

# Heart Rate Variability (HRV) Biofeedback for Beginners



## Clinical Efficacy of HRV Biofeedback

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# Clinical Efficacy of HRV Biofeedback

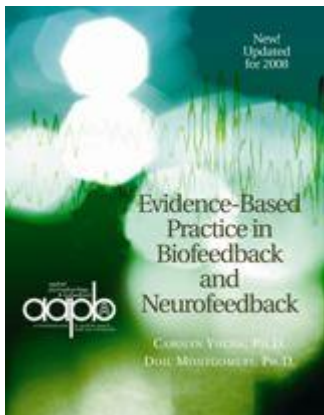
Guidelines for evaluating the clinical efficacy of biofeedback and neurofeedback interventions were recommended by a joint Task Force and adopted by the Boards of Directors of the Association for Applied Psychophysiology (AAPB) and the International Society for Neuronal Regulation (ISNR) (LaVaque et al., 2002).

- A series of white papers have been published, with the sanction of the boards of both AAPB and ISNR, applying the efficacy standards to common disorders.
  - Functional Anorectal Disorders (2004)
  - Attention Deficit Hyperactivity Disorder (2005)
  - Temporomandibular Disorders (2005)
  - Hypertension (2006)

- AAPB/ISNR White papers
  - Urinary Incontinence (2006)
  - Primary Raynaud's Phenomenon (2006)
  - Substance Abuse Disorders (2008)
  - Headache Disorders (2009)

# Clinical Efficacy of HRV Biofeedback

Yucha and Montgomery (2008) evaluated wide variety of biofeedback and neurofeedback applications using these guidelines in *Evidence-Based Practice in Biofeedback and Neurofeedback*.



# Clinical Efficacy of HRV Biofeedback

## **Level 1: Not Empirically Supported**

Supported only by anecdotal reports and/or case studies in non-peer reviewed venues.

# Clinical Efficacy of HRV Biofeedback

## **Level 2: Possibly Efficacious**

At least one study of sufficient statistical power with well identified outcome measures, but lacking randomized assignment to a control condition internal to the study.

# Clinical Efficacy of HRV Biofeedback

## **Level 3: Probably Efficacious**

Multiple observational studies, clinical studies, wait list controlled studies, and within subject and intrasubject replication studies that demonstrate efficacy.

# Clinical Efficacy of HRV Biofeedback

## **Level 4: Efficacious**

In a comparison with a no-treatment control group, alternative treatment group, or sham (placebo) control utilizing randomized assignment, the investigational treatment is shown to be statistically significantly superior.

# Clinical Efficacy of HRV Biofeedback

The studies have been conducted with a population treated for a specific problem, for whom inclusion criteria are delineated in a reliable, operationally defined manner.

# Clinical Efficacy of HRV Biofeedback

The study used valid and clearly specified outcome measures related to the problem being treated.

The data are subjected to appropriate data analysis.

# Clinical Efficacy of HRV Biofeedback

The diagnostic and treatment variables and procedures are clearly defined in a manner that permits replication of the study by independent researchers.

The superiority or equivalence of the investigational treatment has been shown in at least two independent research settings.

# Clinical Efficacy of HRV Biofeedback

Wheat and Larkin (2010) assigned a rating of *probably efficacious* to HRV biofeedback for asthma.

They assigned a rating of *possibly efficacious* to HRV biofeedback for heart disease, heart failure, hypertension, COPD, fibromyalgia, PTSD, and unexplained abdominal pain.

# Clinical Efficacy of HRV Biofeedback

HRV biofeedback is *probably efficacious* for the treatment of:

- asthma <sup>4</sup>

<sup>4</sup> Lehrer et al., 2004

# Clinical Efficacy of HRV Biofeedback

Problem	Study	Design	Outcome
Asthma	Lehrer et al., 2004	Randomized controlled design with placebo and wait-list controls, $N = 94$	reduced asthma medication, improved pulmonary function, fewer asthma symptoms and episodes, improved one full level of asthma severity

# Clinical Efficacy of HRV Biofeedback

HRV biofeedback is *possibly efficacious* in the treatment of:

- heart disease <sup>5</sup>
- heart failure <sup>6</sup>
- hypertension <sup>7</sup>

