BRADYCARDIA AND INCREASE IN LOW FREQUENCY OSCILLATIONS OF RR DURING RECOVERY AFTER LIGHT EXERCISE

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Spectral analysis of heart rate variability (HRV) is a common tool to investigate parasympathetic and sympathetic (PNS, SNS) control of the heart. Despite a large number of investigations, there is no agreement about the interpretation of the results. In particular, if it is widely accepted that high frequency oscillations (HF_{RR}) reflect respiratory sinus arrhythmia, on the contrary, the proposed sympathetic origin of low frequency oscillations (LF_{RR}) was recently questioned (Houle and Bilman 1999).The actual value of heart rate reflects the effects of PNS and SNS activity, respectively consisting in slowing down and in acceleration. In healthy subjects at rest vagal tone prevails, while during exercise parasympathetic withdrawal and sympathetic activation occur. Parasympathetic withdrawal is the main cause of cardiac acceleration, but sympathetic contribution increases at higher exercise levels. The time-course of post-exercise restoration of resting neurovegetative activity depends on the duration as well as on the intensity of exercise. In a previous work we had found that one hour was enough for a complete neurovegetative recovery after 20 min exercise at 50% individual anaerobic threshold (Terziotti et al., 2001). We also found an increasing trend in the total heart rate variability after 3 hours of recovery.

In the present investigations 12 healthy subjects performed a 20 min steady-state cycloergometer exercise at 40% maximal oxygen uptake. In each subject we recorded 10 min ECG at rest (REST) and, after the end of exercise, at 5 (REC1), 20 (REC2), 35 (REC3) and 50 (REC4) min of recovery. The subjects controlled the respiratory rate in order to reduce dispersion of HF_{RR}, thus increasing the consistency of the power estimation. Recordings were processed off line to perform autoregressive spectral analysis, in order to estimate the power of LF_{RR} and HF_{RR} oscillations.

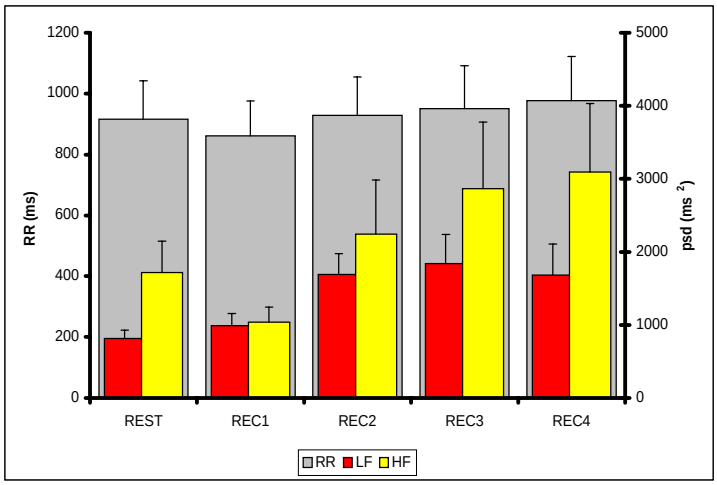

*Fig. 1. Mean values ± SEM of RR interval (grey), LF_{RR} (red) and HF_{RR} (yellow) at rest and during recovery. * = p< 0.05*

By comparing the different times of recovery with rest, we observed an early period of tachycardia, followed by a progressive increase of RR interval during the last recordings (fig. 1). LF_{RR} and HF_{RR} showed a similar increasing trend, which attained statistical significance after 40 min (REC3) (fig. 1). These results demonstrate that - after a light exercise - 30 min are enough for a complete recovery of baseline neurovegetative functions. Furthermore, the simultaneous increase of LF_{RR} and HF_{RR} during the last stages of recovery, associated with bradycardia, suggests that LF_{RR} and HF_{RR} are predominantly modulated by the parasympathetic system.

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