

## Summary

### Master-/Bachelor Thesis

#### **"The regulating effect of breathing- therapeutic interventions relating to the autonomic nervous system"**

Gabriele Pieper

#### **Background**

Like many of the complementary methods applied today breath therapy also generates its knowledge from experiences accumulated over a long time and rooting partly in an old human knowledge. Proofs of effectiveness with a scientific claim were up to now difficult to produce for those methods. Since the publication of the study of Naghavi Mahlsen et al<sup>1</sup> prevention methods have taken an important role in the health sector. So breath therapy is looking for more public acknowledgement also.

Today's breath therapy in Europe has developed in the beginning of the last century from the reform movement at that time, from art, gymnastic movement, dance, and from psychotherapy. In this context, the depth psychology after C. G. Jung played a fundamental role. Breath therapy takes a holistic approach to health. Today's breath therapists understand themselves as performing an activity directly referred to health. Long-standing breath-therapeutic experiences show the therapeutic effectiveness of breath work with regard to specific clinical syndromes by cessation or improvement of the symptoms of illness. This effect is also based on a responsible contact with oneself and with the environment. Thus breath-therapeutic experiences lead to the assumption that breath therapy is an effective method for self-regularization and health preservation. These experiences should stand up to scientific inquiry of whether the effectiveness of breath therapy can be proved.

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<sup>1</sup> Lanzano Rafael und Naghavi Mahlsen et al.: Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden Disease 2010. Lancet 2012 380:095 -128.

## Methods

From a psychological point of view practicing mindfulness and awareness is an essential part of what breath therapy does. In breath therapy awareness is defined in a comprehensive manner, as a sensing presence.

From a physiological-anatomical point of view the effectiveness of breath work can be explained through the rhythm generator situated in the *medulla oblongata*. It has multifold cerebral linkages with several upper brain areas. The **functional breath rhythm** consisting of two phases (breathing in and breathing out) has to be distinguished from the **neural breath rhythm** consisting of three phases (breathing in, breathing out and breathing space). This three-phase breath rhythm is called the “soft breath method” according to Taoist sources. According to Western breath therapy (*Arbeits- und Forschungsgemeinschaft für Atemtherapie und Atempädagogik AFA*®) the three-phase breath rhythm forms the fundamental system of order and moderation.

The respiratory network situated in the *medulla oblongata* is closely connected with the neighboring cardiovascular network. The two together are functionally named as one cardio respiratory network. That is why the breath rhythm has essential influence on the heartbeat sequence: with inhalation the neurons of the sympathetic system leading to the heart are always simultaneously stimulated. That means with strong inhalation the heartbeat becomes also faster. While exhaling and through the influence of the parasympathetic system the heart frequency goes down again. This phenomenon is called respiratory sinus arrhythmia (RSA). The reduction of the respiratory rate causes a distinctive increase of the RSA and with this an increase in activity of the *vagus nerve*. The neuro-physiological effect is a reduction in the respiratory rate and, as a result, an increase in the activity of the parasympathetic system within the three-phase neural circuit that activates the rhythm generator.

The influence which the nervous system and the rhythm generator have on each other forms the anatomical-physiological basis for a symptom oriented breath therapy that can be applied in the case of physical as well as psychological disorders.

For the scientific inquiry long term measurements (24 hours) with the ECG were carried out with five test persons. By doing so the heart rate variability (HRV = variability of the distances between R-points) could be identified. The results that were registered during 24 hours of measurement were compared to the results that could be measured during

a breath treatment lasting 60 minutes. The activities of the parasympathetic system and the activities of the sympathetic system were measured over 24 hours by means of a time analysis and a frequency analysis. The definite point of rest within the heart rate (the lowest heart rate during the entire examination) represents another breath-related parameter for the activity of the parasympathetic system. The verified results of the parasympathetic system provide information about the relaxation and the regeneration of the organism, which are both caused by the breath-therapeutic interventions. PNN50 has been determined as another parameter for the activity of parasympathetic system. It describes the percentage of the successive RR intervals that deviate from each other by more than 50 ms.

