Media Release: European College of Neuropsychopharmacology (ECNP)

"For the science and treatment of disorders of the brain"

Psychotic patients distinguished from controls while watching movie Alice in Wonderland

Embargo until: 00.05 Central European Summer Time (Amsterdam) Monday 31ˢᵗ August 2015

Researchers using fMRI (functional Magnetic Resonance Imaging) have found that even first-episode psychotic* patients process information differently from a control group. To ensure both groups experienced the same brain stimuli, the measurements were taken while the subjects watched a movie, Tim Burton's *Alice in Wonderland.* The work is being presented at the 28th ECNP Conference in Amsterdam*.*

High-precision fMRI is often used in neuroscience to locate brain activity in response to stimuli. With psychotic patients, these experiments often look at chronically ill patients, and so the differences in brain activity shown in the scans would be more obvious than in most of real life. However, early psychosis is more difficult to detect: the patterns in the brain are not as 'hard wired' so the differences are more subtle when compared to control groups.

Given the subtle differences, researchers are also faced with the problem of trying to ensure that the patients and controls receive the same stimuli while undergoing measurement, so that the brains of the patients and the controls are concentrating on the same things while being scanned. Ideally, these stimuli should be involving and information-rich, like in a real-life situation

Now a group of Finnish researchers have come up with a creative solution: patients and controls were scanned while watching the movie *Alice in Wonderland*, which guaranteed that they were receiving the same information-rich stimulus.

Using a 3-Tesla MRI device, they scanned the brains of 46 first-episode psychotic patients (meaning that they had only had one psychotic event) and 32 healthy controls, while watching the movie. The researchers found that significant differences could be seen in the precuneus region of the brain, which is an area associated with memory, visuospatial awareness, self-awareness, and aspects of consciousness.

Asked by the ECNP, lead researcher, Eva Rikandi (Aalto University, Helsinki, Finland) said:

'In this work, we attempted to determine whether a person is a first-episode psychosis patient or a healthy control subject just by looking at their brain activity recorded during movie viewing. We found, that by monitoring activity in a region known as the precuneus we were able to distinguish patients from control subjects especially well. This would mean that the precuneus, a central hub for the integration of self- and episodic-memory-related information, plays an important role in this kind of information processing of psychotic patients.

She continued:

We were able to achieve almost 80% classification accuracy using these methods. This is the first study which directly associates the beginnings of psychosis with the precuneus, so it is now important that much more research is done in this area'.

The researchers hope that this approach can feed into earlier screening and better diagnosisof at-risk populations.

ECNP President-Elect, Professor Celso Arango (Madrid) said

"The interesting question here is how patients with psychosis, even in their first episode, process information in a different way. Specifically how a movie such as Alice in Wonderland elicits the participation of different brain areas, and how that relate to the history of the person watching. What we would like to know is if patients with psychosis might see this as more or less relevant to their own life than would healthy controls. This movie is about a fantasy world, would it be different with other types of movie?"

Please mention the ECNP conference in any story from this press release.

ENDS

Notes for Editors

Contact details:

Ms Eva Rikandi   eva.rikandi@gmail.com

Professor Celso Arango   carango@hggm.es

ECNP Press Officer, Tom Parkhill   tom@parkhill.it   tel +39 349 238 8191

Background

*Psychosis is a mental health problem that causes people to perceive or interpret things differently from those around them. This might involve hallucinations or delusions (definition from **http://www.nhs.uk/conditions/Psychosis/Pages/Introduction.aspx**).

In the UK it is estimated that 4 out of 1000 people have had an active psychotic disorder over the past year (annual prevalence), http://www.psychiatry.cam.ac.uk/files/2014/05/Exec-summary-1.05.pdf

The ECNP

The ECNP is an independent scientific association dedicated to the science and treatment of disorders of the brain. It is the largest non-institutional supporter of applied and translational neuroscience research and education in Europe.

