Loss of network integration is related to cognitive impairment in Dementia with Lewy Bodies.

Afina W. Lemstra[1], Edwin van Dellen[2], Hanneke de Waal[3], Wiesje M. Van der Flier[2], Arjen Slooter[4], Lieke Smits[5], E.C.W van Straaten[2], Cornelis Stam[2], Philip Scheltens[6],

[1]VU University medical center, Amsterdam, Netherlands; [2]VU University Medical Center, Amsterdam, Netherlands; [3]Alzheimer Centre VUMC, Amsterdam, Netherlands; [4]University Medical Center Utrecht, Utrecht, Netherlands; [5]VUMC Alzheimer Centre Amsterdam, Amsterdam, Netherlands; [6]VU University Medical Center, Amsterdam.

Background: Objective: To analyze EEG resting-state functional connectivity and network topology in dementia with Lewy Bodies (DLB), compared to Alzheimer's disease (AD) and non-demented controls. Secondly, we aimed to explore whether alterations in network topology in DLB and AD patients were related to cognitive impairment. **Methods:** EEG recordings were obtained in DLB patients, AD patients and controls, matched for age and sex (N = 66 for all groups; 14 (21%) female; mean age 70 years). We analyzed functional connectivity of band filtered EEG time series using the Phase Lag Index (PLI). Functional brain network topology was analyzed with the maximum synchronization tree (MST). Mini-mental state examination (MMSE), Trail Making Test A (TMT A) and Visual Association Test (VAT) were used as cognitive measures. **Results:** DLB patients showed lower alpha band connectivity strength compared to both controls and AD patients (p<.001). Compared to controls, alpha band networks of DLB patients were characterized by lower maximum degree and betweenness centrality (both indicating a loss of hubs), lower leaf fraction, and higher diameter (both indicating a loss of network integration; all p<.01). Network characteristics in AD patients were in between (but did not differ from) those of the other two groups. In DLB patients, alpha band PLI correlated with VAT scores and TMT A scores (ρ=.33 and ρ=.31, respectively), while leaf fraction correlated with VAT scores (ρ=.29) and MMSE scores (ρ=.27). **Conclusions:** Functional networks of DLB patients are characterized by severely decreased connectivity strength and a loss of network integration and hubs. The relevance of these findings is shown by the observation that less integrated network topology is related to more severe cognitive impairment in DLB.