Imaging markers developed to facilitate diagnosis and treatment of schizophrenia

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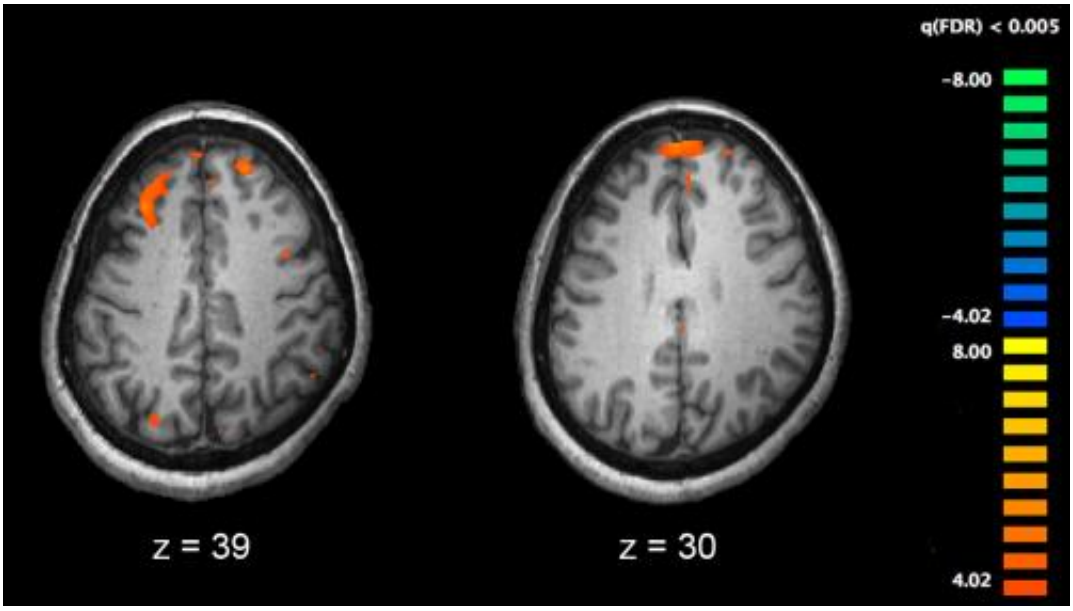

Functional magnetic resonance imaging (fMRI) and other brain imaging technologies allow for the study of differences in brain activity in people diagnosed with schizophrenia. The image shows two levels of the brain, with areas that were more active in healthy controls than in schizophrenia patients shown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

Around four in a thousand people worldwide suffer from schizophrenia, according to scientific estimates. The disease affects people from all walks of life, including Vincent van Gogh, the painter Agnes Martin, mathematician John Nash and Eduard Einstein, a son of the great

physicist. The disease affects men and women equally.

Despite its prevalence, however, schizophrenia has remained a mystery. Diagnosis has relied on patient behavior, such as hallucinations, delusions and disordered thinking, rather than on quantitative biomarkers. As a result, psychiatrists' ability to objectively diagnose and treat people with the illness has been impaired.

New research, led by Prof. Liu Bing and Prof. Jiang Tianzi from the Institute of Automation of the Chinese Academy of Sciences and their collaborators, may change this situation, though. The scientists have recently developed a novel imaging marker that may help in the personalized medicine of psychiatric disorders.

The study, published in *Nature Medicine* on Mar. 23, shows that abnormal striatal function can be a promising biomarker for the diagnosis of schizophrenia and treatment response.

In their search for suitable biomarkers, the scientists collected multimodal neuroimaging data from a total of 1100 individuals with schizophrenia and healthy controls from 2010-15.

Using the large dataset, the researchers first proposed the concept of "functional striatal abnormalities." They then used artificial intelligence technology on resting state fMRI data to map striatal dysfunction at the individual level.

The researchers showed, for the first time, that striatal dysfunction was effective in distinguishing schizophrenia patients and that such dysfunction was also responsible for poorer antipsychotic response.

Based on the newly developed biomarker, the researchers extended their research to other neuropsychiatric disorders. They showed that

individuals with bipolar disorder also showed striatal dysfunction that overlapped with the dysfunction associated with schizophrenia.

After combining different levels of data, the researchers suggested that striatal dysfunction is related to the dopaminergic system and polygenic genetic risk for schizophrenia.

The study also evaluated using this biomarker to predict diagnostic labels and treatment responses across several different hospitals.

The scientists hope research on the biological underpinnings of psychiatric disorders will increase understanding of disease mechanisms as well as guide new drug development.

More information: A neuroimaging biomarker for striatal dysfunction in schizophrenia, *Nature Medicine* (2020). DOI: 10.1038/s41591-020-0793-8 , nature.com/articles/s41591-020-0793-8

A web-based tool developed to calculate personalized functional striatal abnormalities (FSA) score for each individual is available at www.szbiomarkers.net/

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