

Neurofeedback

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How Does Neurofeedback Work?

Neurofeedback uses monitoring devices to provide moment-to-moment feedback information to an individual on the state of their physiological functioning. Neurofeedback training has its foundations in basic and applied neuroscience as well as data-based clinical practice.

NeuroOptimal® is an advanced neuro-technology that offers training to the brain, enabling it to function at its best. It's mathematically designed to communicate directly with your central nervous system. NeuroOptimal® neurofeedback is considered by many to be the best neurofeedback training system in the field. It is completely non-invasive and is designed to work with the brain as a non-linear dynamical system. NeuroOptimal® simply and efficiently provides the brain with information about its own activity in real time. The client's brain then uses this information to organize itself, making it function more efficiently.

Neurofeedback, aka brain training, works as a 'detection and monitoring' system of the changes in cortical patterns within the brain. Brain training provides immediate feedback about the electrical activity of your Central Nervous System (CNS) by providing cues about brain activity that can be undermining optimal brain function. Often after an injury or trauma the brain's electrical activity is out of balance between the two hemispheres or the frequency distribution. Neurofeedback can help get the electrical activity back in balance or homeostasis.

Inconsistency, or abrupt changes in electrical activity in the brain, undermines optimal functioning of the brain. Neurofeedback detects these abrupt changes and informs the brain of these sudden shifts through interruptions in the sound you are listening to. These pauses are a way for the computer system to communicate with your central nervous system to promote more balanced electrical activity. This happens over and over until the natural self-correction becomes your new normal and your brain functions more efficiently, effectively and comfortably. When this happens, you sleep better, can focus more easily and can help your brain recover from head injuries or trauma

Definition of Neurofeedback

Neurofeedback trains the brain to learn information, modify and control cortical electrical impulses (activity) through real-time auditory or visual feedback. The characteristic that distinguishes Neurofeedback from other biofeedback is a focus on the central nervous system and the brain. Neurofeedback training has its foundations in basic and applied neuroscience as well as data-based clinical practice.

During training, sensors are placed on the scalp and ears and then connected to sensitive electronics and computer software that detect, amplify, and record specific brain activity. Resulting information is fed back to the client instantaneously through sound or visualizations. Based on this feedback, and as the brain learns, changes in brain patterns occur and are associated with positive changes in physical, emotional, and cognitive states.

Often the client is not consciously aware of the mechanisms by which such changes are occurring. Clients are also able to access these states and positive changes outside the feedback session. Repetition is required to achieve lasting results.

Neurofeedback training does not involve either surgery or medication and is not painful. When provided by a certified professional with appropriate training, generally clients do not experience negative side-effects. Neurofeedback modulates the brain functioning at the level of the neuronal electrical dynamics of excitation and inhibition.

Neurofeedback training increases flexibility and self-regulation by teaching the brain to optimize and modulate excitatory and inhibitory patterns of specific neuronal assemblies and pathways. This is accomplished using the details provided by the sensors and the feedback algorithms or protocols used in the training.

Research

This literature documents the efficacy of Neurofeedback for numerous conditions. Research demonstrates that neurofeedback can be an effective intervention for ADHD, Epilepsy, Autism, mood disorders, anxiety disorders, OCD, PTSD, learning disorders, headaches, insomnia, TBI and other pain disorders. The research literature is substantial as can be found in the **ISNR Comprehensive Bibliography** (www.isnr.org/resources), ISNR's official peer-reviewed scientific journal **NeuroRegulation** (www.neuroregulation.org), and the archives of ISNR's **Journal of Neurotherapy** (www.isnr-jnt.org). For example, 1,447 peer reviewed journal articles are cited in the National Library of Medicine when using the search terms: 'EEG Biofeedback'. The number of randomized controlled trials showing efficacy are being published with growing frequency. For example, this study by Bessel van der Kolk, M.D. and colleagues was published in December 2016:

van der Kolk, B. A., Hodgdon, H., Gapen, M., Musicaro, R., Suvak, M. K., Hamlin, E., & Spinazzola, J. (2016) A Randomized Controlled Study of Neurofeedback for Chronic PTSD. *PLoS ONE* 11(12): e0166752.
doi:10.1371/journal.pone.0166752 <https://www.ncbi.nlm.nih.gov/pubmed/27992435>

Research Articles

Many of the studies now have links to read either the abstract or some even full text online at no charge. I have provided a small list of some excellent references and recommend books for further interest.

Ayers, M. E. (1991). A controlled study of EEG neurofeedback training and clinical psychotherapy for right hemispheric closed head injury. Paper presented at the National Head Injury Foundation, Los Angeles, 1991.

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Hoffman, D. A., Stockdale, S., & Van Egren, L. (1996a). Symptom changes in the treatment of mild traumatic brain injury using EEG neurofeedback [Abstract]. *Clinical Electroencephalography*, 27(3), 164.

Thornton, K. (2000). Improvement/rehabilitation of memory functioning with neurotherapy/QEEG biofeedback. *Journal of Head Trauma Rehabilitation*, 15(6), 1285-1296.

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Bachers, A. (2004). Neurofeedback with cerebral palsy and mental retardation. *Journal of Neurotherapy*, 8(2), 95–96.

Thornton, K. E., & Carmody, D. P. (2005). Electroencephalogram biofeedback for reading disability and traumatic brain injury. *Child & Adolescent Psychiatric Clinics of North America*, 14(1), 137–162.

Nelson, D., & Esty, M. (2012). Neurotherapy of traumatic brain injury/posttraumatic stress symptoms in oef/oif veterans. *The Journal of Neuropsychiatry and Clinical Neurosciences*, 24(2), 237

Arns, M., de Ridder, S., Strehl, U., Breteler, M., & Coenen, A. (2009). Efficacy of neurofeedback treatment in ADHD: The effects on inattention, impulsivity and hyperactivity: A meta-analysis. *Clinical EEG and Neuroscience*, 40(3), 180-189.

Micoulaud-Franchi, J-A., Geoffroy, P. A., Fond, G., Lopez, R., Bioulac, S., Philip, P. (2014). EEG neurofeedback treatments in children with ADHD: An update meta-analysis of randomized controlled trials. *Frontiers in Human Neuroscience*, 8(906), 1-7.

Steiner, N. J., Frenette, E. C., Rene K. M., Brennan, R. T., & Perrin, E. C. (2014). In-school neurofeedback training for ADHD: Sustained improvements from a randomized control trial. *Pediatrics*, 133(3), 483-492. doi: 10.1542/peds.2013-2059.

Recommended Books

Robbins, J. (2000). *A Symphony in the Brain*. New York: Atlantic Monthly Press.

Thompson, M., & Thompson, L. (2003). *The Neurofeedback Book*. Wheat Ridge, CO: Association for Applied Psychophysiology & Biofeedback.

Larsen, S. (2006). *The Healing Power of Neurofeedback*. Rochester, VT: Healing Arts Press.

Ayers, M., & Montgomery, P. (2007). *Whispers from the Brain*. Beverly Hills: AyersMont.