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Symposium Abstract

HEART RATE BREATHING BIOFEEDBACK, RESONANCE, AND HEART RATE VARIABILITY (RSA BIOFEEDBACK): PSYCHOPHYSIOLOGY AND CLINICAL APPLICATION

MODERATOR

Paul Lehrer, PhD, Department of Psychiatry, RW Johnson Medical School

DISCUSSANT

Edward Sorel, PhD

SUMMARY

Heart rate breathing biofeedback (respiratory sinus arrhythmia biofeedback) involves training in voluntarily producing high-amplitude increases in heart rate fluctuations, primarily those that accompany breathing. Experimental research has documented a number of oscillatory rhythms that contribute to total cardiac variability. Among these are the "fast waves", which are parasympathetically controlled and reflect respiratory activity; the "slow waves", which reflect baroreflex control and are affected by both the sympathetic and parasympathetic systems; and the "very slow" waves, which appear to affect thermal regulation. These oscillatory rhythms reflect important homeostatic reflexes. The complexity of these reflexes reflects cardiovascular adaptivity and health. They can be affected by voluntary control of breathing, and by other maneuvers. Heart rate breathing biofeedback can be used both as a method to study cardiovascular control mechanisms (such as baroreflex activity) and as a therapeutic method to enhance homeostatic function by exercising various homeostatic reflexes. This can be done by causing various reflexes to resonate with each other. At several resonant frequencies, various reflexes oscillate in phase with each other, and oscillation amplitudes greatly increase. This characteristic can provide exercise for homeostatic reflexes, thereby improving their efficiency, and improving various kinds of autonomic nervous system dysfunction.

Evgeny Vaschillo, PhD. Resonance in the Cardiovascular System Discovered by Biofeedback and Frequency Analysis.

Biofeedback procedures and frequency analysis were used to study heart rate (HR) and blood pressure (BP) variability within the frequency range .01-.14 Hz in 5 healthy subjects. We found that the cardiovascular system for each individual has specific resonant frequencies. The resonance characteristics appear to be controlled by the baroreflex. One resonance (the "slow" frequency range of .055-.11 Hz) is caused by the cardiac component of the baroreflex. The other (the "very slow" frequency range of .02-.055 Hz) is caused by the vascular component. Evidence for these conclusions will be discussed, as will implications for therapeutic use of biofeedback methods to control heart rate variability.

Paul Lehrer, PhD, Cardiac Oscillation, Resonance, and Homeostasis: Observations on Heart Rate Variability Among Zen Monks During Practice of Zazen

A theory will be presented linking the presence, amplitude, and complexity of oscillation as markers of homeostatic function. Several sources of oscillation in heart rate rhythm have been mapped out by experimental research. Each appears to reflect the operation of a specific set of homeostatic reflex. Through resonance effects, voluntary control of breathing can affect various autonomic reflexes. This is illustrated in a study of Zen monks during Zazen breathing. Measures of respiration and cardiac variability were taken on 11 Zen monks (six Rinzai and five Soto) during quiet sitting and during Zazen breathing. On the whole, respiration slowed during Zazen, and increases occurred in slow wave HR variability (.05-.15 Hz). Respiration rate was slower and slow wave activity higher among Rinzai than Soto practitioners. Slow wave activity was significantly negatively correlated with respiration rate. One very experienced Zen master breathed at a rate close to once/min, with large increases in very slow waves (.005-.05 Hz). Extrasystolic beats occurred very frequently among the more experienced practitioners, and some practitioners reported becoming warm even in very cold environmental conditions. The implications of resonance effects and clinical heart rate breathing biofeedback are discussed.

Richard Gevirtz, PhD, Resonant Frequency Training to Restore Autonomic Homeostasis in Psychophysiological Disorders

Recent theory and research has indicated that what has been known as RSA training might better be considered "Resonant Frequency" training in that experienced trainees create a characteristic cardio-pulminary rhythm at about .1 Hz. We have been using the idea of Vashillo's that daily practice of this technique is beneficial in restoring autonomic homeostasis. Clinical protocols and case studies of these ideas will be presented.

Alexander Smetankin, PhD, Biofeedback for Respiratory Sinus Arrhythmia as a Way to Regularize Respiratory and Cardiovascular Function

Synchronization of the respiratory and cardiovascular systems is the most important element in achieving homeostasis. A measure of this synchrony is respiratory sinus arrhythmia (RSA). Higher RSA is associated with lower arousal, and hence better homeostatic control. Synchronization of respiration and heart rate achieves positive changes in muscle tension, brain wave activity, body temperature, and skin conductance, resulting in a subsequent reduction in negative thoughts and greater self-confidence. Clinical data will be presented to support these conclusions based on training RSA biofeedback training, using the Alexander Smetankin method.

Bo von Scheele, Respiratory Sinus Arrhythmia (RSA) in a Patient With a Pacemaker

Might patients with pace makers benefit from RSA-biofeedback training? As case data indicates this can be true when the pacemaker is activated temporary on defined occasions. The consequences of this observation might also support in general the argument of careful on-line analysis of RSA during different conditions as well as how the patient can learn through RSA-biofeedback training to control dysfunctional behaviors of the heart before a pace maker is implemented.

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