Compensatory Functional Activation During Motion Discrimination in Parkinson's Disease

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**Objective**
PD patients commonly exhibit cognitive dysfunction early in the disease course which may or may not predict further cognitive decline. In contrast, early emergence of visuospatial and memory impairments are more consistent predictors of an evolving dementia syndrome. Prior studies using fMRI have demonstrated that PD patients exhibit hyperactivation dependent on the degree of cognitive impairment, suggestive of compensatory strategies. No study has evaluated whether PD patients with normal cognition (PD-NC) and PD patients with Mild Cognitive Impairment (PD-MCI) exhibit compensatory activation patterns during visuospatial task performance.

**Participants and Methods**
10 PD-NC, 12 PD-MCI, and 14 age and sex-matched HC's participated in the study. PD participants were diagnosed with MCI based on the Movement Disorders Society Task Force, Level II assessment (comprehensive assessment). FMRI was performed during a motion discrimination task that required participants to identify the direction of horizontal global coherent motion embedded within dynamic visual noise under Low and High coherence conditions. Behavioral accuracy and functional activation were evaluated using $3 \times 2$ analyses of covariance (ANCOVAs) (group [HC, PD-NC, PD-MCI] × Coherence [High vs. Low]) accounting for age, sex, and education.

**Results**
PD-MCI ($0.702 \pm 0.269$) patients exhibited significantly lower accuracy on the motion discrimination task than HC ($0.853 \pm 0.241$; $p = 0.033$) and PD-NC ($0.880 \pm 0.208$; $p = 0.039$). A Group × Coherence interaction was identified in which several regions, including orbitofrontal, posterior parietal and occipital cortex, showed increased activation during High relative to Low coherence trials in the PD patient groups. HC showed default mode deactivation and frontal-parietal activation during Low relative to High coherence trials that were not evident in the patient groups.

**Conclusions**
PD-MCI patients exhibited worse visuospatial performance on a motion discrimination task than PD-NC and HC participants and exhibited hyperactivation of the posterior parietal and occipital regions during motion discrimination, suggesting possible compensatory activation.