<sup>5</sup> Cowan et al., 2001

<sup>6</sup> Swanson et al., 2009

<sup>7</sup> Elliot et al., 2004

# Clinical Efficacy of HRV Biofeedback

Problem	Study	Design	Outcome
Heart disease	Cowan et al., 2001	Randomized controlled design comparing HRV biofeedback + CBT vs. standard medical treatment, $N = 129$ ventricular fibrillation or asystole survivors	HRV + CBT reduced mortality 86%
Heart failure	Swanson et al., 2009	Randomized controlled design with quasi-false alpha-theta biofeedback, $N = 29$	increased exercise tolerance for patients with left ventricular ejection fraction (LVEF) $> 30\%$ ; no change in SDNN or quality of life
Hypertension	Elliott et al., 2004	Randomized controlled design comparing practice using a respiration device with conventional medical care, $N = 149$	15 mm Hg systolic reduction for slow breathing vs. 9 mm Hg reduction for control group after 8 weeks

# Clinical Efficacy of HRV Biofeedback

- COPD <sup>8</sup>
- depression <sup>9</sup>
- fibromyalgia <sup>10</sup>

<sup>8</sup> Giardino et al., 2004

<sup>9</sup> Karavidas et al., 2007

<sup>10</sup> Hassett et al., 2007

# Clinical Efficacy of HRV Biofeedback

Problem	Study	Design	Outcome
COPD	Giardino et al., 2004	Multiple case study HRV biofeedback with pulse oximetry biofeedback, $N = 20$	Improved exercise tolerance, gas exchange efficiency, and quality of life
Depression	Karavidas et al., 2007	Multiple case study, $N = 11$ with major depression	50% reduction in depressive symptoms with an effect size comparable to antidepressants
Fibromyalgia	Hassett et al., 2007	Multiple case study, $N = 12$	Improved depression, pain, and sleep

# Clinical Efficacy of HRV Biofeedback

- posttraumatic stress disorder (PTSD) <sup>11-12</sup>
- unexplained abdominal pain <sup>13</sup>

<sup>11</sup> Zucker et al., 2009

<sup>12</sup> Tan et al., 2010

<sup>13</sup> Humphreys & Gevirtz, 2000

# Clinical Efficacy of HRV Biofeedback

Problem	Study	Design	Outcome
PTSD	Zucker et al., 2009	Randomized controlled design comparing HRV biofeedback using a StressEraser + 6 BPM breathing vs. progressive muscle relaxation CD, $N = 38$ residents treated for substance abuse disorders	Both groups reduced PTSD symptoms on the PTSD and Posttraumatic stress Checklist-Civilian version  HRV + 6 BPM breathing reduced BDI compared to PMR
	Tan et al., 2010	Randomized controlled design comparing HRV + TAU vs. TAU, $N = 30$ veterans with PTSD.	HRV + TAU increased HRV and reduced PTSD symptoms on the CAPS and PCL-S, while TAU did not improve on any measure
Unexplained abdominal pain	Humphreys & Gevirtz, 2000	Randomized controlled design comparing HRV biofeedback vs. CBT and family therapy, $N = 64$ children and adolescents	HRV biofeedback alone produced the strongest outcomes

# Clinical Efficacy of HRV Biofeedback

HRV biofeedback is promising, but not empirically supported, in training golfers with performance anxiety. <sup>13, 14</sup>

# Clinical Efficacy of HRV Biofeedback

Problem	Study	Design	Outcome
Sports training: Performance anxiety	Lagos et al., 2008  Lagos et al., 2011	Two single case studies of resonance frequency HRV biofeedback, the second case treated at a virtual reality golf center	Increase in golf performance and HRV (total, LF, and 0.1 Hz); decrease in anxiety, stress, and sensation seeking symptoms after 10 weeks

# Clinical Efficacy of HRV Biofeedback

1. The efficacy of HRV biofeedback for the reviewed applications ranged from *probably efficacious* to *not empirically supported*.
2. The mechanisms by which HRV biofeedback achieves clinical improvement remain to be determined, since physiological change does not always correlate with clinical outcome.

# Clinical Efficacy of HRV Biofeedback

3. We need clinical studies of anxiety and panic disorder.
4. Researchers need to evaluate the importance of resonance frequency training for each clinical application. Would training at 6 breaths per minute yield inferior outcomes?

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