Resting-State Functional Connectivity of the Basal Ganglia as a Biomarker for Parkinson’s Disease

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Purpose:
Parkinson's disease (PD) is characterized by the degeneration of nigrostriatal dopaminergic neurons, resulting in dysfunctional cortico-striato-thalamic-cortical loops. Parkinson's disease patients suffer from chronic movement disabilities as well as cognitive impairments and other nonmotor symptoms, which implies a system-wide effect on overall brain function. Because the disease currently has no cure, the discovery of a biomarker for specific PD symptoms is crucial for monitoring treatment potency. This study aimed to evaluate the validity of using functional connectivity between regions of the basal ganglia as a biomarker for specific symptoms of PD.

Materials and Methods:
Data from this study were obtained from the Parkinson's Progression Markers Initiative. Resting-state functional magnetic resonance imaging (rs fMRI) and seed based analysis were used to measure functional connectivity between regions of the basal ganglia in 72 PD patients. Parkinson's disease motor symptoms were measured with the Unified Parkinson's Disease Rating Scale Section III (UPDRS-III). Statistical analysis was performed assessing the correlation between connectivity values and PD motor symptoms, taking into account the effect of age, sex, and medication.

Results:
Analysis shows a decrease in functional connectivity between regions of the caudate are highly correlated with the increase of rigidity symptoms in PD patients.

Conclusions:
This study suggests using functional connectivity within in the basal ganglia to understand both motor and cognitive deficits. It introduces the possibility of using functional connectivity between brain regions as a
biomarker for specific symptoms of PD. Future investigations will be conducted to determine the effect of functional connectivity on cognitive symptoms of PD.

Categories:
ADULT BRAIN, Functional Imaging (fMRI, MEG, MRS, PET, DTI, SPECT, connectivity)

Supporting Files

**Figure 1.** Shows the significant correlation between UPDRS-III rigidity score and level of connectivity between the left and right caudate regions of the brain. There is a negative trend for this correlation. As the UPDRS-III rigidity score decreases, the connectivity between left caudate (CL) and right caudate (CR) increases.

(https://ww4.aievolution.com/asn1501/files/content/abstracts/abs_2666/ASNR_Fig.jpg)