

White matter atrophy in Parkinson patients with freezing of gait: a Diffusion Tensor Imaging study

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Background

- Freezing of gait (FOG) is a disabling gait disorder in Parkinson's disease (PD).
- The involvement of cerebral white matter (WM) atrophy in the pathology of FOG is unclear.
- We compared the volume of WM tracts between PD patients with and without FOG and healthy controls and examined its relation with FOG severity.

Methods

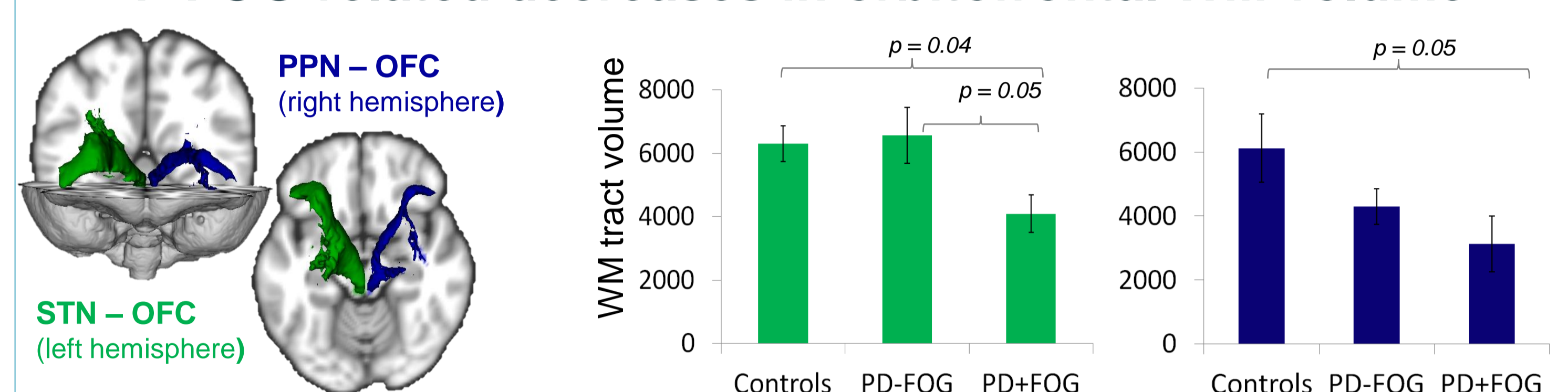
- Multishell diffusion Imaging was applied to
 - 11 PD with FOG
 - 16 PD without FOG (age- and disease matched)
 - 16 age-matched controls
- Data analysis using FSL software (Oxford, UK)
- Main outcome was the volume of WM tracts obtained for:
 - Individual tracts between subcortical seed and cortical target regions.
 - All WM tracts through the PPN yielding a global PPN connectivity outcome.

