

# Heart Rate Variability during Sleep-Related Wake Phases in REM sleep Behavior Disorder

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**Aims:** Autonomic dysfunction can be observed in people with neurodegenerative diseases (ND), and heart rate variability (HRV) is frequently adopted to assess it. Indeed, in the literature, a decrease in HRV was observed in individuals with ND, when it was evaluated during sleep stages. Rapid eye movement (REM) sleep behavior disorder (RBD) is widely accepted as a prodromal symptom of  $\alpha$ -synucleinopathies, a group of neurodegenerative disorders encompassing Parkinson's disease (PD). As such, HRV during the 24-hours or during sleep is being investigated as a potential digital biomarker for these conditions. In this study, we focused on the awake phases immediately before and after sleep, which represents more controlled conditions than 24h recordings without the burden of sleep staging. Thus, we investigated autonomic imbalance in idiopathic RBD (RBDid) and PD with RBD (RBDpd), and unaffected people (CG), during such wake phases.

**Methods:** The dataset consisted of 18 CG, 20 RBDid, and 20 RBDpd participants, who underwent polysomnographic exams with at least six-hours of sleep. For each participant, a 5-min ECG signal was obtained in the two awake phases, and processed to extract different indexes from time, frequency, and non-linear domains. Non-parametric statistical analysis was used, for each group separately, to assess differences between the two wake stages.

**Results:** Significant differences were found in time and frequency domain indexes in RBDpd and RBDid groups, highlighting an HRV increase in the wake stage immediately after sleep, as compared to the wake stage before sleep onset ( $p < 0.05$  to  $p < 0.0001$ ). Similarly, in the same groups, a significant reduction in nonlinear indexes was found during the last wake stage ( $p < 0.01$ ), indicating an altered autonomic regulation in the same groups w.r.t. CG.

**Conclusions:** Results indicate that RBD may cause an increase in parasympathetic activities, with similar behavior along with diagnosed PD or not.