

## An AI-supported diagnostic tool for obstructive sleep apnea patients based on delta-alpha connectivity at the sensorimotor cortex

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**Background** The modulation of delta-alpha phase-amplitude cross-frequency coupling (PACFC) may influence information processing throughout the human cerebral cortex. We investigated whether this frequency band-specific modulation is impaired in patients with obstructive sleep apnea (OSA). **Patients & Methods** In this study, the C3- and C4-electroencephalographic recordings of 170 participants (86 in main dataset: age 27-84 years, 44 subjects had moderate or severe OSA with respiratory disturbance index RDI>15/h; 84 in validation dataset: age 35 -75 years, 42 subjects with RDI>15/h) who underwent full-night polysomnography (PSG) were evaluated. We tested if the delta-alpha PACFC modulation index (MI) at the sensorimotor cortex differs between OSA patients with RDI>15/h and those with RDI≤15/h in distinct sleep stages. Further, by making use of a Support Vector Machine (SVM) algorithm, we tested if the sleep stage – specific MIs could predict RDI values of OSA patients. **Results** In both datasets, in OSA patients with RDI >15/h, the delta-alpha CFC-MI was significantly ( $p < 0.05$ ) reduced at the sensorimotor cortex during REM and NREM1 stages, while increased during NREM2 compared to patients with RDI ≤15/h. In addition, the delta-alpha MI in REM sleep stage could provide with use of an SVM algorithm a quite reliable (82% accuracy) prediction of the RDI in OSA patients. **Conclusions** This increase in disconnection at the cortical sensorimotor areas with increasing respiratory distress during sleep further supports the concept of a cortical sensorimotor dysfunction in OSA patients. Additionally, the delta – alpha MI during REM sleep may provide an objective neurophysiologic surrogate marker of respiratory distress in OSA patients.

### Publikationsverlauf

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