P.1.i.020 Functional network dynamics is altered in first episode psychosis patients during free viewing of a movie

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Background:
- Psychotic disorders are believed to be related to aberrant brain connectivity and network structure [1][2].
- Brain regions with high connectivity to other brain regions (hub nodes) in particular are believed to play a crucial role in the altered network dynamics [3][4].
- Typically differences in functional networks have been investigated in simple task-related or resting-state data.
- Day-to-day information processing demands higher-level information processing, including integration of episodical memory and emotions.

Aim of the study:
- We set out to investigate network-level differences in complex information processing between first-episode psychosis patients and control subjects, using movie stimulus to emulate everyday information processing.

Methods:
- In the Helsinki Early Psychosis Study we recruited 73 first-episode psychosis patients and 49 control subjects.
- We recorded 3T fMRI data while subjects watched scenes from the movie Alice in Wonderland (Tim Burton, 2010).
- Parcellation of the brain into functional nodes was done on the basis of the movie viewing data, using independent component analysis (ICA).
- For each subject, we constructed functional networks of these nodes, with network thresholds from 0.1 to 0.5 (0.01 interval)
- We then calculated group differences (p < 0.05) in node degree (number of connections) for each threshold, testing against random groups 100 times.
- Finally, we filtered out regions with significant differences in less than 30 (out of 50) thresholds.

References:
[1] Friston, K.J., 1998. The disconnection hypothesis. Schizophrenia Research 30(2), 115-125.
[2] Fornito, A., Zalesky, A., Pantelis, C., Bullmore, E.T., 2012. Schizophrenia, neuroimaging and connectomics. NeuroImage 62(4), 2296-2314.
[3] Crossley N.A., Mechelli A., Scott J., Carletti, F., Fox, P.T., McGuire, P., Bullmore, E.T., 2014. The hubs of the human connectome are generally implicated in the anatomy of brain disorders. Brain 137(8), 2382-2395.
[4] Fornito, A., Bullmore, E.T., 2015. Reconciling abnormalities of brain network structure and function in schizophrenia. Current Opinion in Neurobiology 30, 44-50.

Results:
- Independent component analysis resulted in 144 separate nodes.
- Patients had lower node degree in the thalamus, caudate body, posterior cingulate cortex, precuneus and cuneus (Figure 1, regions marked in blue).
- Patients had higher node degree in the left middle frontal gyrus, right superior frontal gyrus, right superior parietal lobule and right inferior semi-lunar lobule (Figure 1, regions marked in red).
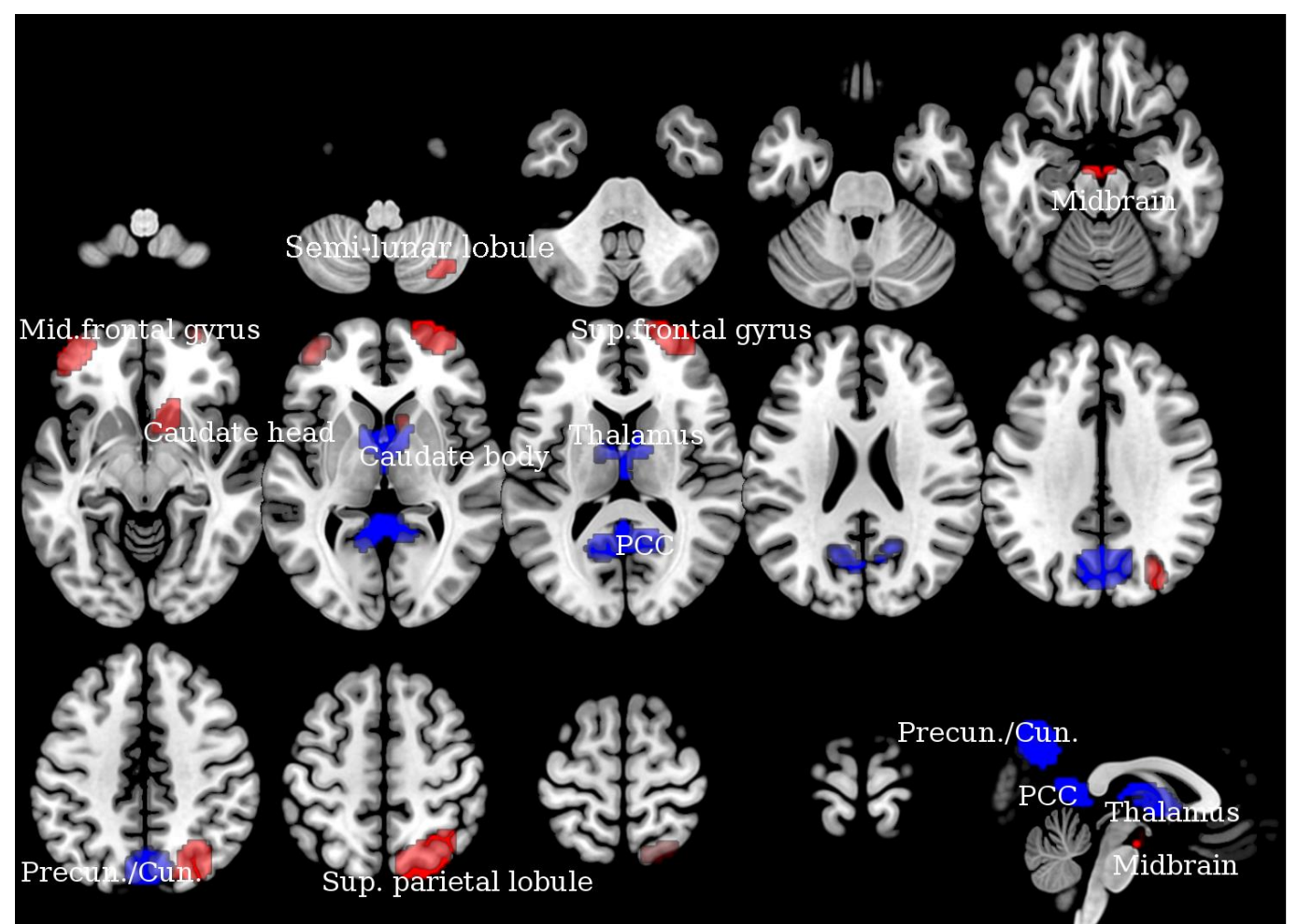

Figure 1. Regions with lower degree (less functional connections) in patients during movie viewing marked in blue. Regions with higher degree marked in red. (Precun = precuneus, Cun = cuneus, PCC = posterior cingulate cortex)

Conclusions:
- The distribution of functional connections in the brain is altered in first-episode psychosis patients while processing a naturalistic stimulus.