

BIOFEEDBACK

WHAT IS IT?

Biofeedback uses various devices to measure physiological activities, with the intent of improving health and/or performance by learning to consciously control those activities. Clinical biofeedback emerged as a discipline starting in the late 1950s, as increasing numbers of technologies were developed to measure different physical functions. Since that time, it has expanded dramatically.

Any number of body functions can be monitored in biofeedback. Certain biofeedback devices work best for different conditions. For example, measuring muscle tension can help with tension headaches, while neurofeedback works well for attention deficit and hyperactivity disorder (ADHD). Important examples of biofeedback devices include the following:

- Hand temperature (thermal biofeedback therapy)
- Skin conductance (electrodermal response)
- Respiratory rate and chest wall expansion
- Cardiovascular measurements, including heart rate (pulse) and heart rate variability (HRV), which are the beat-to-beat differences noted on a heart monitor
- Electroencephalography (EEG). EEG biofeedback is most typically referred to as neurofeedback.
- Muscle tension (electromyography or EMG)
- Number of steps, measured on a pedometer or other wearable device
- Body weight (even your scale is a biofeedback device of sorts)

HOW IT WORKS

Seeing how these measurements change in real time in response to different emotions, thoughts, or behaviors empowers a person to mentally control physical functions they may not have previously been aware they could control. The end goal is to learn how to change body functions to improve health and/or performance, in a way where ideally the changes will endure without continued use of an instrument.

In a clinical setting, a practitioner might combine biofeedback with other treatments, such as Cognitive Behavioral Therapy (CBT), relaxation techniques or specific physical movements, such as in physical therapy. Biofeedback can provide one element of a multifaceted intervention, enhancing the efficacy of other treatments by drawing a person's

awareness to their own ability to consciously change their body functions. Through biofeedback, individuals can become more aware of their own role in influencing health and disease; it can be quite empowering to patients.

WHEN TO USE IT

Most people appreciate or enjoy the use of biofeedback to obtain physiological information. Consider biofeedback for people who tend to be more technology-minded, reluctant to accept a referral for individual talk psychotherapy or like to see concrete data related to how their mental efforts affect them physically.

One form of biofeedback, HRV, has been the focus of multiple recent systematic reviews and meta-analyses. Benefits have been shown to be reductions in stress, anxiety, PTSD, depression and panic symptoms, anger, improved athletic/artistic performance, sleep and quality of life.[1-4] Several of these reviews studied depression specifically and found both biofeedback and neurofeedback associated with reduced depressive symptomology.[5,6] Significant positive effects were found in various patient profiles using HRV including hypertension, cardiovascular prognosis, inflammatory state, asthma disorders, improved cancer symptoms and well-being, improving pulmonary function during asthma attacks, reduced risk of admissions, emergency room visits, and depression in people with coronary artery disease.[7-10] Even HRV interventions that were phone-based showed improved cardiovagal function.[11]

A systematic review looked at whether HRV could enhance executive functioning (EF) across the lifespan and found that it increased attentional skills, inhibition and working memory.[12] Neurofeedback studies showed that healthy subjects could significantly improve working and episodic memory.[13-15] Several studies suggest that HRV shows promise as a complement to first line substance use treatment especially with mitigating cravings.[16-18]

A recent systematic review found support for EMG biofeedback for improving balance in elderly populations.[19] For those who are visually impaired due to macular disease, biofeedback was able to improve oculomotor abilities including fixation stability and reading speed.[20] Several systematic reviews found benefit to improving swallowing function.[21,22] In patients with Parkinson's Disease and dysphagia, biofeedback had a positive effect on swallowing-related quality of life. Post-stroke functioning using EMG biofeedback has been the focus of several studies. Benefits are noted for stroke rehabilitation and improved gait.[23,24] For use in post-stroke upper limb function studies showed that biofeedback associated with conventional therapy had a small clinical effect.[25]

Recent studies have been especially favorable regarding the potential for biofeedback to treat various types of chronic pain. In Sielski et al. meta-analysis of chronic back pain, the authors found significant small to medium effect size for pain intensity reduction that proved to be stable at 8-month follow-up, as well as decreased disability, muscle tension, depression and improved cognitive coping.[4] Studies of neck pain found EMG biofeedback

to have equal or better effectiveness than control interventions, a moderate effect on short term disability and a small effect on intermediate-term disability.[26,27] Pelvic pain treated with biofeedback-assisted training had a positive effect on pain reduction, overall symptoms relief and quality of life.[28] Biofeedback helps with various types of headaches and has been given a “Grade A” evidence rating by various national organizations.[29] In systematic reviews and meta-analyses, neurofeedback was found to show a moderate improvement in chronic pain, as well as secondary symptoms of depression, anxiety, fatigue, and sleep issues in many of the studies.[30,31]

Several systematic reviews and a meta-analysis in 2021 found that pelvic floor muscle training (PFMT) combined with EMG biofeedback achieved better outcomes than PFMT alone for stress urinary incontinence, pelvic floor dysfunction, including increased pelvic floor muscle strength.[32] This is different from an earlier 2019 review which did not see an additional benefit to EMG biofeedback.[33] The combination of PFMT and EMG biofeedback was also shown to be superior for chronic constipation with dyssynergic defecation, fecal incontinence and low anterior resection syndrome.[34] One study indicates that home biofeedback helps with dyssynergic defecation.[35]