Again, the influence of the parasympathetic system is the larger the higher the pNN50 value is. pNN50 results on the higher side show a breath-related increase of the activity of the parasympathetic system. In order to evaluate the activity of the parasympathetic system the results of the HF (High Frequency) were identified during the frequency analysis. A breath-related increase of the HF within the frequency range of 0.15 to 0, 40 hertz allows us to draw a conclusion on the breath-related activation of the parasympathetic system and on a maximum of possibilities for regeneration for the organism.

The frequency range predominantly controlled by the sympathetic system shows results of the LF (low frequency) from 0, 04 to 0, 15 hertz. Test results reflecting a ratio of HF / LF within a normal range of 0, 5 to 2.0 hertz are an indicator for a balance between parasympathetic und sympathetic system.

The entire state of health (Totally Frequency Power = TTP) is first of all determined in the time analysis through the identification of the average of the overall number of all RR-intervals within 24 hours and the squaring of this number in milliseconds. Secondly, TTP results from the overall size of all frequency ranges within a time span of 24 hours, i.e. from the sum of ULF (Ultra Low Frequency), VLF (Very Low Frequency), LF and HF. Here a frequency range from 0 to 0.4 hertz has been chosen. Furthermore, the distribution of ULF, VLF, LF and HF is determined percentage-wise. The distribution shows the ratio between the activation of the sympathetic system (VLF and LF) and the parasympathetic system (HF), which should ideally come to 45 to 55%. VLF and ULF should come to 25 to 35 %, HF to 10 to 25%.

Five test persons between 38 and 78 years old took part in the investigation. The breath treatment lasted 60 minutes. The clients are dressed and lie comfortably. By the means of touches, massages and pressure points the breath therapist supports the breath of the client in his natural rhythm. The client practices sensory presence.

**Results:**

A breath-related increase in activity of the parasympathetic system can be observed with four out of five test persons by an increase of tests of pNN50 in the spectrum of + 77% to + 137% and by an increase of the tests of HF in the spectrum from + 70% to + 149% in the day average comparison. A decrease of the middle heart rate shown with all test persons in the spectrum of - 16% to - 25% in the day average comparison is another proof of effectiveness for the activity of the parasympathetic system due to the breath treatment.

Furthermore, the definite point of rest of the heart rate with 3 of 5 test persons during the breath treatment serves as a parameter for the parasympathetic system. The parameters LF and VLF which correspond mainly with the activation of the sympathetic system show an increase in the spectrum of + 65 % to + 114 % (LF) and + 46 % to + 99 % (VLF) during breath treatment. This causes a profit of the TTP in the spectrum of 52% to 64% with three out of five test persons. Three out of five test persons have found not only relaxation but also regeneration of the organism and with it a strengthening of their health through breath treatment. Two out of five test persons show a decrease of their TTP tests during the breath treatment. This result indicates for both cases another breath-therapeutic treatment plan that differentiates individually. For both the test persons from a breath-therapeutic point of view an activation of the sympathetic system would be induced for the support of their health. This can be done by person-centered breath-therapeutic practicing in movement and by self-massages.

**Conclusions:**

In spite of individual differences like age, practice status and motivation the measurements reveal a consistent picture of the regulating effects of breath-therapeutic interventions on the autonomous nervous system. It is obvious that breath-therapeutic interventions lead to relaxation and to comprehensive regeneration of the organism. Within the meaning of self-regularization breath therapy can self-confidently take its place among the preventive methods.

The individual case studies undertaken do not claim to be statistically significant. However, based on the evaluation of the measured data with the evidence-based software *Lebensfeuer*® evidence of effectiveness can be produced for the examined people and the breath method applied by the *Atemwerkstatt Bonn* (AFA®). It would be worthwhile if more investigations followed that consider differences in age, gender, and diagnosis and practice status. The results could form the basis for more detailed and also symptom-oriented breath-therapeutic treatment plans.