

## Determination of ventilatory threshold using heart rate variability in patients with heart failure

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**Background:** The first ventilatory threshold (VT1) has been shown to assess exercise tolerance and help in the exercise rehabilitation prescription of chronic heart failure patients (CHF). However, VT1 cannot always be detected in CHF by classical methods. Previous investigations revealed that the assessment from heart rate variability (HRV) analysis gives an accurate estimation of VT1 in trained subjects. Objectives: This study proposed to examine whether HRV analysis could help in VT1 determination in CHF.

**Methods:** 18 CHF patients (12 males and 6 females, age:  $62 \pm 13$  years, weight:  $73 \pm 17$  kg, left ventricular ejection fraction:  $0.32 \pm 0.7$ ,  $VO_{2peak}$ :  $1.3 \pm 0.4$  L.min<sup>-1</sup>) performed a cycle incremental exercise (CPX testing). Beat-to-beat RR interval, oxygen uptake ( $VO_2$ ), carbon production ( $VCO_2$ ) and minute ventilation (VE) were collected during the test. VT1 corresponded to the last point before a first non-linear increase in both VE and  $VE/VO_2$ . Time (RMSSD) and time-frequency (HFp) domain indices, both extrapolated from the RR time series were calculated.

**Results:** A marked RMSSD and HFp deflection points were found in the region of VT1, and were identified as variability heart rate thresholds (HRVT). No significant difference was found between VT1 and both HRVT ( $p < 0.05$ ) in terms of  $VO_2$ , heart rate values and exercise intensity. Correlations between the different measures ranged from 0.97 to 0.99 providing a strong agreement between all methods (Bland and Altman's method). Conclusions: These data reveal that HRV analysis using time-frequency indices during CPX testing can provide a useful alternative to the classical VT1 determination in CHF patients.

### Biography

Pierre-Marie Lepretre has completed his Ph.D. in 2005 from French University of Evry-Val d'Essonne and postdoctoral position from French University of Strasbourg. From 2006 to 2008, he occupied an exercise physiologist position at the French sport institute (INSEP). Since 2008, he has been an Associate Professor at the University of Picardie Jules Verne. He has published more than 30 papers about cardiovascular responses to exercise in indexed ISI journals and serving as reviewer in many international journals of Sports sciences.

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