

# Altered striatal functional connectivity in Parkinson's disease patients with impulse control disorder

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## Purpose

To evaluate the capability of resting state functional MRI in indentifying the disease-specific changes in functional brain networks from PD patients with or without impulse control disorders (ICD).

## Methods

24 PD patients with impulse control disorders (52±9 years, Hoehn and Yahr stage I-IV), 20 PD patients without ICD (55±5 years, stage I-IV), and 20 age-matched healthy controls (55±2 years) were enrolled in this study. The mean Hoehn and Yahr stage was 2 and 1.75 ± 1, and mean UPDRS score 30 ± 23 and 32 ± 26, respectively. The manifestations of the ICD included hypersexuality, gambling, shopping, and working. Images were acquired with a Siemens Magnetom Trio Tim syngo 3T MR scanner. Resting-state fMRI data were collected using multislice single-shot T2\*-weighted gradient recalled echo planar imaging (GRE-EPI) pulse sequence (time echo/time repetition [TE/TR] = 45/3000 ms; field of view [FOV] = 192x192 mm, voxel size = 3x3x3 mm, 40 transverse slices, 120 volumes, scanning time = 6 min 15 sec). Data were processed and analyzed using SM8 (Statistical Parametric Mapping, [www.fil.ion.ucl.ac.uk/spm](http://www.fil.ion.ucl.ac.uk/spm)) and REST (Resting-State fMRI Data Analysis Toolkit, <http://restfmri.net/forum>). For Functional connectivity, six circular ROIs with radius = 6mm was defined on the basal ganglion on each side, following Di Martino et al and including inferior ventral caudate (VSi, ±9, 9, -8 (x, y, z) in MNI space), superior ventral caudate (VSs, ±10, 15, 0), dorsal caudate (DC, ±13, 15, 9), dorsal caudal putamen (DCP, ±28, 1, 3), dorsal rostral putamen (DRP, ±25, 8, 6), and ventral rostral putamen (VRP, ±20, 12, -3).

## Results

PD patients showed significantly enhanced striatal functional connectivity with sensori-motor cortex (IZI > 2.61, cluster significance P < 0.05, corrected by AlphaSim Monte Carlo Simulation). Compared with healthy subjects and PD patients without ICD, PD patients with ICD also showed significantly increased striatal connectivity with the ACC and prefrontal cortex, which are involved in execution and reward system.

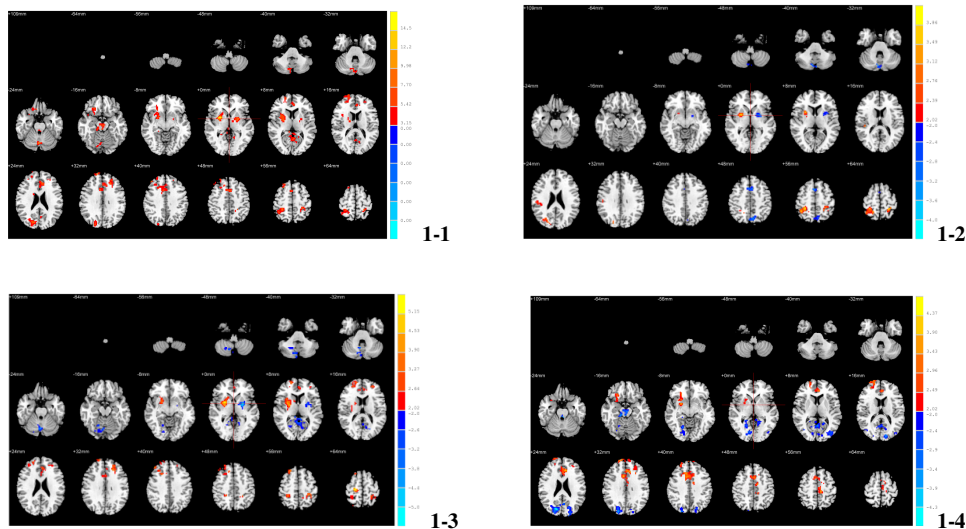


Fig 1. Comparison of striatal functional connectivity among healthy subjects, PD patients without and with ICD. 1-1: one-way ANOVA, 1-2: PD without ICD vs. healthy subjects, 1-3: PD with ICD vs. healthy subjects, 1-4 PD with ICD vs. PD without ICD.

## Discussion& Conclusion

In this study, PD patients showed significantly enhanced striato-cortical connectivity<sup>1,2</sup>, which could reflect the compensated mechanism for depletion of the dopamine at the putamen. For patients with ICD, the striatal functional connectivity with reward system is also increased, which might underlie the pathophysiology of ICD. This study shows that mapping striatal functional connectivity is feasible and may aid in understanding the pathophysiology of PD and ICD.

## Reference

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