Altered EEG resting state networks in Parkinson’s disease

L. Schneider¹, V. Seeger¹, L. Timmermann¹, E. Florin¹

¹Universität zu Köln, Cologne, Germany

**Background:** Parkinson’s disease (PD) affects primarily the motor system with the non-motor symptoms gaining more attention recently. In PD global brain networks are altered, not only during motor tasks, but also at rest. We therefore tested PD patients and healthy controls with electroencephalography (EEG) and extracted resting state networks (RSNs). In particular, we hypothesized the sensorimotor network in PD to be spatially decreased, as reported in a previous functional Magnetic Resonance Imaging (fMRI) study [1]. Furthermore we aimed at identifying frequency specific oscillatory network changes.

**Methods:** We recorded 20 PD patients in the clinical medication OFF state and 12 age matched healthy controls with a 128 channel EEG at rest, the patients for 10 minutes each and the controls for 30 minutes each. We also performed a T1 scan in the MRI from which we extracted the individual brain surfaces with *Freesurfer*. After combined visual and automated artifact control of the EEG data with *Brainstorm* we solved the inverse problem and calculated the *Hilbert* envelope in the source space [2]. Finally, we performed an Independent Component Analysis (ICA) at the group level for different frequency bands (δ, θ, α, β and γ). We compared the extracted networks for the Parkinson group with the one from the healthy control group.

**Results:** In both groups we found sensorimotor network components throughout different frequency bands ranging from θ to β. The sensorimotor network of PD patients showed a marked reduction in size for the beta band compared to the control group, in particular in the posterior regions. This is in line with previous findings that found a decreased β activity in the motor cortex in OFF state PD [3].

**Conclusions:** It is possible to extract robust RSNs from EEG data using ICA. PD seems to alter particularly the sensorimotor network throughout a wide frequency range. This might, in part, explain various motor symptoms in PD. Further research should test EEG based resting state analysis as a possible tool to evaluate disease progression and severity.

**References:**