Statistical analysis

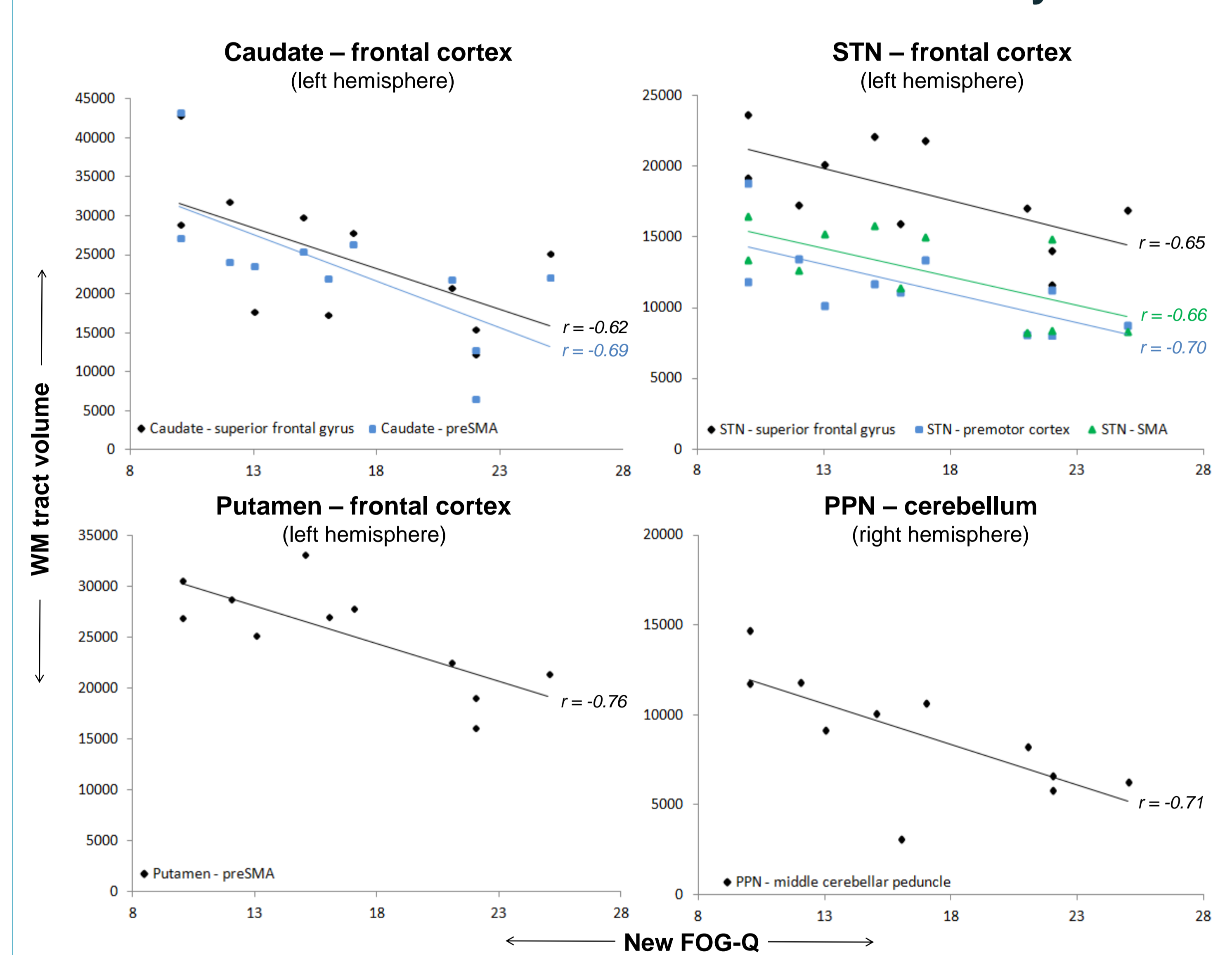
- Group comparisons of WM volume using ANOVA with post-hoc Newman-Keuls tests and t-tests.
- Pearson correlations between WM volume and FOG severity within PD with FOG group.

Results

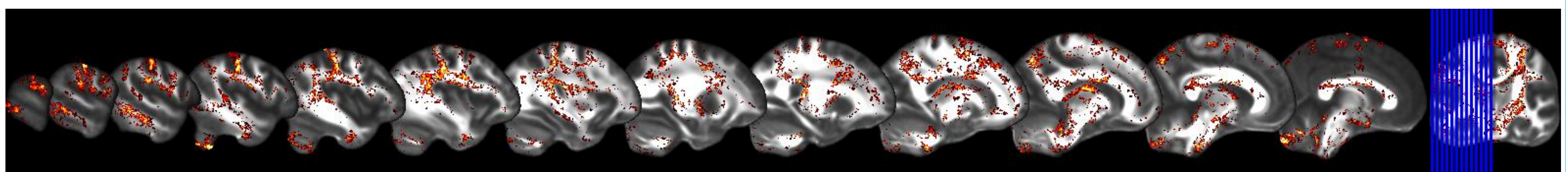
1. FOG-related decreases in orbitofrontal WM volume



2. WM volume correlates with FOG severity



3. FOG-related decreases in left PPN connectivity



Group differences in volume of WM tracts through the left PPN ROI in the sagittal view. Results were obtained by unconstrained tracking through the left PPN. The colored voxels indicate a reduction in WM volume of the tracts passing through left PPN in PD with FOG compared to PD without FOG ($p=0.03$).

Conclusions

- WM atrophy in PD patients with FOG was mostly found in striato-frontal tracts and WM connections through the PPN.
- The involvement of pathways up- and downstream of the basal ganglia reported here corroborates earlier neuroimaging studies on FOG but also suggests a left-hemispheric dominance.

Abbreviations

- DTI: Diffusion Tensor Imaging
- OFC: Orbitofrontal cortex
- PPN: Pedunculo-pontine nucleus
- New FOG-Q: new FOG Questionnaire
- FOG: Freezing of gait
- STN: Subthalamic nucleus
- WM: White matter
- PD: Parkinson's disease

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