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Sensitivity analyses of heart rate variability variables by an incremental, passive head-up tilt.

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We analyzed the sensitivity of heart rate variability (HRV) variables as an index of autonomic nervous activity by an incremental, passive head-up tilt (HUT). Twelve healthy male volunteers, mean age 20.5 years +/- 2.1 SD, were subjected, after a horizontal (0 degrees) supine posture period, to an incremental, passive HUT of 14.5, 30, 48.6, 61 and 90 degrees. The tested HRV variables were: heart rate (HR), standard deviation of the RR interval (SD(RR)), coefficient of variance of the RR interval (CV(RR)), low-frequency band [0.04-0.15 Hz] power spectrum (P(LF)), high-frequency band [0.15-0.4 Hz] power spectrum (P(HF)), the ratio of P(LF) to P(HF) (P(LF)/P(HF)), coefficients of low-frequency and high-frequency component variance (C-CV(LF), C-CV(HF)), percentages of P(LF) and P(HF) in total power spectrum (%LF, %HF), and normalized units of low frequency and high frequency band power spectra (NU(LF), NU(HF)). The SD(RR), CV(RR), P(LF) and C-CV(LF) were not sensitive to the sine of the tilt angles, i.e., the body-axis component of gravity (+Gz), in the incremental HUT. Therefore, these variables may be less suitable as indices of autonomic nervous activity. The P(LF)/P(HF), NU(LF), and NU(HF) appear to be useful as indices of sympathovagal balance. Both the NU(LF) and NU(HF) (both are equivalent and inversely related) are suitable for the comparison of sympathovagal balance between subjects of different ages and levels of physical fitness because they are not significantly influenced by age and physical fitness. The HR and HRV variables represent quite different characteristics of autonomic nervous activity, according to the Rosenblueth Simeone model. Therefore, the HR appears to be effective for combined assessment of sympathovagal balance. These results provide information useful in the selection of HRV variables while estimating autonomic nervous activity from short-term HRV.