Large-scale brain imaging study reveals five patterns of age-related degeneration

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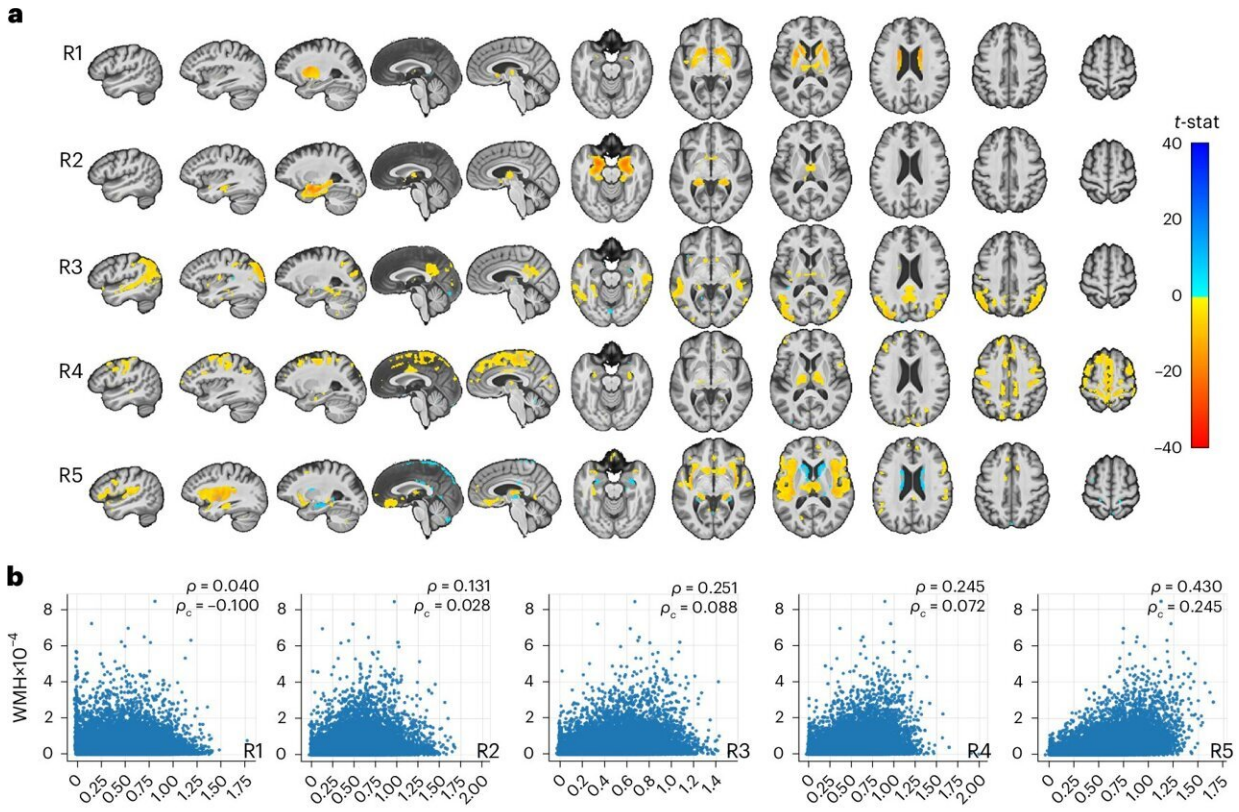

Surreal-GAN identifies five dimensions of brain aging. Credit: *Nature Medicine* (2024). DOI: 10.1038/s41591-024-03144-x

Through a large-scale brain imaging study, an international research team has identified five patterns of age-related degeneration in older

people experiencing mental decline. In their study, published in the journal *Nature Medicine*, the team conducted the multi-year study of thousands of MRI scans using machine learning applications to find patterns in brain degeneration as people age.

Prior research has shown that as people age, they experience changes to most every part of their body, including the brain, though such differences can differ significantly from person to person. These changes are difficult to spot on MRIs, at least by the human eye.

For this new study, the research team used a machine-learning application to spot age-related brain degeneration in 8,992 older people who had undergone at least one brain MRI scan over an eight-year period. MRIs from more than 1,100 younger people and other older people not experiencing mental decline were also included.

Together, the scans were used to teach the system what brains look like as they grow older. The team then applied the model to 49,482 MRI scans from people who had been scanned for a variety of reasons related to their neural health.

The model identified five main patterns surrounding brain atrophy. The researchers also found that multiple causes could be linked to one or more of the patterns. Dementia, for example, could be seen in three of the patterns. So could diseases like Alzheimer's and Parkinson's.

The team also found associations between certain behaviors and brain degeneration, such as smoking and drinking, which they noted appeared to correlate with overall health indicators. Additionally, they found patterns that could be linked to mortality and/or the potential for future degeneration.

The researchers point out that their study does not suggest that

everything involving brain degeneration can be boiled down to one or more of the five patterns. They note that much more research is required to learn more about these patterns before they can be used in a meaningful way.

More information: Zhijian Yang et al, Brain aging patterns in a large and diverse cohort of 49,482 individuals, *Nature Medicine* (2024). DOI: 10.1038/s41591-024-03144-x