

The following letter is in response to the Point:Counterpoint series "Cardiovascular variability is/is not an index of autonomic control of circulation" that appeared in the August issue (vol. 101: 676–682, 2006).

To the Editor: Heart rate variability (HRV) is a very interesting and noninvasive tool to estimate, in correctly controlled conditions, the modulations of parasympathetic and sympathetic nervous systems to the heart.

However, it is very important to take into account the major influence of ventilation on the low- and high-frequency (HF) HRV component. Indeed, some results show that ventilatory pattern and increase or decrease of ventilation could induce significant changes in HRV indexes (5). It has already been shown that respiratory problems could induce HRV changes (4). Indeed, subjects with airway hyperresponsiveness had a significantly higher parasympathetic tone than reference subjects at baseline and showed a significant increase in cardiac reactivity after bronchial challenge. These modifications allow for the detection of a probable whole body autonomic nervous system imbalance in airway hyperresponsiveness by using HRV spectral analysis. However, during exhaustive exercise, for example, the impact of ventilation on HRV assessment is more problematic. The large increase in minute ventilation and its mechanical (1) or chemical (2) effects on the heart covers, modifies, or suppresses a large part of the signal normally attributed to autonomic modulation. During exhaustive exercise, the measure of autonomic changes by HRV spectral analyses is really difficult and must take into account the effects of ventilation (3).

Therefore, physiological interactions between the cardiovascular and the ventilatory systems must be considered to determine the best circumstances to use HRV analyses and to better understand the relationships between these systems. In these conditions, HRV could be used as an interesting and heuristic tool to improve physiological comprehension and clinical follow up in cardiovascular diseases.

REFERENCES

1. **Bernardi L, Porta C, Gabutti A, Spicuzza L, Sleight P.** Modulatory effects of respiration. *Auton Neurosci* 90: 47–56, 2001.
2. **Malliani A, Julien C, Billman GE, Cerutti S, Piepoli MF, Bernardi L, Sleight P, Cohen MA, Tan CO, Laude D, Elstad M, Toska A, Evans JM, Eckberg DL.** Comments on Point:Counterpoint: Cardiovascular variability is/is not an index of autonomic control of circulation. *J Appl Physiol* 101: 684–688, 2006.
3. **Pichon AP, de Bisschop C, Roulaud M, Denjean A, Papelier Y.** Spectral analysis of heart rate variability during exercise in trained subjects. *Med Sci Sports Exerc* 36: 1702–1708, 2004.
4. **Pichon A, de Bisschop C, Diaz V, Denjean A.** Parasympathetic airway response and heart rate variability before and at the end of methacholine challenge. *Chest* 127: 23–29, 2005.
5. **Yildiz M, Ider YZ.** Model based and experimental investigation of respiratory effect on the HRV power spectrum. *Physiol Meas* 27: 973–988, 2006.

Aurélien Pichon
Laboratory Réponses Cellulaires et Fonctionnelles à l'Hypoxie
UFR SMBH
Bobigny, France
e-mail: aurelien.pichon@orange.fr