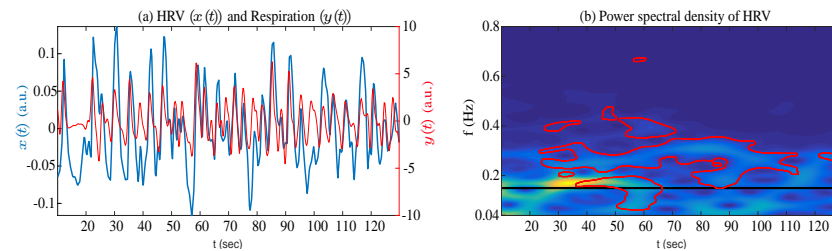


# Heart Rate Variability Analysis Guided by Respiration in Mayor Depression Disorder

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In this study a Heart Rate Variability (HRV) analysis guided by respiration to evaluate different patterns of Autonomic Nervous System (ANS) in response to a cognitive stressor between Mayor Depression Disorder (MDD) and control (CT) subjects is presented. Cardiorespiratory Time Frequency Coherence (TFC) reveals the local coupling of HRV and respiration signal which is essential and usually not included in estimation of ANS measures derived by HRV. Parasympathetic activity of ANS is measured as the power at the frequencies where TFC between HRV and respiration is significant, whereas sympathetic dominance is measured as the normalized power in the low frequency band  $[0.04, 0.15]$  Hz of HRV excluding the power of those frequencies related to respiration. Results showed significantly lower ( $p < 0.05$ ) sympathetic dominance in MDD with respect to CT subjects during stress, suggesting that ANS reactivity as response to stress stimuli is lower in MDD patients. The lower performance of MDD subjects  $110.0 \pm 50.2$  sec (median  $\pm$  interquartile range), measured as the time required for accomplishing the cognitive task, in comparison with CT  $66.0 \pm 27.5$  sec, might be associated with a less inhibited parasympathetic branch in MDD patients, who probably are not capable to adjust their mental state to abrupt behavioral changes. The study of ANS reactivity to a stressor may serve as a biomarker useful for the early diagnosis and monitoring of MDD patients.



(a) HRV (blue) and Respiration (red) signal, (b) Power spectral density of HRV. In red are marked the areas with significant coupling between HRV and respiration, while black line corresponds to the upper limit of low frequency band (0.15 Hz).