# Dysconnection of functional network in Schizophrenia: a ROI-based model approach

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## Introduction

Schizophrenia is a mental disorder, the core symptoms include hallucinations, delusions and nonsense. It is generally believed that structure of functional network concerns with the illness of Schizophrenia. In the previous study, the disconnection and abrupted small world property of functional network was found in Schizophrenia patients[1].

To estimate the brain functional network, the popular approach is using fMRI to collect the time course data. Two brain regions will be functionally linked if their correlation coefficient between time course data is higher than a given threshold, otherwise it is functionally disconnected. However, the node definition for the functional network is pivotal to the study of functional network structure. Usually, there are two ways to define nodes, one is model-based method. Several regions of interest(ROIs) are selected as definition of nodes, the structure of functional network depends on which ROIs are selected. The alternative is model free method, one uses clustering, Independent component analysis(ICA), and etc. to parcellate whole brain into several synchronous regions. The synchronous regions are defined as nodes in functional network. The short coming of model free method is the results depends on external stimuli of the brain.

Here, we adopt two ROI-based models of functional network, and systematic compare the consistency of the results for the three models.

## Methods and Results

Two ROI-based models with 10,22 and 160 ROIs respectively were adopted in this study[1,2,3]. The time series fMRI data of Schizophrenia patients and healthy control was downloaded from the COBRE dataset in International Neuroimaging data-sharing Initiative(INDI, http://fcon_1000.projects.nitrc.org/). The COBRE dataset contains 72 patients with Schizophrenia and 75 healthy controls,and ages ranging from 18 to 65 in each group (TR:2s,TE:29ms,matrix size:64x64, 33slices)[4].

The preprocessing of fMRI data was done by SPM8(Statistical Parametric Mapping, http://www.fil.ion.ucl.ac.uk/spm/). The preprocess arranges in order of smooth, slice timing correction, head movement correction, and normalization to MNI template. After preprocessing step, we use REST(Resting State fMRI data analysis Toolkit,

http://www.nitrc.org/projects/rest) to calculate the brain's functional network. The functional networks for Schizophrenia and Healthy control were compared by t test after Fisher's Z transformation. The P value was adjusted by Bonferroni correction and False Discovery Rate(FDR).

In addition, the calculation of a network characteristics, including degree, clustering coefficient,betweenness,etc.,to prove that the network link changes.

## Discussion

The disconnectivity of functional network for several ROIs was found in schizophrenia. The disconnections in middle and superior left temporal and right posterior cingulum were also found. The mainly missing and few rewiring of connections cause the abruption of functional network in Schizophrenia.

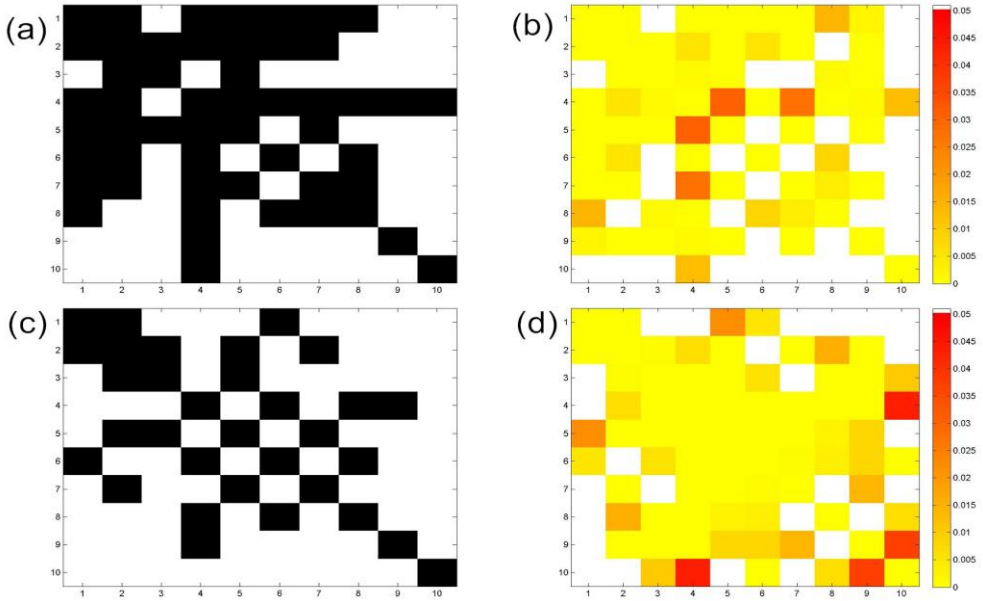


**Figure 1.** (a) The adjacency matrix between 10 ROIs for healthy controls.(b)The P-value of the adjacency matrix for healthy controls.(c) The adjacency matrix between 10 ROIs for Schizophrenia patients.(d) The P-value of the adjacency matrix in Schizophrenia.

## References


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3 Nico U. F. Dosenbach, Binyam N., Alexander L. Cohen, Damien A. Fair, et al.(2010) Prediction of Individual Brain Maturity Using fMRI. Published 10 September 2010, Science 329, 1358.

4 International Neuroimaging data-sharing Initiative, COBRE dataset. ( http://fcon_1000.projects.nitrc.org/indi/retro/cobre.html)