

Transfer Function Gain Between Heart Period and QT Interval Variability Decreases at a 10-year Follow-up in Half-Marathon Runners

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In the last years even more attention is paid to the evaluation of the effects of physical activity on the cardiovascular control of athletes by heart period (HP) variability analysis, while a limited amount of studies focused on QT interval (QT) variability and on its relationship with HP change. Thus, the aim of this study is to apply the cross-spectral method to evaluate the relation between HP and QT variability in a group of athletes. We acquired the electrocardiogram in 18 half-marathon runners (age: 52.3 ± 8.0 yrs, 17 males) at rest in supine condition (REST) and during active standing (STAND) at baseline (B) and at a 10-year follow up (FU). HP and QT beat-to-beat series of 300 consecutive values were analyzed at REST and during STAND. The transfer function gain (TFG) was computed as the ratio between the modulus of the cross-spectral density between HP and QT divided by the power spectral density of HP. TFG was sampled in correspondence of the weighted central frequency of the HP components in low frequency (LF, 0.04-0.15 Hz, TFG_{LF}) and high frequency (HF, 0.15-0.4 Hz, TFG_{HF}) bands. We found that TFG_{HF} was lower at FU compared to B both at REST (0.03 ± 0.02 vs 0.09 ± 0.09) and during STAND (0.05 ± 0.03 vs 0.11 ± 0.13). TFG_{LF} did not change between B and FU and increased during STAND compared to REST only at FU (0.05 ± 0.03 vs 0.03 ± 0.02). The present work supports the use of the cross-spectral method, in addition to the more traditional time domain markers, to typify the cardiac control of athletes. Findings suggest that a moderate and regular physical activity is beneficial through the years as it favors a decrease of the sympathetic cardiac modulation contributing to lower the overall cardiovascular risk.