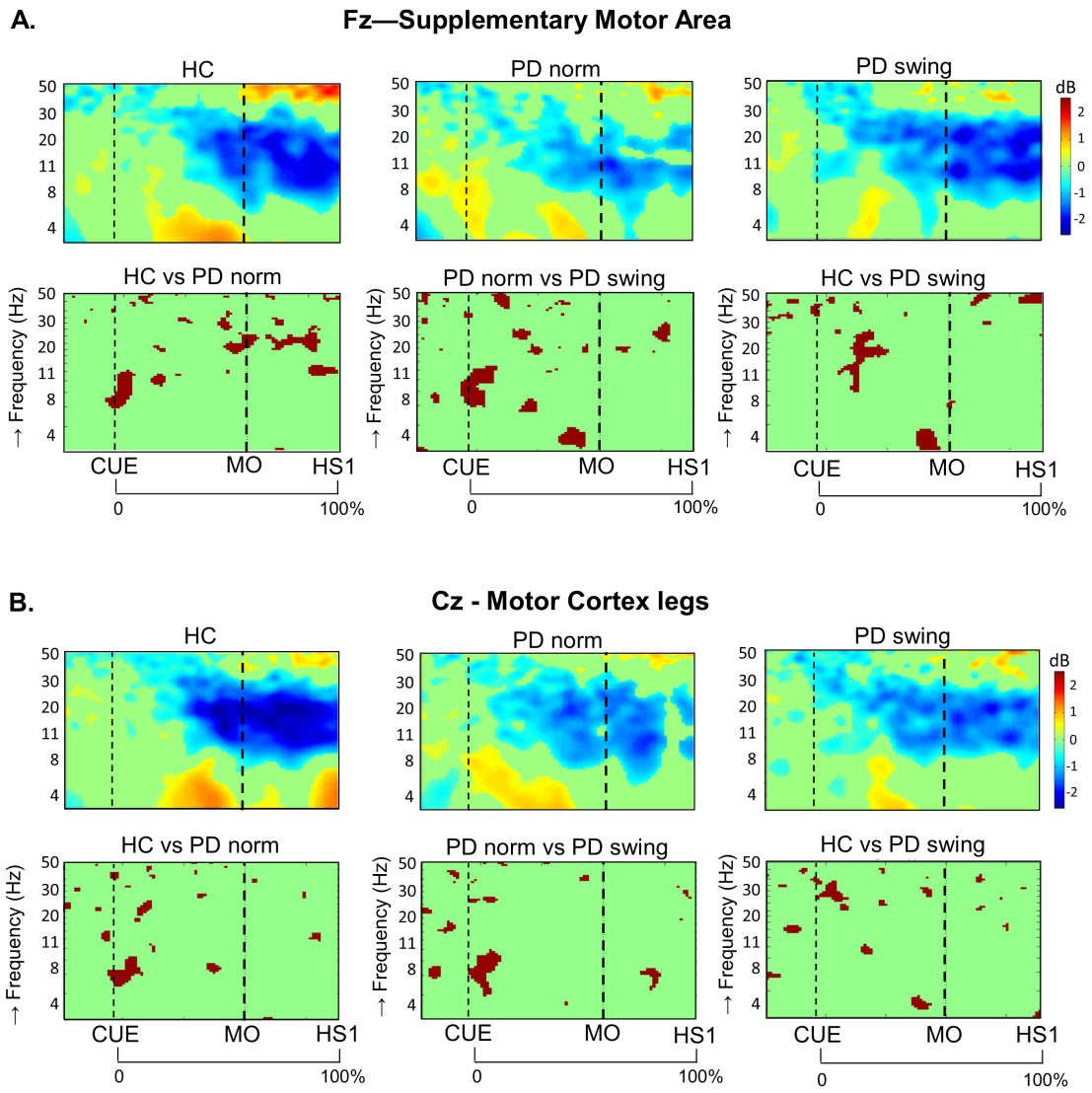
Supplementary Material

Pre-Movement Cortico-Muscular Dynamics Underlying Improved Parkinson Gait Initiation after Instructed Arm Swing