Obsessive-Compulsive Disorder was shown to benefit from neurobiofeedback, even when compared to other treatments.[36] Further studies were needed in order to draw conclusions about the effectiveness of biofeedback in treating irritable bowel syndrome.[38] Electrodermal feedback shows promise with reducing pain and chronic inflammation.[39]

BIOFEEDBACK RESEARCH: A SUMMARY

A rating system for efficacy for biofeedback is used by national and international groups. The disorders most commonly assessed using psychophysiological recording techniques and treated using biofeedback-based interventions which have been shown to be reasonably efficacious through research studies are included in the section below. The ratings are featured on the website of the [Association for Applied Psychophysiology and Biofeedback](#). [40]

Biofeedback

- ADD & ADHD
- Alcoholism
- Anxiety
- Arthritis
- Asthma
- Breathing Problems
- Chest pain
- Chronic pain
- Constipation
- Drug Addiction
- Epilepsy/Seizure
- Fecal Elimination Disorder
- Headaches
- Hypertension
- Hyperventilation
- Incontinence
- Insomnia
- Irritable Bowel Syndrome
- Jaw Area Pain
- Knee Pain
- Low Back Pain
- Non-Cardiac Chest Pain
- Pain
- Phantom Limb Pain
- Posture related pain
- Raynaud's Syndrome
- Stump Pain
- Subluxication of the Patella
- Substance Abuse
- Temporomandibular Disorder
- Traumatic Brain Injury
- TMJ/TMD
- Urinary Elimination Disorders
- Vulvar Vestibulitis

Efficacy is rated on a scale of 1 - 5 with 5 being the best. All disorders listed above have been rated as having at least level 3 evidence supporting their efficacy.

The ratings of efficacy presented are compiled from The Association for Applied Psychophysiology and Biofeedback's list of disorders and treatments as well as Yucha and Gilbert's 2004 book on biofeedback and neurofeedback.[40-42]

WHAT TO WATCH OUT FOR (HARMS)

Biofeedback is very safe, provided that instrumentation is operated correctly, and practitioners are able to set reasonable and safe parameters and goals for a person to aim for when using various measures. There are various products a person can use on their own to do biofeedback as well, but it is best to have support from a trained professional, especially early on.

TIPS FROM YOUR WHOLE HEALTH COLLEAGUES

Most experts would agree that it is best to obtain biofeedback from a qualified health care professional. A variety of qualified professionals can offer biofeedback, ranging from psychologists and physicians to nurses, occupational therapists, physical therapists, and social workers.

Get to know practitioners at your site and in your local community. To find certified biofeedback professionals who practice in a certain part of the country, use the following as resources:

- [Association for Applied Psychophysiology and Biofeedback](https://aapb.org/). <https://aapb.org/>.
- [Biofeedback Certification International Alliance](https://www.bcia.org/). <https://www.bcia.org/>. The BCIA was established to provide certification for biofeedback providers worldwide.
- [International Society for Neuroregulation & Research \(ISNR\)](https://isnr.org/). <https://isnr.org/>. Organization built around neurofeedback.

RESOURCES

VA WHOLE HEALTH WEBSITE AND RELATED SITES

- [Whole Health Veteran Handouts - Biofeedback](https://www.va.gov/WHOLEHEALTH/Veteran-Handouts/docs/Biofeedback-Final508-07-12-2018.pdf). <https://www.va.gov/WHOLEHEALTH/Veteran-Handouts/docs/Biofeedback-Final508-07-12-2018.pdf>
- [Evidence Map of Biofeedback](https://www.hsrd.research.va.gov/for_researchers/cyber_seminars/archives/3631-notes.pdf): https://www.hsrd.research.va.gov/for_researchers/cyber_seminars/archives/3631-notes.pdf
- [Integrative Health Coordinating Center SharePoint on Biofeedback](https://dvagov.sharepoint.com/sites/VHAOPCC/IHCC/SitePages/Biofeedback.aspx). <https://dvagov.sharepoint.com/sites/VHAOPCC/IHCC/SitePages/Biofeedback.aspx>
- CIH Listservs. To be added, contact:

- Biofeedback listerv: VHAOPCC&CTBiofeedback@va.gov
- Other listservs: Lana.Frankenfield@va.gov

OTHER WEBSITES

- Association for Applied Psychophysiology and Biofeedback. <https://aapb.org/>
- Biofeedback Certification International Alliance. <https://www.bcia.org/>
- Heart Math for Troops, Veterans and Families.
<https://www.facebook.com/heartmathtroopsveteransfamilies/>
- International Society for Neuroregulation & Research (ISNR). <https://isnr.org/>

BOOKS

- Evidence-Based Practice in Biofeedback and Neurofeedback (3rd ed), Gabriel Tan, Frederic Shaffer, Randall Lyle, Irene Teo, Randy R. Lyle (2016).
- Biofeedback: A Practitioner's Guide (4th ed), Mark S Schwartz & Frank Andrasik (2017).
- The Clinical Handbook of biofeedback: A step-by Step Guide for Training and Practice with Mindfulness, Inna Z. Khazan (2013).

APPS AND MONITORING SOFTWARE

- **BioZen**. Created by U.S. Department of Defense for Android. Requires sensor.
- **Elite HRV Free application but requires purchase of HRV sensor.**
- **Heart Math (heartmath.com) Application and sensor.**

AUTHOR(S)

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