Altered resting-state functional connectivity of the cortico-basal ganglia-thalamo-cortical network in Parkinson’s disease: a meta-analysis with cross-validation

Gong-Jun Ji¹,²,³, Ting-Ting LIU⁴, Ying LI⁴, Xingui CHEN¹,²,³, Yanghua TIAN⁴,²,³, Xianwen Chend, Panpan HU⁴,²,³*, Kai WANG⁴,¹,²,³*

¹Laboratory of Cognitive Neuropsychology, Department of Medical Psychology, Anhui Medical University, Hefei 230000, China

²Collaborative Innovation Centre of Neuropsychiatric Disorder and Mental Health, Hefei 230000, China

³Anhui Province Key Laboratory of Cognition and Neuropsychiatric Disorders, Hefei 230032, China

⁴Department of Neurology, The First Affiliated Hospital of Anhui Medical University, Hefei 230000, China

*Corresponding author:
E-mail: hpppanda9@126.com, wangkai1964@126.com

Abstract: Objective Dysfunction of cortico-basal ganglia-thalamo-cortical (CBTC) circuits is strongly implicated in the motor symptoms of Parkinson’s disease (PD). A number of resting-state functional magnetic resonance imaging studies have characterized aberrant functional connectivity (FC) of the CBTC network in PD. This study aimed to summary the findings by meta-analysis. Methods We performed a quantitative meta-analysis on rs-fMRI studies comparing the whole-brain FC of seeds in the CBTC network between PD and healthy controls. Thirty experiments with 854 PD patients and 831 controls were included. Results Increased FC in the left post-central gyrus was found consistently in PD by meta-analysis including all experiments as well as in PD sub-groups, and this finding was cross-validated by an independent dataset. By comparing medication-naïve and (off-state) medicated patients, long-term effects of medication on brain function were found in the left inferior parietal lobule, left putamen, and right post-central gyrus. Conclusion These
findings identify the post-central gyrus as a critical region in PD pathophysiology and a potential target for clinical intervention.

**Keywords:** Functional connectivity; Parkinson’s disease; meta-analysis; resting state; magnetic resonance image