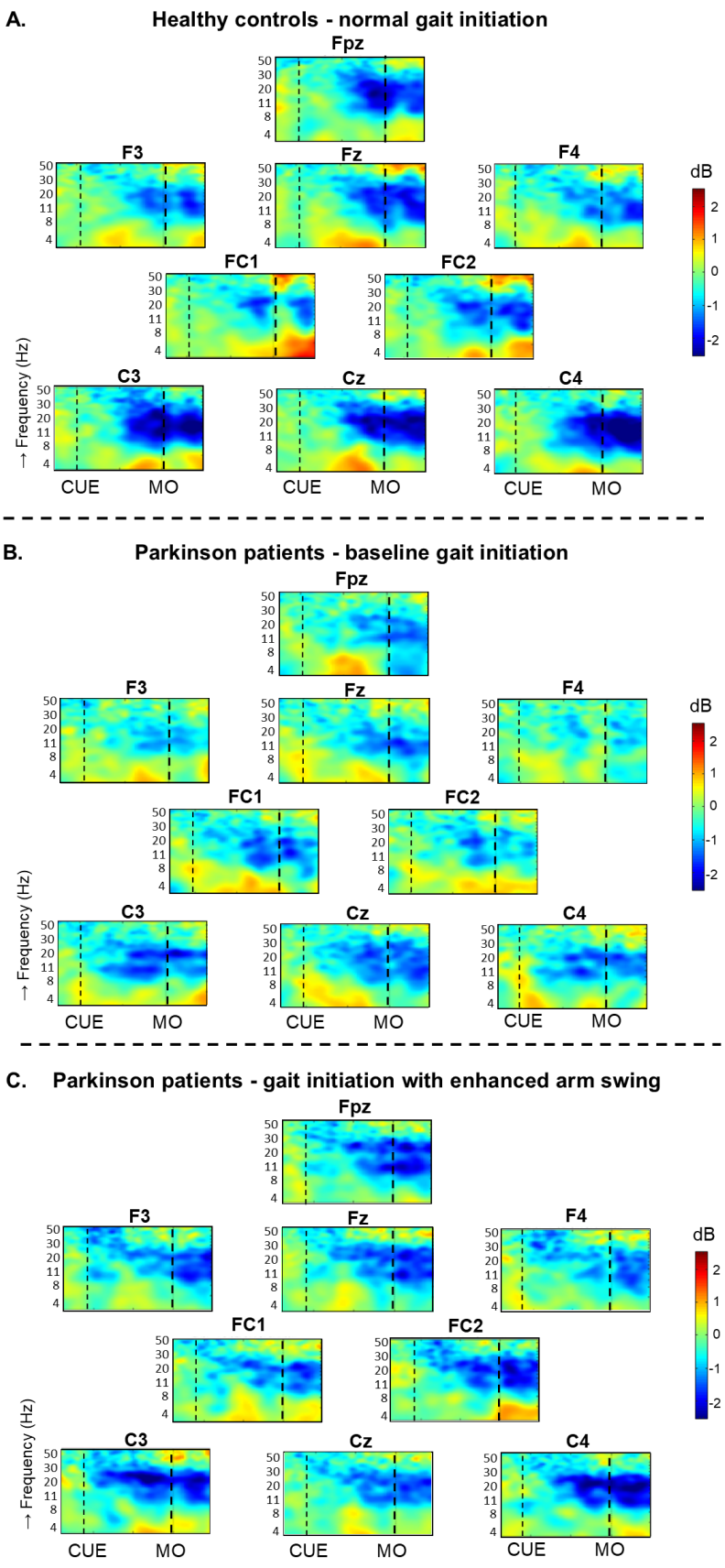
Supplementary Fig. 1 - ERSP and significance plots of gait initiation



Group averaged changes across the EEG frequency spectrum from electrodes over the putative supplementary motor area (A, upper panels) and the motor cortex of both legs (B, upper panels) during the stages of gait initiation in healthy controls (HC), Parkinson patients starting according normal baseline instruction (PD norm) and Parkinson patients starting with enhanced arm swing (PD swing). The baseline used to calculate Event Related Spectral Perturbations (ERSP) was the mean power during standing still, i.e., between 4000 and 2000 ms before movement onset. Event related desynchronization (ERD) is illustrated in blue and event related synchronization (ERS) in red. Vertical lines mark the occurrence of the auditory beep (CUE), movement onset (MO) and first heel strike (HS1). Significant ERSP differences between conditions ($p<0.05$) are shown in the lower panels of A and B, illustrated in brown. One image is constituted by pixel matrix of 4700 values, with 100 values along the x-axis for the time

