

The evaluation of respiratory sinus arrhythmia using deep breathing test and heart rate variability analysis.

Respiratory-frequency rhythms are translated into changes in a discharge frequency of the sinoatrial node known as **respiratory sinus arrhythmia (RSA)**. RSA is mediated through physiological mechanisms by which the R-R interval on the ECG is shortened during inspiration (heart rate increases) and prolonged during expiration (heart rate decreases). These mechanisms include **central medullary generator, reflexes from the lungs, baroreflexes, chemoreflexes, as well as local mechanisms (stretching of the sinoatrial node etc.)**. The parasympathetic branch is the main way for phasic beat-to-beat cardiac control including RSA and the sympathetic branch plays only a tonic modulatory role. Thus, the assessment of respiratory sinus arrhythmia is accepted as an index of **cardiac vagal function**. RSA can be quantified by various methods - the *spectral analysis of heart rate variability* or *deep breathing test*.

Deep breathing test (Fig. 1, 2)

Respiratory mediated heart rate changes are small during quiet breathing, then, it is more convenient to evaluate the respiratory sinus arrhythmia during deep breathing. Deep breathing test is considered as an index of **cardiac vagal control**.

Method

The method, analysis and evaluation of deep breathing test are the same as a task „Deep breathing test, orthostatic test, Valsalva's manoeuvre – automatic evaluation by microcomputer system“.

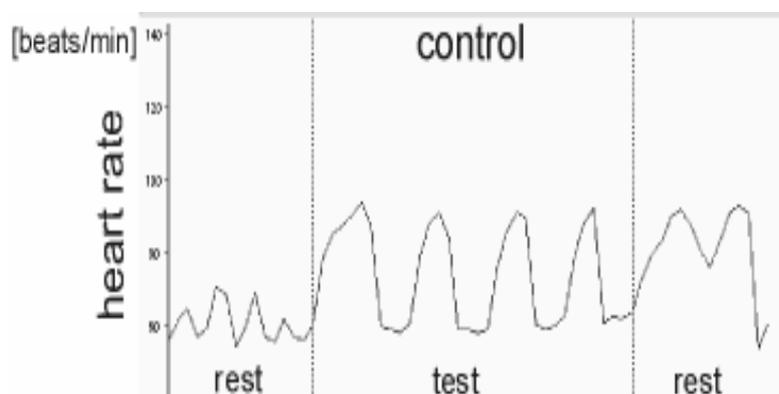


Fig.1 Deep breathing test in a healthy proband (Department of Physiology, Martin)

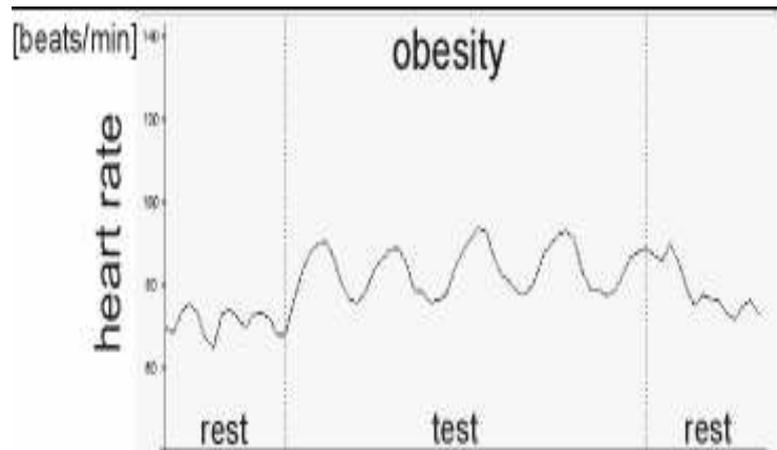


Fig. 2 Deep breathing test in an obese patients. Respiratory sinus arrhythmia is reduced compared with a healthy proband (Fig. 1) (Department of Physiology, Clinic of Children and Adolescents, Martin)

The heart rate variability analysis – high frequency (HF) band (Fig. 3, 4)

The high frequency spectral power of the heart rate variability analysis (0.04-0.15 Hz) reflects mainly respiratory sinus arrhythmia regarded as an index of the **cardiac vagal modulation**. The high-frequency (HF) spectral activity is decreased during manoeuvres associated with *sympathetic activation* (e.g. orthostatic test, mental load) and – *vice versa* – higher spectral activity in HF band is associated with *parasympathetic activation* (e.g. relaxation).

Method

The method, analysis and evaluation of HRV parameters characterizing the high-frequency band are the same as a task „Evaluation of heart rate variability“.

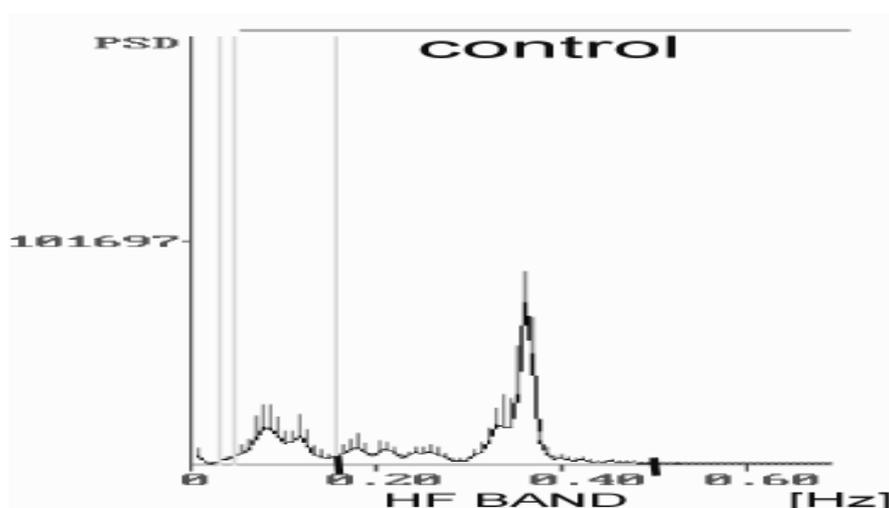


Fig. 3 The high frequency band in a healthy proband (Department of Physiology, Martin).



Fig. 4 The high frequency band in an obese patients. Spectral activity in HF band is reduced compared with a healthy proband (Fig. 3). (Department of Physiology, Clinic of Children and Adolescents, Martin)