Intense endurance training on heart rate and blood pressure variability in runners

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Purpose: The purpose of this experimentation was to measure the effects of intense endurance training on autonomic balance through a spectral analysis study of the heart rate (HR) and systolic blood pressure (SBP).

Methods: Eight elite runners were tested twice: after a relative rest period (RRP) of 3 wk and after an 12-wk intense training period (ITP) for endurance. At the end of each phase, the subjects were tested by means of a VO2max test and a tilt-table test.

Results: The resting heart rate (HR) variability was lower ($P < 0.001$) in the intensive training phase. Likewise, there were differences in the low-frequency (0.04-0.150 Hz; LF) and high-frequency (0.150-0.500 Hz; HF) components and the LF/HF ratio of the HR spectral analysis. The LF spectral power was significantly lower in the supine position ($P < 0.05$) during ITP. Upright tilting was accompanied
by a 22.6% reduction in HF values during the rest period, whereas in ITP the HF spectral power rose by 31.2% ($P < 0.01$) during tilt, characterizing a greater parasympathetic system control. Sympathetic control represented by the LF/HF ratio regressed markedly ($P < 0.01$) in response to the tilt test in ITP.

**Conclusions:** The spectral analysis of SBP in the high frequencies shows that the changes in cardiac parameters are coupled with a decrease in sympathetic vasomotor control (-18%) and a reduction in diastolic pressure (-3.2%) in the response to the tilt test at the end of ITP. Spectral analysis could be a means of demonstrating impairment of autonomic balance for the purpose of detecting a state of fatigue that could result in overtraining.

**Key Words:** SPECTRAL ANALYSIS; AUTONOMIC BALANCE; HARD TRAINING; FATIGUE