

Human brains age less than previously thought

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Left hemisphere of J. Piłsudski's brain, lateral view. Credit: public domain

Older brains may be more similar to younger brains than previously thought.

In a new paper published in *Human Brain Mapping*, BBSRC-funded researchers at the University of Cambridge and Medical Research

Council's Cognition and Brain Sciences Unit demonstrate that previously reported changes in the ageing brain using functional magnetic resonance imaging (fMRI) may be due to vascular (or blood vessels) changes, rather than changes in neuronal activity itself.

Given the large number of fMRI studies used to assess the ageing brain, this has important consequences for understanding how the brain changes with age and challenges current theories of ageing.

A fundamental problem of fMRI is that it measures neural activity indirectly through changes in regional blood flow. Thus, without careful correction for age differences in vasculature reactivity, differences in fMRI signals can be erroneously regarded as neuronal differences.

An important line of research focuses on controlling for noise in fMRI signals using additional baseline measures of vascular function. However, such methods have not been widely used, possibly because they are impractical to implement in studies of ageing.

An alternative candidate for correction makes use of resting state fMRI measurements, which is easy to acquire in most fMRI experiments. While this method has been difficult to validate in the past, the unique combination of an impressive data set across 335 healthy volunteers over the lifespan, as part of the [CamCAN project](#), allowed Dr. Kamen Tsvetanov and colleagues to probe the true nature of ageing effects on resting state fMRI signal amplitude.

Their research showed that age differences in signal amplitude during a task are of a vascular, not neuronal, origin. They propose that their method can be used as a robust correction factor to control for vascular differences in fMRI studies of ageing.

The study also challenged previous demonstrations of reduced [brain](#)

[activity](#) in visual and auditory areas during simple sensorimotor tasks. Using conventional methods, the current study replicated these findings.

However, after correction, Tsvetanov et al. results show that it might be vascular health, not brain function, that accounts for most age-related differences in fMRI signal in sensory areas. Their results suggest that the age differences in [brain](#) activity may be overestimated in previous fMRI studies of ageing.

Dr. Tsvetanov said: "There is a need to refine the practice of conducting fMRI. Importantly, this doesn't mean that studies lacking 'golden standard' calibration measures, such as large scale studies, patient studies or ongoing longitudinal studies are invalid. Instead, researchers should make use of available resting state data as a suitable alternative. These findings clearly show that without such correction methods, fMRI studies of the effects of age on cognition may misinterpret effect of age as a cognitive, rather than vascular, phenomena."

More information: Kamen A. Tsvetanov, Richard N. A. Henson, Lorraine K. Tyler, Simon W. Davis, Meredith A. Shafto, Jason R. Taylor, Nitin Williams, Cam-CAN, and James B. Rowe (2015). The effect of ageing on fMRI: correction for the confounding effects of vascular reactivity evaluated by joint fMRI and MEG in 335 adults. *Human Brain Mapping*, [onlinelibrary.wiley.com/doi/10 ... 2/hbm.22768/abstract](https://onlinelibrary.wiley.com/doi/10.1002/hbm.22768/abstract)

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