"Active Air" Inhalation Therapy:
Autonomic Regulation Mechanisms with Use of Heart Rate Variability Analysis

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Abstract

Active Air inhalation of 20 minutes duration (modus AE 5/5) demonstrates significant influence on the autonomic nervous system and its regulatory efficacy by eliciting a marked increase of efficiency of regulatory systems. This increased efficiency is caused by the activation of energetic and metabolic resources along with a parallel decrease of organism stress (i.e. caused by disease) as well as a harmonizing effect of the autonomic nervous system.

This kind of inhalation therapy could be recommended for patients with chronic diseases, where organism stress is high, which causes a decrease of activity of regulatory systems resulting in disorders of homeostasis and a decrease of energetic (metabolic) reserves. This could help improve the overall health condition.

The presented study was directed for a short one-time use of Active Air inhalation to detect its immediate effect. The study of long time use of inhalation is recommended as well to determine the period of persistent effect after inhalation.

Introduction

Heart rate variability (HRV) is a measure of variations of heart rate, which is used as an indicator of the activity of autonomic regulation of circulatory function. HRV is being utilized more often in research to use it as a physiological marker to classify different health disorders, such as cardiovascular disease, and how it relates to performance activity. When HRV is used as a measurement of fitness, specifically the speed at which one's heart rate drops after exercise, it shows that the speed at which a person's heart rate returns to resting is faster for a fit person than an unfit person. For example, a drop of 20 beats in a minute is typical for a healthy person, whereas a drop of less than 12 beats per minute after maximal exercise has been correlated with a significant increase in mortality. In other words, a healthy heart has a large HRV, while decreased variability may indicate heart disease.

Activated Air technology, has been shown to improve HRV. With this technology, an activated oxygen species gets generated. Although singlet oxygen is unstable, it quickly stabilizes back to triplet oxygen releasing energy. This "charged" or "activated" air, increases the body's ability to use oxygen, thereby optimizing cell metabolism, which improves HRV. Dr. Kucera's following study effectively demonstrates that Activated Air technology improves HRV, thereby demonstrating the vast potential uses for Activated Air in treating age-related disorders and health conditions caused by oxidative stress.

Active Air 5 Inhalation Therapy

Please see: White Paper – A Brief Overview of the Concepts Underlying Activated Air Technology by Eng3 Corporation

The above described method seems to be effective to correct health conditions with energy deficiency caused by different diseases. The deficiency of energetic resources in healthy subjects is charcteristic for long-term adaptation mechanisms. Thanks to this mechanism the synthesis of proteins and nucleic acids is activated, which increases the cell mitochondrial apparatus resulting an increase of adaptation capabilities of the organism. To keep these adaptation capabilities funcionally effective, the informational, energetic, and metabolic reserves are essential – when the reserves are inadequate, then the functional insufficiency of the organism develops leading to restricted ability to adapt to different influences (environmental, health condition, etc.), esp. under conditions of moderate or mild stress.

In this work the method of heart rate variability analysis [actually a very important method to estimate autonomic (vegetative) nervous system function and of adaptation reactions of the organism] for evaluation of practical "Active Air" inhalation therapy effect is presented. The work is concentrated to process the method of evaluation of effectiveness of inhalation "Active Air" therapy based on heart rate variability analysis.

Methodology and Material

Analysis of heart rate variability (HRV) is an actual methodology and technology of evaluation of the states of regulatory systems of organism, particularly of functional states of different parts of autonomic (vegetative) nervous system (ANS). Important studies of HRV began in 1960 in Russia (U.S.S.R.), esp. on studies of development of HRV in space medicine. During that time different studies of use of HRV in cardiology, surgery, occupational physiology, sport medicine, and experimental physiology were performed on a large scale. Thanks to these studies the very important new knowledge of indicators and parameters of HRV were received to estimate not only vegetative balance but also the evaluation of non-specific adaptation reactions. All the results are summarized in "Mathematical Analysis of Changes of Heart Rhythm by Stress", further worked out by studies of problems of **donosological** diagnostics – the diagnostics of health conditions prior to when the symptoms of disease have developed.

At present time the methods (and importance) of HRV analysis are generally accepted and every year brings new knowledge with broader use of HRV by different medical professionals. Further development of HRV is linked with rapid development of computer technology. One of the most important studies of HRV analysis is comprised of a 20-year study of 20,000 different groups of people. The purpose of the study was to detect different stages of adaptation reactions of the organism to different influences of the outside environment ("Estimation of adaptation capabilities of the organism and risk of development of diseases").

