

Self/other Discrimination in Schizophrenia: Functional MRI Study.

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Introduction

As emerged from the meta-analysis experiencing oneself as the cause of an action or experiencing another person as being the cause of that action is mediated in healthy subjects particularly by the anterior cingulate cortex and frontomedial cortex [1].

A paradigm for activation of self-reference pattern is usable in schizophrenia research. Anomalies of self-experiences are apparently related to the phenomenology of first-rank schizophrenia symptoms, in which thoughts and actions are perceived to be under the control or influence of an external agent. Those symptoms include specific auditory verbal hallucinations, delusions of control, thought withdrawal, thought insertion and thought broadcasting.

Our study deals with differences in activation of self-reference patterns between patients with first episode of schizophrenia (FES) and healthy subjects. A paradigm to activate self-reference pattern is developed. This paradigm allows to manipulate the experience of movement control by visual feedback.

Materials and methods

The study enrolled 35 healthy right-handed subjects (mean age 30.6±9.3 years, mean years of education 14.2±1.9) and 35 FES right-handed patients (mean age 29.4±6.8 years, mean years of education 13.7±1.9). Patients met ICD-10 criteria for first episode of schizophrenia-spectrum disorders (schizophrenia, acute polymorphic psychotic disorder with symptoms of schizophrenia, acute schizophrenia-like psychotic disorder and schizoaffective disorder). All of them were receiving antipsychotic medication. Controls were excluded if they had any psychiatric disorder, or a history of a psychotic disorder in a first degree relative. Further exclusion criteria for both patients and controls included neurological disorders affecting brain function (e.g. stroke, traumatic head injury, seizure disorders).

The activation paradigm with either modified or true cursor trajectory was performed by home-built MR-compatible joystick with optical data transmission. This trajectory was displayed to subject using developed software allowing also recording of coordinates from the joystick. During the fMRI experiment 20s blocks were alternating: **(A)** with movement deviated artificially by introducing an angle deviation and **(B)** with precise trajectory of the joystick movement. Subjects were instructed to recognize movements influenced by "somebody else" **(A)** and their own movements **(B)** and to move the cursor in specified parts of the displayed window according to the recognized cause of the movement. Recorded cursor position was used for later statistical evaluation.

All fMRI measurements were performed on Siemens Trio 3T scanner using GRE-EPI sequence (FOV = 192x192 mm, voxel size 3x3x3 mm, TR/TE = 2000/30 ms, 30 slices). Total of 240 dynamical scans was acquired and measurement lasted 8 minutes.

Statistical analysis was done in SPM8 using GLM. Cursor trajectory was used for definition of onsets of "owning" the cursor periods and "stolen" periods. Statistical group maps ($p = 0.05$ FWE) and difference between volunteers and patients were calculated.

Results

Success rates of recognition oneself (the sense of agency) from "somebody else" differed between patients and controls. In blocks without movement distortion controls attributed correctly the movement themselves in 89% and patients in 76% of the block duration.

Controls showed increased activation compared to FES patients during **B** period in the following areas (Fig. 1a, 1b): anterior cingulate, mediofrontal cortex, precuneus. Increased activation in middle frontal gyrus R in both groups during period **A** was also detected (Fig. 1c, 1d).

Conclusion

Patients with FES did not activate midline cortical structures during the self-reference experiment. The functional disturbance of this area may be the pathophysiological basis of the schizophrenia.

References

[1] van der Meer L, *Neurosci Biobehav Rev.* 2010; 34(6):935-46.

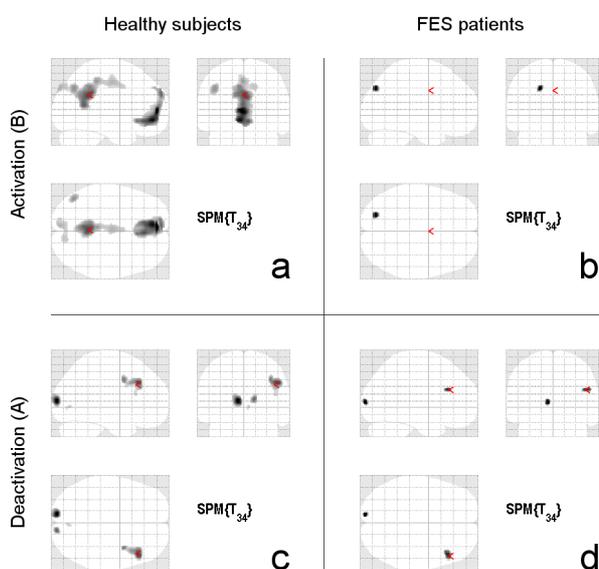


Fig 1: Activation in healthy subjects (a, c) and patients (b, d) when **B** > **A** (a, b) and **A** > **B** (c, d).

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