**Wide-sense stationarity during REM sleep in Old Adults**

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**Abstract Text:**

**Background:** Visually, Rapid Eye Movement (REM) sleep is characterized by REMs, muscle atonia and desynchronized EEG activity. When quantitative analyses of the signals are carried out, usually, non-linearity and non-stationarity are assumed without an adequate analysis, especially in Old Adults (OA). The Priestley-Subba Rao (PSR) test for wide-sense stationarity (stationarity for short) calculates locally the spectrum of the EEG records –possibly changing over time– and then test if it effectively changes over time, a condition equivalent to nonstationarity. In here, stationarity ‘presence’ was quantified over REM sleep and compared to that from Wakefulness (W) and Non-REM (NREM) sleep. **Methods:** 5 Old Adults (OA) (age: 68.2 ± 7.2; education: 9.2 ± 2.7) without depression neither anxiety and with intact daily living activities were selected. Also, evaluations with the Mini-Mental State Examination (MMSE, 29.4 ± 0.9) and a one night polysomnography were performed. 30 second epochs were classified according to the American Academy of Sleep Medicine (AASM) and every epoch of W, NREM and REM sleep was subjected to PSR tests to detect stationarity. Percentages of stationary epochs were obtained with respect to the total number of epochs of each stage and Wilcoxon t-tests were used to compare them. **Results:**The PSR effectively showed different proportions of stationarity according to the classification of stages in each subject. Clearly, a lower proportion of stationarity was found in REM sleep vs. the other stages. These differences reached significance in C3, C4, CZ, F7, Fp1, LOG and ROG (p < 0.05). **Conclusions:**In OA, REM sleep showed lower proportions of epochs with stationarity vs. W and NREM sleep at anterior areas, a result that could be explained by the tonic and phasic REM sleep. When stationarity measurements are planned, it is recommended to differentiate anterior from lateral and posterior areas.