

# Source of cognitive decline in aging brains

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(PhysOrg.com) -- As people age, memory and the ability to carry out tasks often decline. Scientists looking for ways to lessen that decline often have focused on the "gray matter" -- the cortical regions where high-level functions such as memory are located.

But there are signs that the search may need to be expanded: A new study by MIT neuroscientists has found that memory and cognitive impairments were more associated with loss of brain "white matter," which forms connections within and between brain regions.

"Historically a lot of people have put their eggs in the gray matter basket. This study suggests that what might really be important are the connections and the integrity of the connections," said David Ziegler, a graduate student in the Department of Brain and Cognitive Sciences and lead author of a paper on the work that appeared in the online edition of *Neurobiology of Aging* in December.

Enhancing white matter in older people through drug intervention or changes in diet or cardiovascular fitness could offer a new approach to countering some of the cognitive declines that are typical of advanced age, said Ziegler, who works in the laboratory of Suzanne Corkin, professor of behavioral neuroscience.

The study is the first to examine changes in both white and gray matter and correlate those changes with declines in memory and cognition, said Ziegler.

White matter consists of bundles of neuronal axons that form connections between neurons, allowing brain regions to communicate with each other. Gray matter, or cortex, is where the bodies of neurons are located.

The researchers used a new MRI brain scanning technique, known as diffusion tensor imaging, to study the white and gray matter of two groups of healthy adults -- one group aged 18 to 30, and the other aged 60 to 85.

They also measured subjects' performances in three categories -- memory for specific events; memory for vocabulary; and ability to plan and carry out everyday tasks.

In the older subjects, the researchers found a correlation between decline in cognitive performance and deterioration in the white matter of the frontal brain regions, where planning and executive functions are located. Similarly, deterioration of white matter in the parietal and temporal lobes, which are involved in memory, was associated with memory impairment.

"Thus, age-related impairments in specific cognitive capacities may arise from degenerative processes that affect the underlying connections of their respective neural networks," the researchers wrote in their paper.

Other authors of the paper are former MIT postdoctoral associates Olivier Piguet, who is now at the Prince of Wales Medical Research Institute, Sydney, Australia; David Salat, now at the Athinoula A. Martinos Center for Biomedical Imaging; and former MIT laboratory technicians Keyma Price and Emily Connally.

Provided by MIT

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