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Researchers identify previously unrecognised abnormalities in how MND affects brain activity

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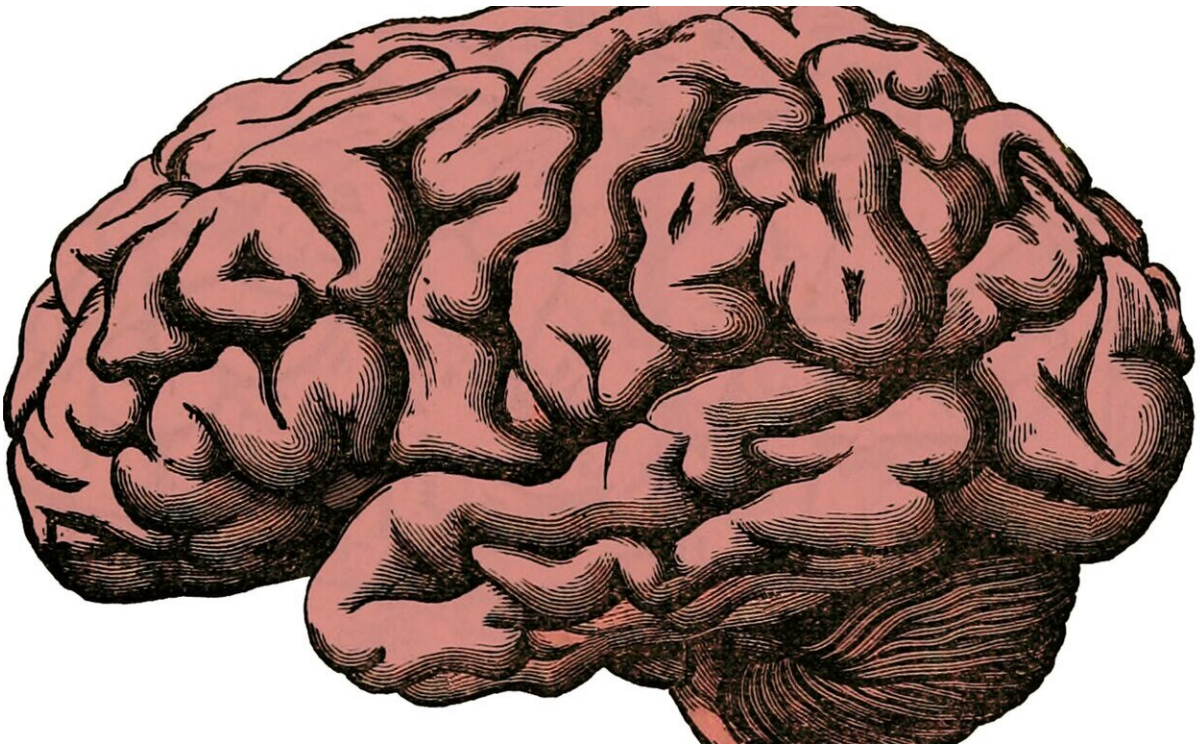

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Researchers in the Academic Unit of Neurology at Trinity College Dublin have identified characteristic changes in the patterns of electrical brain wave activity in motor neurone disease (MND). This ground

breaking observation will help to develop treatments for the disease that affects over 350 people in Ireland.

Their findings, published in the recent issue of the journal *Human Brain Mapping* reveals how MND affects the neural communication in different brain networks.

Motor neurone disease (MND), also known as Amyotrophic Lateral Sclerosis (ALS), is a devastating condition which causes progressive paralysis, increasing physical disability and ultimately death within an average of two to three years. One person is diagnosed every 3 days with the condition in Ireland.

Using electroencephalography (EEG), the team at Trinity College has been able to capture second to second changes in electrical signalling, and have identified specific groups (or networks) of nerves that behave abnormally in MND. This is the first time researchers have used EEG in this way in MND. The work shows that this inexpensive technology can give information about abnormal brain activity that rivals functional MRI, and at a fraction of the cost.

The team has been able to identify and study in detail more than six different brain networks associated with MND.

Lead author of the study, Stefan Dukic, who is pursuing his Ph.D. jointly between Trinity College Dublin (Ireland) and University Medical Centre Utrecht (The Netherlands) said: "The human brain works by electrical signalling between billions of neurons in different networks. This electrical signalling between neurons allows us to perform every-day tasks such as movement, sensing and thinking. In MND, we have for the first time found specific and reproducible changes in electrical brain signalling using electroencephalography (EEG) recordings"

"The new findings have identified previously unrecognised abnormalities in the brain networking. This advances our understanding of the specific brain networks that become dysfunctional as the disease progresses."

The Fr Tony Coote Assistant Professor in Neural Signalling, and senior author of the study, Dr. Bahman Nasseroleslami said: "The emerging technologies such as advanced signal analysis and electrical source imaging of the brain are changing our understanding of MND and related diseases. We can now use EEG, which is inexpensive compared to MRI, to probe brain networks instantaneously and identify important changes that reflect the impact of the disease on the patients."

Head of the Academic Unit of Neurology at Trinity, Professor Orla Hardiman, a world expert in MND said: "In MND research, these findings are a major leap from the current state-of-the-art approach to studying the disease. The work of Dukic and Nasseroleslami has shown how we can now begin to carefully quantify changes in specific parts of brain networks. This will have major implications on how we classify the sub-types of the disease. It can also help to tell us what patient groups may respond to new therapies."

The cutting edge work undertaken at Trinity College Dublin moves the field one step closer to the quest for better treatments.

"There is an urgent need for new treatments that can slow disease progression, and the development of new biomarkers that can help to identify patient subgroups is a very important unmet need," added Professor Hardiman.

More information: Stefan Dukic et al, Patterned functional network disruption in amyotrophic lateral sclerosis, *Human Brain Mapping* (2019). DOI: 10.1002/hbm.24740

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