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Memory-related brain network shrinks with aging

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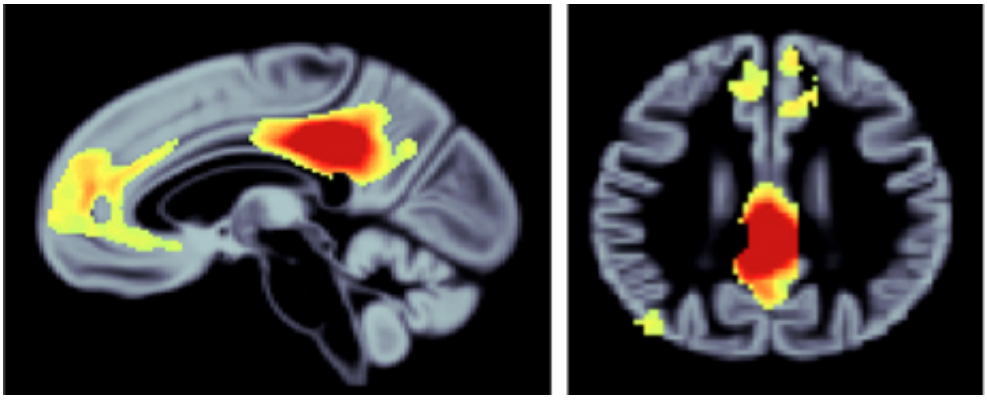

Network of brain regions, highlighted in red and yellow, show atrophy in both healthy aging and neurodegenerative disease. The regions highlighted are susceptible to normal aging and dementia.

Brain regions associated with memory shrink as adults age, and this size decrease is more pronounced in those who go on to develop neurodegenerative disease, reports a new study published Sept. 18 in the *Journal of Neuroscience* (Vol. 33:38). The volume reduction is linked with an overall decline in cognitive ability and with increased genetic risk for Alzheimer's disease, the authors say.

"Our results identify a specific pattern of structural brain changes that may provide a possible brain marker for the onset of Alzheimer's disease," said Nathan Spreng, assistant professor of human development and the Rebecca Q. and James C. Morgan Sesquicentennial Faculty

Fellow in Cornell's College of Human Ecology.

The study is one of the first to measure structural changes in a collection of brain regions – not just one single area – over the adult life course and from normal aging to neurodegenerative disease, said Spreng, who co-authored the study with Gary R. Turner of York University in Toronto.

Overall, they studied brain data from 848 individuals spanning the adult lifespan, using data from the Open Access Series of Imaging Studies and the Alzheimer's Disease Neuroimaging Initiative (ADNI). About half of the ADNI sample was assessed multiple times over several years, allowing the researchers to measure brain changes over time and determine who did and did not progress to dementia.

The researchers found that brain volume in the default network (a set of brain regions associated with internally generated thoughts such as memory) declined in both healthy and pathological aging. The researchers noted the greatest decline in Alzheimer's patients and in those who progressed from mild cognitive impairment to Alzheimer's disease. Reduced brain volumes in these regions were associated with declines in cognitive ability, the presence of known biological markers of Alzheimer's disease and with carrying the APOE4 variant of APOE gene, a known risk factor for Alzheimer's.

"While elements of the default network have previously been implicated in aging and neurodegenerative disease, few studies have examined broad network changes over the full adult life course with such large participant samples and including both behavioral and genetic data," said Spreng. "Our findings provide evidence for a network-based model of neurodegenerative disease, in which progressive brain changes spread through networks of connected brain regions."

The study, "Structural Covariance of the Default Network in Healthy

and Pathological Aging," was supported in part by the Canadian Institutes of Health Research.

More information: www.jneurosci.org/content/33/38/15226.full