

## **Heart Rate Variability – General Information**

Contrary to the common assumption, a healthy heart doesn't beat regularly as a metronome. The heart's moment by moment beating rate is naturally influenced by many physiological factors and varies constantly. The most obvious of these factors is physical activity. At rest, for example, the heart might beat in the neighborhood of 60 times per minute. When a person is running for the bus or swimming lengths, it might accelerate to well over 100 times a minute. In fact, the range defined by your minimum to maximum heart rate capacity is a key factor defining your level of health. As a person's physical condition deteriorates, this range can actually become narrowed to the point of limiting their ability to adapt to the stresses of daily life. From that point on, any unexpected stressful condition could push the individual to the limit of their adaptability and put them at risk for cardiovascular accidents and possibly death.

The idea of exercising the cardiovascular system to maintain as wide as possible a range of heart rate adaptability is not new. Medical practitioners have prescribed physical exercise and stress management techniques, such as meditation or yoga, for generations. In recent years, a novel biofeedback method has gained serious recognition from practitioners of many health care professions. A set of standard signal processing and analysis methods, proposed in 1996, has been widely accepted by practitioners and manufacturers of equipment. A number of heart rate variability (HRV) biofeedback protocols have been developed and tested for various clinical conditions. The research shows sufficient evidence of success that it places HRV biofeedback ahead of many other self-regulation methods in terms of acceptance by mainstream medicine.

## **Heart Rate Variability analysis**

The heart rate variability (HRV) analysis is done by a 5 min resting test and a one min. breathing test as well as a 24 hour long term analysis. The ECG is recorded and the Interbeat Intervals (IBI) are detected. Out of these IBI the HRV analysis is calculated, which can show the condition of the Autonomic Nervous System (ANS), that regulates heartbeat, breathing, muscle tension, digestion, and in combination with the hormone and immune system, also many important circuits of cognition, reaction and emotional behavior. The HRV analysis can show how adequate the ANS can regulate stress, activation and regeneration in general and at certain given circumstances.

## **Heart Rate Variability Biofeedback**

Some main HRV parameters can be used as parameters for biofeedback training. Most of these training formats are based on the coherency between breath, heart rate and blood pressure regulation, or on a frequency band training (FFT). This training is used in order to stimulate regeneration or relief stress, trauma, tension or high blood pressure.

## **Areas of application**

A very important area of application is the peak performance training in sports and military environments. Many football teams like FC Barcelona or Manchester United use the HRV as well as athletics athletes like Marlen Ottey and the US American, the Jamaican and the Chinese team. Moreover, German 7 times Laser class sailor German Champion Tobias Schadewaldt has been HRV coached by the author as well as members from the Germany Karate National Team. In Afghanistan, many soldiers have been using HRV devices in order to reduce stress and prevent trauma.

Another important application is the stress management of CEO'S of multinational blue chip companies that have to struggle with Jetlag, high workloads and personal power struggles.

A third application of HRV analysis and biofeedback is the analysis of cardiovascular risk and fitness and the biofeedback training for stress relief and blood pressure reduction.

## **Heart Rate Variability and Intermittent Hypoxia/ Hyperoxia Training (IHHT)**

HRV analysis is widely used before the IHHT in order to determine the depth of the hypoxia and the length of the hypoxic intervals. It can also show the adequate level of therapeutic stimulus and the results.