The Asymmetric Nature of Transitions in Heart Rate Variations

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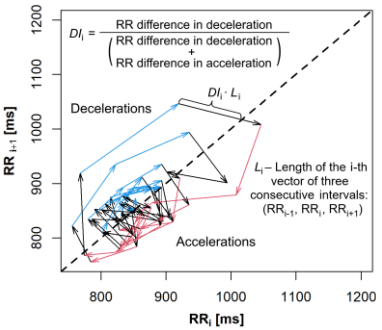
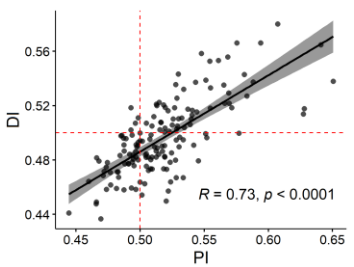
The purpose of our study is the development of a new heart rate asymmetry method (HRA) allowing for an extended assessment of autonomic nervous system functioning. Despite the increasing amount of HRA evaluation tools elaborated in recent years, this feature is still not fully understood. The essential question is: what is the reason of HRA absence in large parts of the healthy population?

We have calculated the mean value of an input of decelerations (the Deceleration Input – DI) into the heart rate transitions between accelerations and decelerations and *vice versa*. The method has been implemented in 151 heartbeat interval series obtained from ECG recordings of healthy males (age 33.6 ± 8.7; BMI: 25.9 ± 3.3). The participants underwent a head up tilt test with inclination angle of 70°; 5 min length series from supine and tilt stage of the test have been analyzed.



The idea of Deceleration Input calculated for a heart rate transition

We have observed DI < 0.5 in 60.3% of subjects in supine and 74.8% in tilt, p = 0.0146 and p < 0.0001 respectively according to the proportion test (indicating whether the proportion of asymmetric cases is significantly different from 50%). There is a significant difference between DI values in supine (0.497 ± 0.027) and tilt (0.486 ± 0.027): p = 0.0008. We have found that especially the *acceleration to deceleration* type of heart rate transitions is responsible for this change (p = 0.0003 in this transition type, no significant difference in the opposite one). Moreover, a high negative correlation of asymmetry by Porta's Index and DI has been observed in supine.



Correlation between Porta Index and DI in supine (n = 151)

The temporal variability analysis of a three consecutive heartbeat intervals is a method allowing for deepened insight into a nature of asymmetry between heart rate accelerations and decelerations.