The leading factor of disease development is the reduction of adaptation capabilities of the organism which is possible to detect by degree of tension of regulatory systems. As the functional reserves of the organism lowers, the tension of regulatory mechanisms to secure adequate energetic and metabolic functioning of systems and organs should rise. The method of HRV analysis is to be used to measure the degree of regulatory systems tension (activity). For evaluation of adaptation capabilities of the organism, the degree of activity (tension) of regulatory systems – level of stress – the complex hardware-software "Valeograph" (Fa LZ Synapsis, Neubrandenburg, Germany) was used. All measurements were performed under standard conditions in a quiet room with a standard temperature in a sitting position before inhalation and immediately after inhalation; the recording time was 5 minutes.

HRV parameter	Short name	Physiological interpretation
Heart rate (Pulse)	HR	*Mean level of cardiovascular function*
Standard deviation	SDNN	*Total activity of regulatory systems*
Root mean square standard deviations	RMSSD	*Parasympathetic (vagal)activity*
Stress index	SI	*Sympathetic system activity*
High frequency spectrum of HRV	HF, %	*Activity of parasympathetic system*
Low frequency spectrum of HRV	LF, %	*Vasomotoric center activity*
Very low frequency spectrum of HRV	VLF, %	*Activity of energetic and metabolic levels of regulatory systems, central regulation*
Lower centralization index	LF/HF	*Prevalence of intermediate levels of regulatory systems*
Index of centralization	IC	*Prevalence of central levels of regulatory systems*
Total power of HRV spectrum	TP	*Total power of all spectral components of regulatory systems*
Index of activities of regulatory systems	IARS	*Summary of activities of all regulatory systems*

Table 1 List of parameters included into study

The materials of the study are based on measurements of 37 patients of different age (23-83 years, ave. 52), sex (F-21, M-16), and diagnosis (Coronary heart disease CHD-21, Hypertension HTN-17, Type 2 Diabetes-14, Type 1 Diabetes-1, Chronic obstructive pulmonary disease COPD-1, Morbus Crohn-2, Glaucoma-1, Chronic fatigue syndrome CFS- 1, Polyarthritis rheumatica-2, Bronchial asthma-2) using their medication without interruption in Health Centers in Karlovy Vary, Czech Republic, and Neubrandenburg, Germany. Recording Heart Rate Variability was performed before (after sitting quietly for 20 minutes) and immediately after "Active Air" 20 minutes inhalation with modus AE 5/5. Measurement lasted 5 minutes in a sitting position under quiet room conditions, which are the international standards for short term HRV recordings. Statistical significance was provided by criteria of **Anova**-test and **Student** t-test.

Result of Measurements – Discussion

The object of this trial was to determine the effect of "Active Air" inhalations on the autonomic nervous system. The results of HRV analysis demonstrate a significant increase of variability (increase of parasympathetic activity: RMSSD-p<0,001, SDNN-p<0,01), significant decrease of sympathetic activity: SI-p<0,001), and significant increase of total power (TP: total efficiency of ANS-p<0,001). These results stand for significant decrease of organism stress and for significant growth of energetic and metabolic reserves (activation of metabolic resources) with an important increase of ANS efficiency. The reduction of organism stress is supported with a decrease of index LF/HF (p<0,01), IC (p<0,05), RSAI (p<0,05), and heart rate HR (p<0,05).

Individual analysis points out another important effect on all parameters of HRV analysis: **harmonizing of parameters (harmonizing of autonomic regulatory systems).** It means, that when individual parameters were low, inhalation causes an increase of the parameters and vice versa.

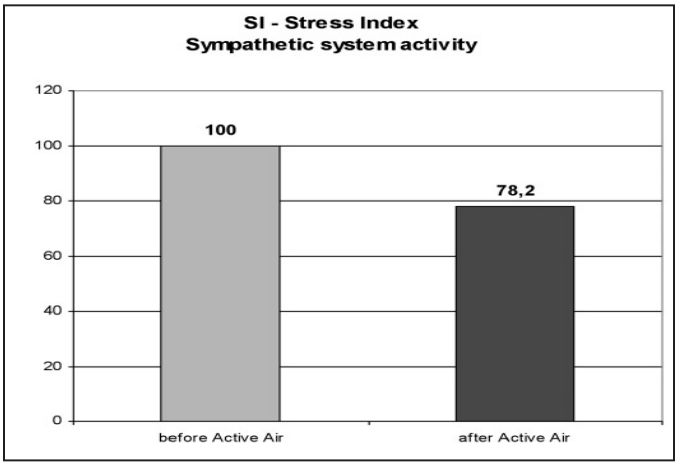

Chart 1 ignificant decrease (p<0.001) of SI (-21.8%) shows considerable increase of parasympathetic activity and decrease of sympathetic activity which indicates a decrease of organism stress.

