Advanced MRI scans could help predict people at risk of schizophrenia

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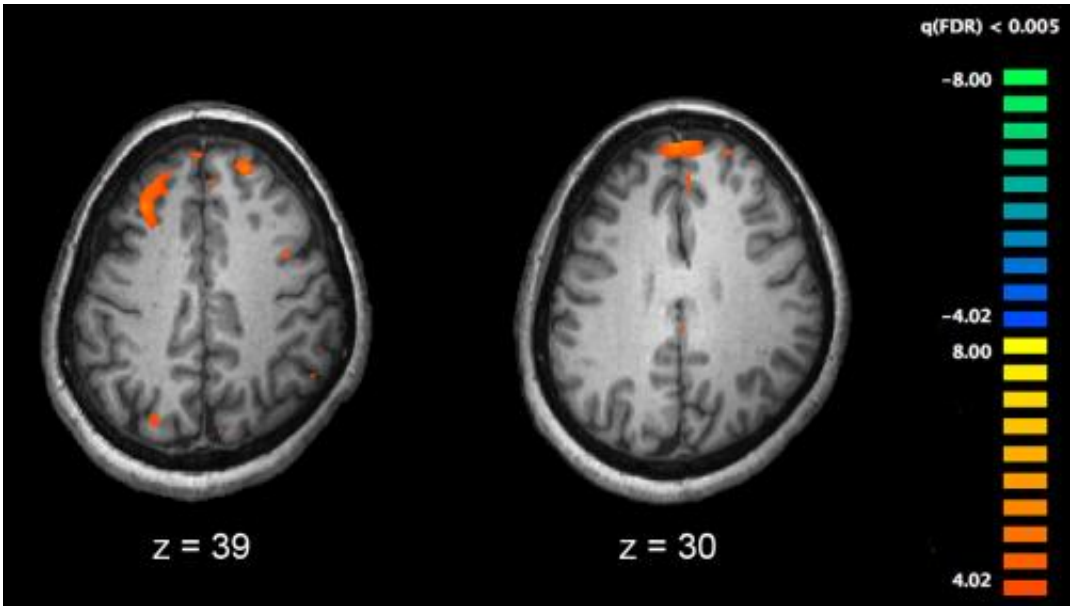

Functional magnetic resonance imaging (fMRI) and other brain imaging technologies allow for the study of differences in brain activity in people diagnosed with schizophrenia. The image shows two levels of the brain, with areas that were more active in healthy controls than in schizophrenia patients shown in orange, during an fMRI study of working memory. Credit: Kim J, Matthews NL, Park S./PLoS One.

New scanning methods which map the wiring of the brain could provide a valuable new tool to predict people at risk of schizophrenia, according to a new study.

Scientists have long known that the symptoms of schizophrenia are partly explained by disordered connectivity in the brain.

Now, a team of scientists from Cardiff University Brain Research Imaging Centre (CUBRIC), the Institute of Psychiatry, Psychology and Neuroscience, Kings College London and the University of Bristol, have, for the first time, used Magnetic Resonance Imaging (MRI) to identify how the brains of young people, who have some of the symptoms of schizophrenia, are wired differently.

"We already know that the brains of people with schizophrenia are wired differently and are less efficient than healthy people," according to Professor Derek Jones, Director of CUBRIC.

"However, until now, no study has tried to use this information to look at healthy individuals with some of the same symptoms but without actually having the condition." he added.

Using a specific type of MRI scan which maps the wiring of the brain, in a study funded by the Medical Research Council (MRC), the team scanned 123 people who have vulnerability to psychosis, and 125 people without vulnerability and compared the differences in the wiring of their brains.

The results, published in the journal *Human Brain Mapping*, showed the ability of the brain network in people vulnerable to schizophrenia to transmit information from one region to another was reduced and some information pathways were rerouted.

Crucially, the team found that this affected certain central information hubs of the brain, which could lead to widespread problems in information processing in a similar way to schizophrenia.

Cardiff University's Dr Mark Drakesmith, who led the research, said: "The changes we've identified in the brain networks are extremely subtle.

"However, using a specific type of Magnetic Resonance Imaging (MRI) which maps the wiring of the brain, we have made some key discoveries that would not have been detected using more established brain imaging techniques.

"The technique employs a branch of mathematics called 'graph theory', which allows us to examine complex architectural features of networks, such as efficiency of information transfer.

This approach is traditionally used in computer science, but is now giving neuroscientists and psychiatrists new insights into how configurations of brain networks are altered in mental illness."

Schizophrenia is a serious mental disorder, which causes hallucinations, delusions and disordered thought. It is a relapsing and remitting condition which can be controlled with medication.

Nevertheless, the World Health Organisation (WHO) estimates that schizophrenic disorders affect around 26M people worldwide and result in moderate or severe disability in sixty percent of cases.

The team hope their new analysis could provide a valuable insight into how the wiring of the brain gives rise to symptoms of schizophrenia, and crucially, offer a new tool for predicting future illness.

Professor Anthony David at Kings College London added: "Understanding the way people's brains become misconnected or connected less efficiently is crucial to understanding the illness.

"What we would like to find out is why for some people, these changes progress while in others they don't - that's the next challenge."

More information: "Schizophrenia-like topological changes in the structural connectome of individuals with subclinical psychotic experiences," *Hum Brain Mapp*. 2015 Apr 2. DOI: 10.1002/hbm.22796

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