Measuring the complexity of the aging brain

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An international collaboration between the Center for Healthy Brain Aging (CHeBA) and Beihang University in China has researched differential longitudinal changes in structural complexity and volumetric measures in community-dwelling older individuals.

The research analyzed the brain scans of community-dwelling older individuals aged 70-90 without dementia, using data from CHeBA's Sydney Memory & Aging Study.

The findings, published in *Neurobiology of Aging* discovered that a measure of "complexity" of the brain is more sensitive to brain changes over time than more conventional measures such as cortical thickness or cortical volumes.

"To investigate the relationship between the complexity measure, which is indexed as fractal dimensionality (FD), and the traditional Euclidean metric, such as volume and thickness, of the brain in older age, we analyzed MRI scans of 161 community-dwelling, non-demented individuals aged 70-90 years at baseline and at their 2-year and 6-year follow-ups," said Associate Professor Wen.

"We quantified changes of neuroimaging metrics in cortical lobes and subcortical structures, and investigated the age, sex, hemisphere and education effects on FD."

FD showed significant age-related decline in all brain structures, and its trajectory was best modeled quadratically, i.e. it accelerated in later years, in bilateral frontal, parietal, and occipital lobes, as well as in bilateral subcortical structures such as hippocampus.
According to Professor Wei Wen the findings suggest that FD is reliable yet shows a different pattern of decline compared to volumetric measures.

"It could provide a useful measure for future brain morphological and cognitive studies," says Professor Wen.


Provided by Centre for Healthy Brain Ageing


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