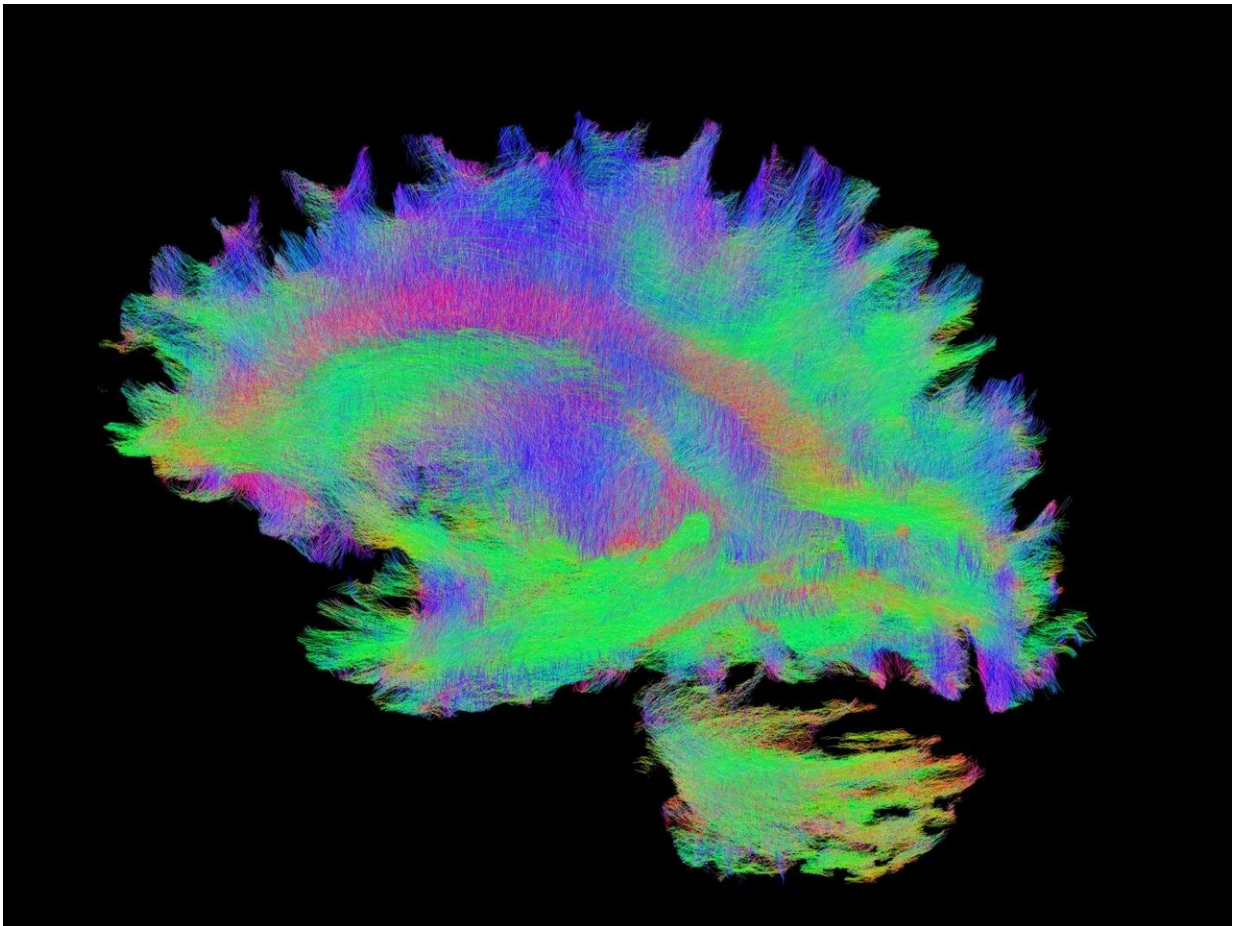


Big data analysis suggests role of brain connectivity in epilepsy-related atrophy

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The connectome is a map of neural connections that describes how brain regions interact and work together to perform certain tasks. Credit: Boris Bernhardt lab/The Neuro

An international study has found a link between the brain's network connections and gray matter atrophy caused by certain types of epilepsy, a major step forward in our understanding of the disease.

In neuroscience, it is becoming increasingly clear that the brain's connectome is as important as its anatomy when studying [human disease](#). The connectome is a map of neural connections that describes how [brain regions](#) interact and work together to perform certain tasks. While connectome research in [epilepsy](#) has moved forward in recent years, there is still a lot we do not know about its role in the disorder.

The study, led by researchers from The Neuro (Montreal Neurological Institute-Hospital), analyzed data from 1,021 individuals with epilepsy and 1,564 healthy controls over 19 sites around the world from the ENIGMA database, a collection of neuroimaging data available to researchers under Open Science principles. They used this data to map gray matter atrophy, a characteristic of epilepsy, in the patients.

They then collected data from another database called the Human Connectome Project, which provides [connectome](#) data from a large group of healthy controls. Their hypothesis was that gray matter atrophy would appear most often in parts of the brain where connectivity was highest, known as hubs.

"Hub regions are known to participate in brain signaling, have high plasticity, and high metabolic activity, making them a candidate for epilepsy-related atrophy," says Sara Larivière, the study's lead author and a Ph.D. candidate at The Neuro.

The team found that areas of high [atrophy](#) in patients with both idiopathic generalized epilepsy and [temporal lobe epilepsy](#) also tended to be hub regions. Using further analyses, they were able to show their model could predict the damage the epilepsy did to the gray matter of

individual patients over time.

"Our multi-site findings show that brain connectivity contributes to the effect that epilepsy has on whole brain structure," says Boris Bernhardt, a researcher at The Neuro and the study's senior author. "This will be important to understand common functional deficits in individual patients and to assess the effect of the disease over time."

More information: Sara Larivière et al, Network-based atrophy modeling in the common epilepsies: A worldwide ENIGMA study, *Science Advances* (2020). [DOI: 10.1126/sciadv.abc6457](https://doi.org/10.1126/sciadv.abc6457)

Provided by McGill University

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