

Heart Rate Variability Analysis Assessment for Asthma Control Stratification

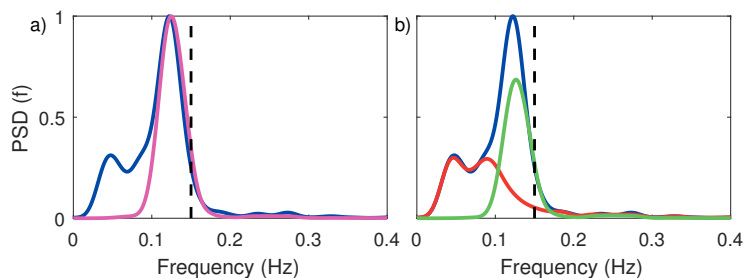
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Motivation and aim: Autonomic nervous system (ANS) has been suggested to play a major role in the pathogenesis of asthma. This has motivated large research, revealing a reduced modulation of the heart rate in subjects with uncontrolled asthma, when compared to asthmatics with controlled symptomatology. Under the hypothesis that ANS information could represent an added value in the stratification of asthmatic subjects attending to the control of their symptoms, we tested the accuracy of a logistic regression classifier trained using different combinations of autonomic activity-related and clinical features.

Materials: 30 asthmatic adults were recruited. Whereas 19 of them presented controlled asthma, the remaining 11 suffered from uncontrolled asthma. Clinical parameters, as well as 10 minute electrocardiogram and respiratory effort recordings were acquired from all of them.

Methods: ANS activity was assessed using heart rate variability (HRV) analysis. A preliminary study revealed low respiratory rates of some patients, so an orthogonal subspace projection decomposition was applied to separate the respiratory-related and unrelated components of HRV. The powers of these components, as well as their ratio, were obtained. Afterwards, the accuracy of a logistic regression classifier trained using different combinations of the HRV and the clinical parameters was tested.

Results and conclusion: The accuracy of the classifier improved when including ANS information (71.77%, versus 64.73% when only clinical parameters were considered), suggesting that ANS assessment could contribute to better non-invasive asthma monitoring.



HRV (blue) and respiratory effort (pink) spectra are displayed in a). In b), the decomposition of the HRV spectra in the respiratory-related (green) and -unrelated (red) components is shown.