

The importance of first and second ventilatory thresholds to define aerobic exercise intensity in cardiac patients and in healthy subjects: what is essential can be visible to the eyes

Anselmi F.¹; Cavigli L.¹; Pagliaro A.²; Valente S.²; Valentini F.¹; Cameli M.¹; Focardi M.¹; Mochi N.³; Mondillo S.¹; Dendale P.⁴; Hansen D.⁵; Bonifazi M.⁶; Halle M.⁷; D'ascenzi F.¹

¹University of Siena, Department of Medical Biotechnologies, Division of Cardiology, Siena, Italy

²University Hospital of Siena, Cardio-Thoracic and Vascular Department, Clinical and Surgical Cardiology Unit, Siena, Italy

³Azienda USL Toscana Centro, Sports Medicine Unit, Florence, Italy

⁴Heart Centre Hasselt, Hasselt, Belgium

⁵Hasselt University, Hasselt, Belgium

⁶University of Siena, Department of Medicine, Surgery, and NeuroScience, Siena, Italy

⁷Technical University of Munich, Department of Preventive Sports Medicine and Sports Cardiology, Munich, Germany

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Background. Although structured exercise training is strongly recommended in cardiac patients, uncertainties exist about the methods for determining exercise intensity (EI) and their correspondence with effective EI obtained by ventilatory thresholds. We aimed to determine the first (VT1) and second ventilatory threshold (VT2) in cardiac patients, sedentary subjects and athletes comparing VT1 and VT2 with EI defined by recommendations.

Methods. We prospectively enrolled 350 subjects (mean age: 50.7 ± 12.9 years; 167 cardiac patients, 150 healthy sedentary subjects, 33 competitive endurance athletes). Each subject underwent ECG, echocardiography, and cardiopulmonary exercise testing. The percentages of peak VO₂, peak heart rate (HR), and HR reserve were obtained at VT1 and VT2, and compared with EI definition proposed by the recommendations.

Results. VO₂ at VT1 corresponded to high rather than moderate EI in 67.1% and in 79.6% of cardiac patients, applying the definition of moderate exercise by the previous recommendations and the 2020 guidelines, respectively. Most of cardiac patients had VO₂ values at VT2 corresponding to very-high rather than high EI (59.9% and 50.3%, by previous recommendations and 2020 guidelines, respectively). A better correspondence between ventilatory-thresholds and recommended EI domains was observed in healthy subjects and in athletes (90% and 93.9%, respectively).

Conclusions. EI definition based on percentages of peak HR and peak VO₂ may misclassify the effective EI and the discrepancy between the individually determined and the recommended EI is particularly relevant in cardiac patients. A ventilatory threshold-based rather than a range-based approach is advisable in order to define an appropriate level of EI.

Abstract Figure.

