

Schizophrenia: It's in the Wiring of the Brain

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Reports new study in Biological Psychiatry

Just as wires must be insulated to effectively carry electrical impulses, nerve cells must be insulated by myelin to effectively transmit neural impulses. Using typical magnetic resonance imaging or MRI, one can visually distinguish parts of the brain that look white and parts that look gray. Myelin is most prevalent in the white matter because this component of the brain tissue is principally comprised by the nerve cell projections (axons) that are covered by myelin and that transmit information from one part of the brain to another.

In a new paper in *Biological Psychiatry*, Fei Du and colleagues at Harvard Medical School combined two types of brain imaging to characterize abnormalities in the white matter in schizophrenia.

One type of imaging, called magnetic resonance spectroscopy, measures the levels of particular chemicals in the brain. Another approach, called magnetization transfer imaging, is sensitive to changes in the level of myelin in the white matter.

“The notion that the brain in schizophrenia is characterized by abnormalities in connections between distant brain regions is not new, and imaging studies using diffusion tensor imaging have long suggested that the white matter where these connections travel is abnormal in this condition,” explained senior author Dr. Dost Öngür. “However, we have not had the tools to determine whether the abnormalities are in axons, or the myelin sheath around the axons, or both.”

The researchers found evidence for abnormalities in both myelin and axons among patients with schizophrenia, when compared with healthy individuals who underwent the same testing. More specifically, they found reduced myelination of white matter pathways in schizophrenia, and also abnormal diffusion of N-acetylaspartate, a metabolite thought to be predominately localized within nerve cells.

This pattern of results is indicative of abnormalities in information processing and cognitive deficits, which is consistent with what scientists already know about how the brain is impacted by schizophrenia and the symptoms associated with this disorder.

“This study provides new evidence that myelination abnormalities in schizophrenia are associated with disturbances in the functional integrity of the white matter. As the white matter carries long range communication in the brain, the current findings raise new questions about the functional impact and treatment for these neural deficits,” said Dr. John Krystal, Editor of *Biological Psychiatry*.

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These findings are important because they suggest that “the white matter abnormalities in schizophrenia are complex and interconnected”, added Öngür. “A strategy to impact both axonal health and myelin synthesis may be needed to restore normal white matter functioning in this condition.”

Such a strategy to restore abnormal functioning is not likely in the near future, but advances provided by this study and others like it help bring scientists ever closer to that ultimate goal.

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