

# Mechanically Induced Heart Rate Variability: analysis and processing

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During exercise, analysis of the spectral components of the heart rate variability (i.e. R-R interval series variability; HRV) reveals that high frequencies remain present while the vagal activity is withdrawn. It has been already shown that it is partly explained by the mechanical stretching of the sinus node due to the respiration. In addition, it is pointed out a new high frequency component related to the pedalling frequency. This component is independent of the classical low and high frequency bands related to the autonomic nervous system modulation of the heart period. It is not related to ECG distortion or artifacts, and could be linked to the mechanical influence of the muscle pump on venous return. To assess this new component, we develop and propose a method based on a time-varying filter, designed in the timefrequency plane, as well as a new model to link the potential input of the modulation (the muscle pump) to the pedalling frequency component of HRV. This experiment shows that care should be taken when designing the exercise protocol to avoid misleading conclusions concerning the autonomous nervous system activity.