Would you really want to say that person has a better memory than a person who knows the birthdays of 2000 people, but can ‘only’ match the right person to the right birthday nine times out of ten?” asks Ramscar.

The answer appears to be “no.” When Ramscar’s team trained their computer models on huge linguistic datasets, they found that standardized vocabulary tests, which are used to take account of the growth of knowledge in studies of ageing, massively underestimate the size of adult vocabularies. It takes computers longer to search databases of words as their sizes grow, which is hardly surprising but may have important implications for our understanding of age-related slowdowns. The researchers found that to get their computers to replicate human performance in word recognition tests across adulthood, they had to keep their capacities the same. “Forget about forgetting,” explained Tübingen researcher Peter Hendrix, “if I wanted to get the computer to look like an older adult, I had to keep all the words it learned in memory and let them compete for attention.”

The research shows that studies of the problems older people have with recalling names suffer from a similar blind spot: there is a far greater variety of given names today than there were two generations ago. This cultural shift toward greater name diversity means the number of different names anyone learns over their lifetime has increased dramatically. The work shows how this makes locating a name in memory far harder than it used to be. Even for computers.

Ramscar and his colleagues’ work provides more than an explanation of why, in the light of all the extra information they have to process, we might expect older brains to seem slower and more forgetful than younger brains. Their work also shows how changes in test performance that have been taken as evidence for declining cognitive abilities in fact demonstrates older adults’ greater mastery of the knowledge they have acquired.

Take “paired-associate learning,” a commonly used cognitive test that involves learning to connect words like “up” to “down” or “necktie” to “cracker” in memory. Using Big Data sets to quantify how often different words appear together in English, the Tuebingen team show that younger adults do better when asked to learn to pair “up” with “down” than “necktie” and “cracker” because “up” and “down” appear in close proximity to one another more frequently. However, whereas older adults also understand which words don’t usually go together, young adults notice this less. When the researchers examined performance on this test across a range of word pairs that go together more and less in English, they found older adult’s scores to be far more closely attuned to the actual information in hundreds of millions of words of English than their younger counterparts.

As Prof. Harald Baayen, who heads the Alexander von Humboldt Quantitative Linguistics research group where the work was carried out puts it, “If you think linguistic skill involves something like being able to choose one word given another, younger adults seem to do better in this task. But, of course, proper understanding of language involves more than this. You have also to not put plausible but wrong pairs of words together. The fact that older adults find nonsense pairs – but not connected pairs – harder to learn than young adults simply demonstrates older adults’ much better understanding of language. They have to make more of an effort to learn unrelated word pairs because, unlike the youngsters, they know a lot about which words don’t belong together.”

The Tübingen research conclude that we need different tests for the cognitive abilities of older people – taking into account the nature and amount of information our brains process. “The brains of older people do not get weak,” says Michael Ramscar. “On the contrary, they simply know more.”

Literature:

Michael Ramscar, Peter Hendrix, Cyrus Shaoul, Petar Milin, Harald Baayen. (2014) The Myth of Cognitive Decline: Non-Linear Dynamics of Lifelong Learning. Topics in Cognitive Science, 6, 5-42.

Contact:

Dr. Michael Ramscar
Tübingen University
Humanities Faculty
Linguistics Institute, Quantitative Linguistics
Phone: +49 7071 29-76893
michael.ramscar[at]uni-tuebingen.de