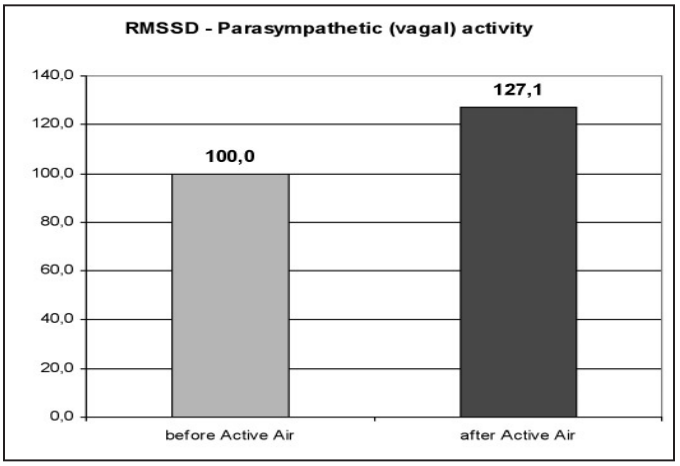

Chart 2 Significant (p<0,001) increase of RMSSD (+27,1%) shows considerable increase of parasympathetic activity and decrease of sympathetic activity which stands for decrease of organism stress.

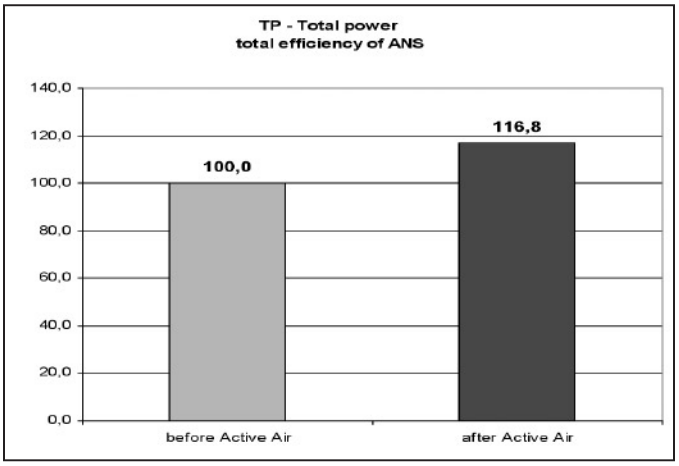

Chart 3 Significant increase(p<0.001) of total effectivity (TP-total power +16.78%) of autonomic nervous system demonstrates significant growth of reserves and energetic-metabolic efficacy.

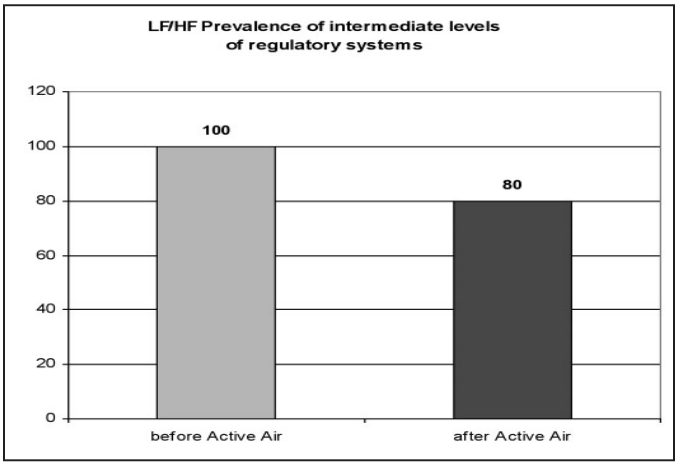

Chart 4 Significant decrease (p<0.01) of LF/HF (-20%) with activation of lower levels of regulatory systems and decrease of organism stress.

Please see the White Paper on the following page for further information on Activated Air Technology

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