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Eye movements and the search for biomarkers for schizophrenia

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(Medical Xpress)—There is a long history of research on impaired eye movements associated with schizophrenia. Using a series of simple viewing tests, researchers of a new paper in Biological Psychiatry explored the ability of these eye movement tests to distinguish people with and without the diagnosis of schizophrenia.

Using their complete dataset, they were able to develop a model that could discriminate all schizophrenia cases from healthy control subjects with an impressive 98.3% accuracy.

Drs. Philip Benson and David St. Clair, lead authors on the paper, agreed that their findings were remarkable: "It has been known for over a hundred years that individuals with psychotic illnesses have a variety of eye movement abnormalities, but until our study, using a novel battery of tests, no one thought the abnormalities were sensitive enough to be used as potential clinical diagnostic biomarkers."

Their battery of tests included smooth pursuit, free-viewing, and gaze fixation tasks. In smooth pursuit, people with schizophrenia have well-documented deficits in the ability to track slow-moving objects smoothly with their eyes. Their eye movements tend to fall behind the moving object and then catch-up with the moving object using a rapid eye movement, called a saccade.. A picture is displayed in the free-viewing test, and where most individuals follow a typical pattern with their gaze as they scan the picture, those with schizophrenia follow an abnormal pattern. In a fixation task, the instruction is to keep a steady gaze on a

single unmoving target, which tends to be difficult for individuals with schizophrenia.

As expected, the researchers found that the performance of individuals with schizophrenia was abnormal compared to the healthy volunteer group on each of the eye tests. At right is an example of the differences, with the eye tracking of a schizophrenia case in red and a healthy control in blue.

The researchers then used several methods to model the data. The accuracy of each of the created algorithms was then tested by using eye test data from another group of cases and controls. Combining all the data, one of the models achieved 98.3% accuracy.

"It is encouraging to see the high sensitivity of this model for the diagnosis of schizophrenia. It will be interesting to see the extent to which this approach enables clinical investigators to distinguish people with schizophrenia from individuals with other psychiatric disorders," commented Dr. John Krystal, Editor of Biological Psychiatry.

Benson and St Clair have already started that work, stating, "We now have exciting unpublished data showing that patterns of eye movement abnormalities are specific to different psychiatric subgroups, another key requirement for diagnostic biomarkers. The next thing we want to know is when the abnormalities are first detectable and can they be used as disease markers for early intervention studies in major mental illness?"

"We are also keen to explore how best our findings can be developed for use in routine clinical practice," they added. Typical neuropsychological assessments are time-consuming, expensive, and require highly trained individuals to administer. In comparison, these eye tests are simple, cheap, and take only minutes to conduct. This means that a predictive

model with such precision could potentially be incorporated in clinics and hospitals to aid physicians by augmenting traditional symptom-based diagnostic criteria.

 More information: *Biological Psychiatry*, Volume 72, Issue 9 (November 1, 2012)

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