Our brains do change from early to mid-adulthood

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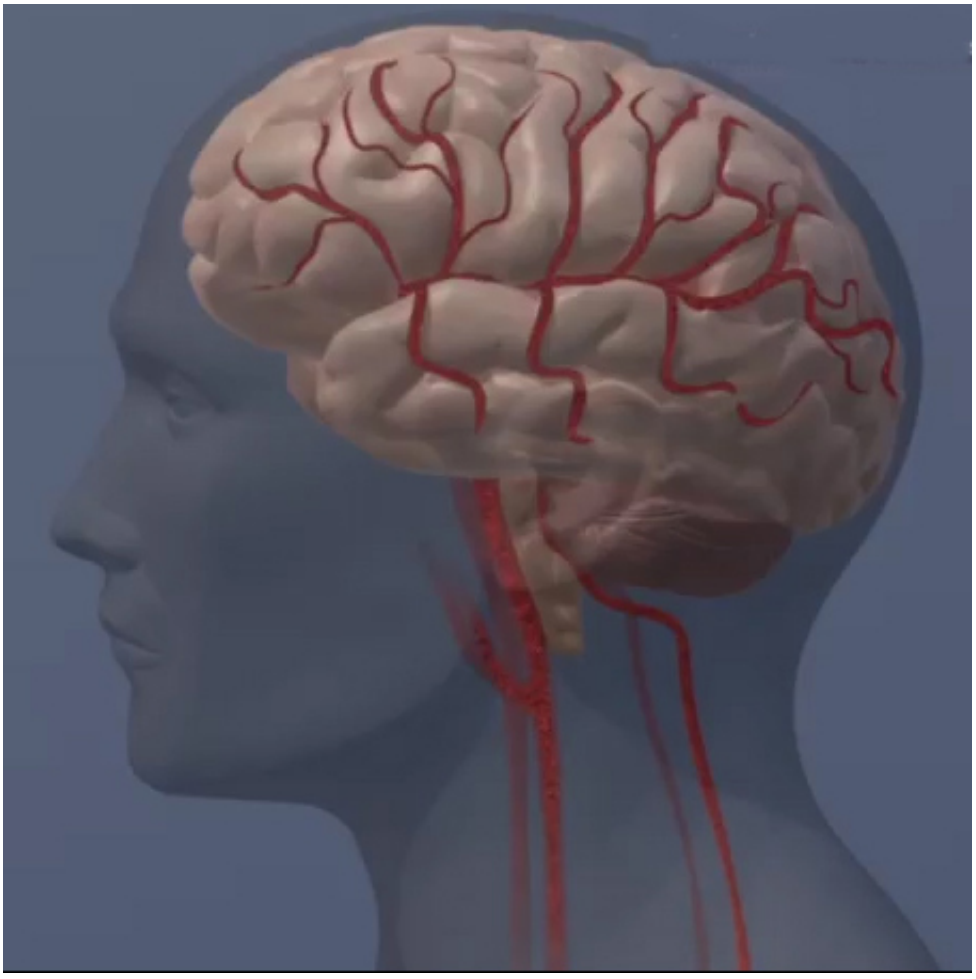

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Scientists in China have found that significant microstructural changes

occur in the brain from early to mid-adulthood, allowing them to accurately estimate an individual's age from their brain structure. The findings are striking, because until now scientists thought that brain structure was relatively stable during this period of adulthood.

Researchers have known for a while that our brains change as we age. From their initial maturation during childhood to their decline in old-age, numerous studies have demonstrated that our brains change over our lives in terms of their structure and activity.

Scientists have mostly focused on the rapid and profound brain changes that occur in early and late life and have largely neglected to study changes from early to mid-adulthood, assuming that our brain structure is relatively stable during this period.

"The changes in brain structure and function from early to mid-adulthood are largely unknown," explains Lixia Tian of the Beijing Jiaotong University, and an author on the study, which was recently published in *Frontiers in Human Neuroscience*. "The motivation for this study was to add to our knowledge about the changes in brain structure throughout the lifespan."

Because scientists have been unaware of how our brains change during this period of life, they don't routinely account for this when studying the brain, which could lead them to misinterpret their results. "In brain studies including adult subjects and covering a large age-span, scientists should consider possible age effects carefully. Otherwise, they could produce spurious results, possibly reflecting age effects, rather than the effect under investigation," explains Tian.

The team analyzed a publicly available dataset of brain scans from a group of healthy volunteers who had undergone diffusion tensor imaging , a specialized type of magnetic resonance imaging. Diffusion tensor

imaging allows scientists to image and map structures in the brain and to measure parameters such as fractional anisotropy, a measurement based on the diameter, density and connectivity of nerve fibers in specific brain regions.

The researchers analyzed a sample of scans from 111 volunteers in early to mid-adulthood (18-55 years old). They found that fractional anisotropy significantly decreased with age, and identified specific brain regions where the earliest age-related changes occurred. The changes were so highly correlated with age that the researchers could estimate the age of an individual simply by analyzing their brain scan. This is striking, considering that prior to this, scientists had thought that the brain structure of healthy adults was relatively stable before old-age.

So, what do these changes mean? "Researchers have linked decreases in fractional anisotropy to degeneration of the human brain with disease or in old-age," says Tian. Although the structural changes were subtle compared with those previously reported in elderly people, the brain regions that showed the earliest changes have been associated with cognitive decline in old-age, such as decreased reaction times, reasoning abilities and memory.

The team did not directly investigate if the changes were linked to cognitive decline in these adults. These changes may represent some of the very first signs of the aging brain, but it is unclear if they coincide with the beginning of age-related cognitive decline.

One of the limitations of the study was that it provided just one snapshot of differences in brain structure over adulthood. The researchers would like to conduct a long-term study following the same people from early to mid-adulthood. "Such a longitudinal study may more accurately show microstructural changes in the human brain from early to mid-adulthood," explains Tian.

More information: Lixia Tian et al, Microstructural Changes of the Human Brain from Early to Mid-Adulthood, *Frontiers in Human Neuroscience* (2017). DOI: 10.3389/fnhum.2017.00393

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