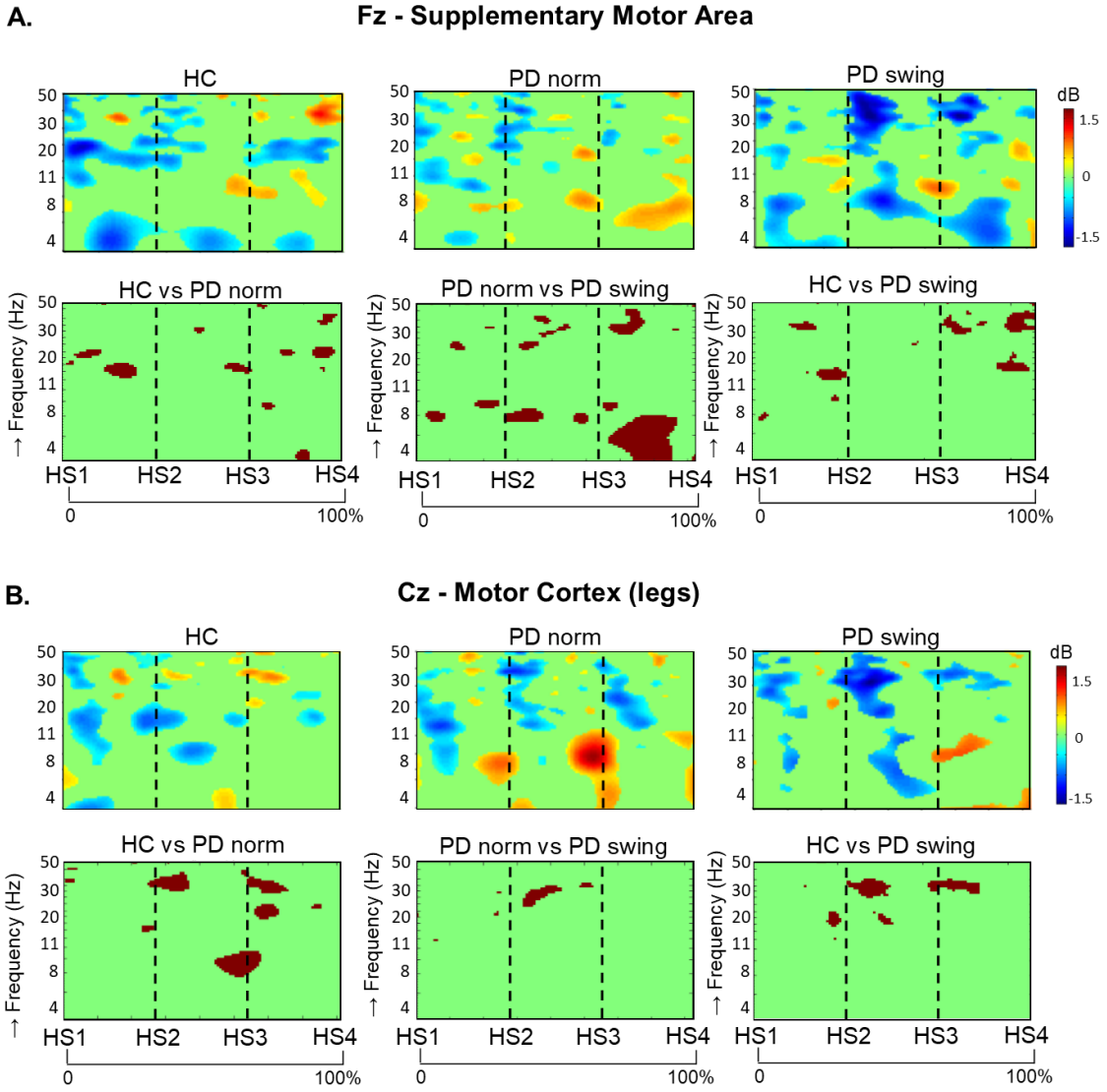
domain and 47 values along the y-axis for the frequency domain, for which a non-parametric permutation test was applied with a False Detection Rate decorrection for multiple comparisons (available in EEGLAB 14_1_2b). Unpaired statistics were used to compare HC with PD norm and PD swing, respectively, while paired statistics were used to compare PD norm and PD swing. dB, decibel

Supplementary Fig. 2 - ERSP of electrodes surrounding Fz



Group averaged changes across the EEG frequency spectrum from electrodes Fz and surrounding recording sites, during the stages of gait initiation in healthy controls (A) and Parkinson patients starting according normal baseline instruction (B) as well as starting with enhanced arm swing (C). Event related desynchronization (ERD) is illustrated in blue and event related synchronization (ERS) in red. Vertical lines mark the occurrence of the auditory beep (CUE) and movement onset (MO). The spatial distribution of ERSP profiles over the various EEG channels complement the scalp maps presented in Figure 2 of the main text, and make it plausible that the effects seen at Fz do not result from sources underlying the lateral motor regions C3 and C4. A major argument, in this respect, is the fact that ERSP at FC1 and FC2, recording sites in-between Fz-C3 and Fz-C4 respectively, are weaker than the neighbouring sites. See further the legends of Supplementary Figure 1.

Supplementary Fig. 3 - ERSP and significance plots of transition phase



Group averaged dynamic changes across the EEG frequency spectrum from electrodes placed over the putative supplementary motor area (A, upper panels) and the motor cortex of both legs (B, upper panels) during the transition steps two, three and four towards regular gait, in healthy controls (HC), Parkinson patients starting according to normal baseline instruction (PD norm) and Parkinson patients starting with enhanced arm swing (PD swing). Event related desynchronization (ERD) is illustrated in blue and event related synchronization (ERS) in red. Vertical lines mark the occurrence of the second (HS2), third (HS3) and fourth (HS4) heel strike. Significant ERSP differences between conditions ($p<0.05$) are shown in the lower panels of A and B, and illustrated in brown. For further details, see the legend of Supplementary Figure 1.