ECNP organises a wide range of scientific and educational activities, programmes and events across Europe, promoting the exchange of high-quality experimental and clinical research and fostering young scientists and clinicians.

The 28th ECNP Congress takes place in Amsterdam from 29 August-1 September. It is Europe's premier scientific meeting for disease-oriented brain research, annually attracting between 5,000

and 7,000 neuroscientists, psychiatrists, neurologists and psychologists from around the world. Website: www.ecnp.eu

Abstract

P.1.i.035 **Differentiation between first-episode psychosis patients and healthy subjects on the basis of precuneus activation** E. Rikandi1 °, S. Pamilo1, T. M¨antyl¨a1, J. Suvisaari2, R. Hari1, M. Sepp¨a1, T. Raij1 *1Aalto University, Department of Neuroscience and Biomedical Engineering, Helsinki, Finland; 2The National Institute for Health and Welfare, Mental Health Unit, Helsinki, Finland*

Purpose of the study: The brain basis of psychotic disorders remains inadequately understood. In this study we used multivariate machine-learning methods to differentiate brain fingerprints of first-episode psychosis patients and healthy control subjects. Earlier machine-learning classification of functional magnetic resonance imaging (fMRI) data have mainly focused on brain activity of chronic patients and data have been collected during resting-state [1] or simple tasks [2]. However, resting-state results are difficult to interpret because ongoing thoughts and experiences are likely to drastically differ between patients and healthy control subjects. Simplistic, such as working memory or verbal learning tasks, can match the experience between the groups but capture only a narrow field of information processing and may therefore miss the functions that are most affected in every-day life. Here we set out to unravel brain activation patterns related to naturalistic stimuli in first-episode psychosis patients and healthy control subjects. We hypothesized that brain networks earlier shown to be affected in psychotic disorders—such as the default mode, executive and salience networks—would be identified as discriminative features between the groups and that the severity of psychotic state would be correlated with the success of classification within the patient group.

Methods: We recorded 3-T fMRI from 46 first-episode psychosis patients and 32 healthy control subjects who viewed episodes with both realistic and supernatural content from the movie Alice in Wonderland [3]. Compared with just resting, viewing a movie decreases the variance between patients and control subjects in experience but still provides naturalistic accounts to the richness of everyday experiences. Patients' symptom severity was assessed at baseline and at 2-mo follow up by using the Brief Psychiatric Rating Scale Extended (BPRS-E). Machine learning methods were used to classify patients and healthy control subjects on the basis of both voxel- and time-point patterns.

Results: The majority of (136 out of 194) voxels that best classified the groups were clustered in an anatomically contiguous bilateral region of the precuneus (PC). Seed-based analysis showed the PC region to be functionally connected to defaultmode network and middle temporal gyri. Classification accuracies were up to 79.5% (p = 1.61*10−9), and the higher classification frequency across several classifiers, the higher were the positive symptom scores of patients.

Conclusions: These are the first findings to show abnormalities in PC functioning during naturalistic information processing in first-episode psychosis patients. The symptom-severity-related findings further propose the association of the functional PC alteration with psychotic state. PC is known as a central hub for the integration of self- and episodic-memory-related information and thus its dysfunction might give insights into understanding of psychosis. Our findings indicate the usefulness of natural stimuli in classification analyses based on brain-imaging data and call for future research on the role of precuneus in psychosis.

References [1] Bleich-Cohen, M., Jamshy, S., Sharon, H., Weizman, R., Intrator, N., Poyurovsky, M., Hendler, T., 2014. Machine learning fMRI classifier delineates subgroups of schizophrenia patients. Schizophrenia Research 160, 196–200. [2] Calhoun, V.D., Maciejewski, P.K., Pearlson, G.D., Kiehl, K.A., 2008. Temporal lobe and "default" hemodynamic brain modes discriminate between schizophrenia and bipolar disorder. Human Brain Mapping 29, 1265–1275. [3] Tim Burton, Walt Disney Pictures, 2010; Finnish soundtrack.