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## Side-dependent subthalamic local field potential (LFPs) dynamics in Parkinson's disease

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*Introduction:* The role of dopaminergic neurons' brain asymmetries in Parkinson's disease (PD) motor symptoms is still undefined. LFP recordings from the subthalamic nucleus (STN) revealed some neurophysiological biomarkers of the disease: increased beta activity, increased low frequency activity, high frequency oscillations. Few data about STN-LFP asymmetry are available. Phase-amplitude coupling (PAC) coordinates the timing of neuronal activity and allows to determine the mechanism for communication within distinct regions of the brain.

*Methods:* We report the use of PAC to assess the differences between the two in 21 patients with PD before and after L-DOPA administration.

*Results:* We found a significant beta PAC disparity between the left and right hemisphere; whereas the left STN shows a higher phase-amplitude coupling within low-beta range in OFF condition as compared to the opposite side (Kruskal-Wallis test: $p < 0.001$), the right STN shows a significant coupling between high-frequencies (260-360 Hz) and low-beta in OFF condition as compared to the left one (Kruskal-Wallis test: $p = 0.006$). Interestingly, these findings are independent both from disease phenotype and side onset.

*Discussion:* These findings have important implications for the origin of neural signals and may provide an exhaustive insight into STN dynamics, possibly suggesting the use of novel adaptive DBS approaches (e.g. aDBS) to only one STN.