

Study finds visual and tactile processing deficits in 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.

A new study out today in the journal *Translational Psychiatry* sheds further light on the idea that schizophrenia is a sensory disorder and that individuals with the condition are impaired in their ability to process stimuli from the outside world. The findings may also point to a new

way to identify the disease at an early stage and before symptoms become acute.

Because one of the hallmarks of the disease is auditory hallucinations, such as hearing voices, researchers have long suspected a link between auditory processing and schizophrenia. The new study provides evidence that the filtering of incoming visual information, and also of simple touch inputs, is also severely compromised in individuals with the condition.

"When we think about schizophrenia, the first things that come to mind are the paranoia, the delusions, the disorganized thinking," said John Foxe, Ph.D., the chair of the University of Rochester Medical Center Department of Neuroscience and senior author of the study. "But there is increasing evidence that there is something fundamentally wrong with the way these patients hear, the way they feel things through their sense of touch, and in the way in which they see the environment."

The researchers conducted a series of experiments in which they presented visual and touch stimuli to 15 [schizophrenia patients](#) and 15 controls while they recorded the brain's response via electrodes placed on the surface of the scalp. What scientists have known for years is that when encountering a series of inputs, such as successive flashes of light, the brain's initial response is large and strong. However, as the flash is repeated the reaction quickly fades in intensity.

This response reduction is known as sensory "adaptation" and is an essential mechanism which enables the brain to filter out repetitive and irrelevant information. Researchers believe that adaptation allows the brain to free itself up to respond to new events and stimuli that may be more important.

The research team found that adaptation was substantially weaker in the

patients with schizophrenia, and this was the case for both repeated visual stimulation and for repeated touch stimulation.

"If you can't properly filter the information at the basic sensory input stage, then it is not too hard to imagine how the external world could begin to be experienced as bizarre and unreliable," said Gizely Andrade, Ph.D. with the Albert Einstein College of Medicine and a co-author of the study. "A fundamental aspect of the way our minds operate is that they can rely on the fact that the external world remains constant. If it doesn't, then reality itself could become distorted."

The team is hopeful that this discovery might lead to simple and basic measures of sensory adaptation that could be used to diagnose schizophrenia or identify individuals at risk of developing the condition before the disease has had a chance to fully establish itself.

"A key point with this study is that we find these dramatic differences in patients who are already suffering from full-blown [schizophrenia](#)," said Foxe. "Schizophrenia is a disease that typically strikes during late adolescence or early adulthood, but what we also know is that long before a person has their first major psychotic episode, there are subtle changes occurring that precede the full manifestation of the disease. Our hope is that these new measures can allow us to pick up on these people before they ever become seriously ill."

Provided by University of Rochester Medical Center

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