Retinal changes may serve as measures of brain pathology in schizophrenia

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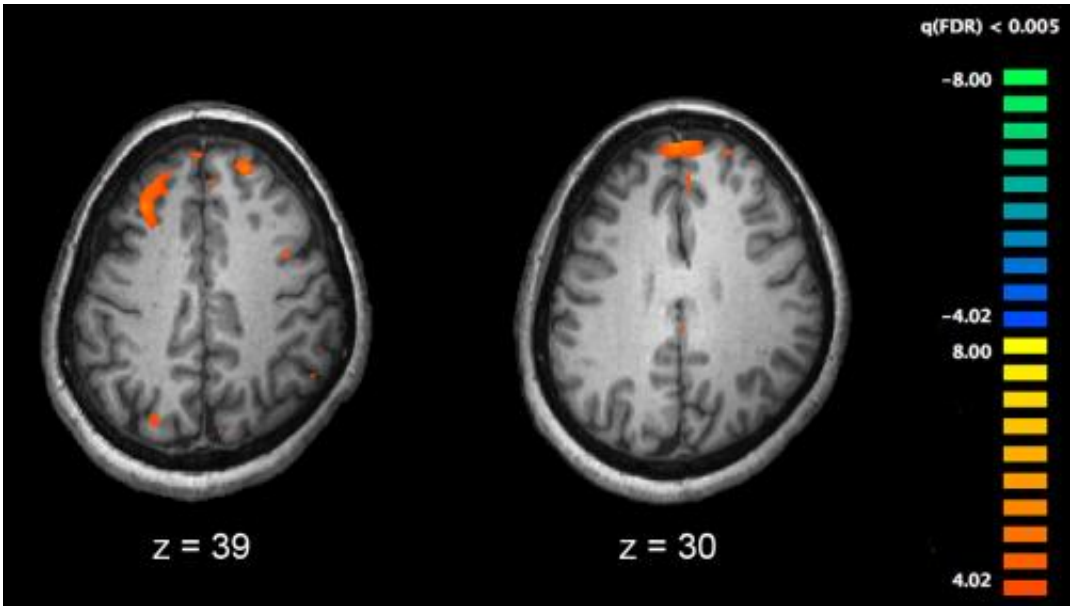

Functional magnetic resonance imaging (fMRI) and other brain imaging technologies allow for the study of differences in brain activity in people diagnosed with schizophrenia. The image shows two levels of the brain, with areas that were more active in healthy controls than in schizophrenia patients shown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

Schizophrenia is associated with structural and functional alterations of the visual system, including specific structural changes in the eye. Tracking such changes may provide new measures of risk for, and progression of the disease, according to a literature review published

online in the journal *Schizophrenia Research: Cognition*, authored by researchers at New York Eye and Ear Infirmary of Mount Sinai and Rutgers University.

Individuals with schizophrenia have trouble with social interactions and in recognizing what is real. Past research has suggested that, in schizophrenia, abnormalities in the way the brain processes visual information contribute to these problems by making it harder to track moving objects, perceive depth, draw contrast between light and dark or different colors, organize visual elements into shapes, and recognize facial expressions. Surprisingly though, there has been very little prior work investigating whether differences in the retina or other eye structures contribute to these disturbances.

"Our analysis of many studies suggests that measuring retinal changes may help doctors in the future to adjust schizophrenia treatment for each patient," said study co-author Richard B. Rosen, MD, Director of Ophthalmology Research, New York Eye and Ear Infirmary of Mount Sinai, and Professor of Ophthalmology, Icahn School of Medicine at Mount Sinai. "More studies are needed to drive the understanding of the contribution of retinal and other ocular pathology to disturbances seen in these patients, and our results will help guide future research."

The link between vision problems and schizophrenia is well established, with as many as 62 percent of adult patients with schizophrenia experience visual distortions involving form, motion, or color. One past study found that poorer visual acuity at four years of age predicted a diagnosis of schizophrenia in adulthood, and another that children who later develop schizophrenia have elevated rates of strabismus, or misalignment of the eyes, compared to the general population.

Dr. Rosen and Steven M. Silverstein, PhD, Director of the Division of Schizophrenia Research at Rutgers University Behavioral Health Care,

were the lead authors of the analysis, which examined the results of approximately 170 existing studies and grouped the findings into multiple categories, including changes in the retina vs. other parts of the eye, and changes related to dopamine vs. other neurotransmitters, key brain chemicals associated with the disease.

The newly published review found multiple, replicated, indicators of eye abnormalities in schizophrenia. One of these involves widening of small blood vessels in the eyes of schizophrenia patients, and in young people at high risk for the disorder, perhaps caused by chronic low oxygen supply to the brain. This could explain several key vision changes and serve as a marker of disease risk and worsening. Also important in this regard was thinning of the retinal nerve fiber layer in schizophrenia, which is known to be related to the onset of hallucinations and visual acuity problems in patients with Parkinson's disease. In addition, abnormal electrical responses by retinal cells exposed to light (as measured by electroretinography) suggest cellular-level differences in the eyes of schizophrenia patients, and may represents a third useful measure of disease progression, according to the authors.

In addition, the review highlighted the potentially detrimental effects of dopamine receptor-blocking medications on visual function in schizophrenia (secondary to their retinal effects), and the need for further research on effects of excessive retinal glutamate on visual disturbances in the disorder.

Interestingly, the analysis found that there are no reports of people with schizophrenia who were born blind, suggesting that congenital blindness may completely or partially protect against the development of schizophrenia. Because congenitally blind people tend to have cognitive abilities in certain domains (e.g., attention) that are superior to those of healthy individuals, understanding brain re-organization after blindness may have implications for designing cognitive remediation interventions

for people with schizophrenia.

"The retina develops from the same tissue as the brain," said Dr. Rosen. "Thus retinal changes may parallel or mirror the integrity of brain structure and function. When present in children, these changes may suggest an increased risk for schizophrenia in later life. Additional research is needed to clarify these relationships, with the goals of better predicting emergence of schizophrenia, and of predicting relapse and treatment response and people diagnosed with the condition."

Dr. Silverstein points out that, to date, vision has been understudied in schizophrenia, and studies of the retina and other ocular structures in the disorder are in their infancy. However, he added, "because it is much faster and less expensive to obtain data on retinal structure and function, compared to brain structure and function, measures of retinal and ocular structure and function may have an important role in both future research studies and the routine clinical care of people with schizophrenia."

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