Better memory in old age linked with neural compensation

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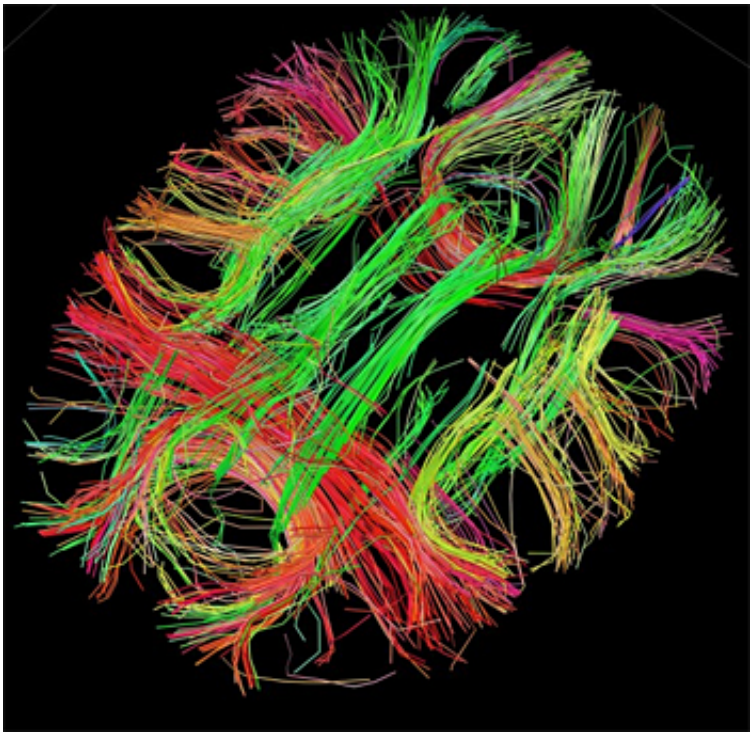

White matter fiber architecture of the brain. Credit: Human Connectome Project.

A new study by neuroscientists in Trinity College Dublin on successful ageing has linked better memory performance in older age with patterns of neural compensation. The research sheds light on how memory can remain efficient in spite of common age-related neural decline.

There is large variability in how memory changes with age. Some individuals show progressive decline in their ability to learn and, later, recollect information. By contrast, others show little or no decline and can maintain memory function well into old age.

The study by researchers at the Institute of Neuroscience and the School of Psychology focused on why some individuals are better at maintaining their memory in old age. In particular the study looked at the protective factors that reduce decline or promote maintenance of brain function in old age.

An important question in current cognitive aging research is whether older people who age successfully produce better memory performance by retaining their cognitive processes (preservation hypothesis) or, alternatively, by showing evidence of adaptive changes with age (compensation hypothesis), explains Dr Paul Dockree, Assistant Professor at the School of Psychology and lead author of the paper.

The research, published in the leading international peer-reviewed journal *Brain and Cognition*, supports the compensation argument because older people with less decline in memory exhibited prolonged neural signals when studying and learning new material.

In the study, 43 older people (average age of 70) classified according to their level of memory function were asked to learn or simply read a series of words and then, after a delay, to identify previously presented words in a recognition test. During both learning and recognition, neural signals were recorded.

Analysis revealed that during learning, high-performing older people exhibited neural signals that discriminated between words to-be-learned compared to words read for an additional 300 milliseconds compared to a young group and a subgroup of low-performing older people.

These findings support the compensation hypothesis of successful ageing because the group of older people with well-maintained memory showed prolonged neural signals when studying and learning new material, not only compared to the group of older people with more substantial decline in memory function but also in contrast to young adults with superior memory.

Patterns of neural compensation during study were also linked to the expression of neural signals that were seen later, during the recognition test. These recognition signals successfully dissociated words that were earlier learned versus read in high-performing elderly but did not in low-performing older people who lacked the neural compensation patterns during learning.

Together, these findings reveal that adaptive neural markers during learning may be a feature of better memory retrieval capabilities in successful aging, explains Dr Dockree.

Understanding how these compensatory patterns emerge in the brain, and discovering their relationship to life-long experiences or activities that can promote these adaptive changes, offers hope for the goal of prolonging healthy aging, he adds.

More information: "Characterising neural signatures of successful aging: Electrophysiological correlates of preserved episodic memory in older age," *Brain and Cognition*, Volume 97, July 2015, Pages 40-50, ISSN 0278-2626, dx.doi.org/10.1016/j.bandc.2015.04.002

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