Biofeedback & Neurotherapy

In Clinical Practice
What is Neuropsychotherapy?

Neuropsychotherapy is an integrative approach to therapy that takes into account the dynamic interplay between the mind, body, social interaction, and the environment on a person’s well being, with a focus on neuroscientific research. By understanding how the brain works, neuropsychotherapists use specific techniques, such as biofeedback and neurotherapy, to help improve brain functioning and overall well being. Understanding how specific mental illnesses impact the brain is utilized and is incorporated into treatment.

Quick Overview of Biofeedback & Neurotherapy:

*Biofeedback*: Includes medical devices that measure aspects of your physiology to help understand overall health and the degree to which you are experiencing stress and anxiety. Primarily used to teach deep breathing techniques to help lower anxiety and stabilize your mood.

*Audio-Visual Entrainment*: Form of neurotherapy that uses special glasses and earphones to help guide your brainwave activity into a deeply relaxed and meditative state. Although this is primarily used to help alleviate stress and anxiety and treat addiction, clinical studies have shown that it helps to improve ADHD and behavioral problems, as well as improve learning and memory, in children and adolescents.

*Cranio-Electro Stimulation*: Form of neurotherapy that involves placing ear clips on each earlobe. These ear clips emit a small electrical pulse that travels across your brain. Studies have shown that 15-20 minutes of use helps boost certain neurotransmitters to improve mood and decrease stress and anxiety.

*Transcranial-Direct Current Stimulation*: Form of neurotherapy brain stimulation that involves attaching small pads to specific locations on your scalp. This is mainly used to treat low mood, depression, and addiction.
Biofeedback

Biofeedback technology is frequently used by neuropsychotherapists to help clients learn how one’s physiology is related to their mental health. This is primarily achieved through the use of devices that monitor heart rate variability (HRV). Heart rate variability measures the variations between heartbeats and is an excellent indicator of stress, anxiety, and overall health. A higher HRV indicates good health and that you are calm, relaxed, and taking slow deep breaths. A low HRV indicates poorer health and is present when you are under significant stress and your breath is shallow and erratic. The following devices are frequently used to monitor HRV:

iRELAX: This device by Devon Medical Products fits on your finger to monitor HRV. Through an interactive LCD display, the user is taught how to breathe properly and improve their HRV.

Spire Mind & Body Tracker: This is a small stone that clips onto your belt or the inside of your bra. It has all the same functions that other health monitors have, such as the Fitbit and Apple Watch; however, it also tracks your HRV. When paired with an iPhone it will send you a text alert when you become stressed (as indicated by a low HRV). It can also tell you when you are in a “calm streak” or a “focused streak.”
**Stress Thermometer:** This is a basic device that reads your skin temperature. When you are stressed or anxious, your skin temperature tends to decrease. This is because your heart is beating faster and the blood in your body is taken away from the extremities and kept closer to your heart. As you become more relaxed, your skin temperature begins to rise as your blood recirculates back to your extremities. This device shows you that you have control over your physiology; if you think about and visualize distressing topics, you will see the skin temperature of your fingers begin to drop several degrees. When you visualize happy and positive thoughts that are less stressful, your skin temperature will begin to rise!

**EZ-Air Light:** This device helps clients learn how to breathe properly. As stated, deep breathing improves HRV and decreases stress and anxiety. By synching your breathe with the timed increases and decreases of the light you will be able to achieve 5.5 breaths per minute. Most people typically take 15-20 breaths per minute, which decreases your HRV and contributes towards increased stress and anxiety.
**Light Therapy**: 20-30 minutes exposure to light therapy has been shown to help improve mood and decrease symptoms associated with depression and Seasonal Affective Disorder (SAD). Light therapy can be used on a daily basis and is most effective at an intensity of 10,000 lux.
Neurotherapy

Neurotherapy equipment is different from biofeedback in that it focuses directly on altering brain activity.

Audio-Visual Entrainment (AVE): In 2005, the Dalai Lama (Tenzin Gyatso) spoke at the 35th annual Society for Neuroscience Conference in Washington, D.C. Since then, the Dalai Lama has supported the neuroscientific study of meditative practice. Specifically, many researchers have conducted electroencephalographic (EEG) and functional magnetic resonance imaging (fMRI) studies on Tibetan Buddhist monks experienced in meditative practice (ranging from 10,000 to 50,000 hours of sustained practice). From these studies we have learned a great deal about how the brain functions when in a deep meditative state. The major goal of AVE therapy is to help guide the brain into that deep meditative state so that you can experience a sense of tranquility and calmness. Sessions generally last about 20 minutes and are primarily used to help reduce stress and anxiety, alleviate symptoms of addiction, as well as improve mood and general cognitive functioning. Four things occur when you undergo AVE therapy:

1) Your EEG activity is being altered – AVE programs are designed to help guide your brainwave activity into a deep meditative state so that both your mind and body “let go” and relax.

2) Your limbic system is being stabilized – Your body is calmed, your breathing becomes rhythmic, your hands warm and your muscles relax.

3) A number of neurotransmitters are being produced – AVE boosts brain levels of serotonin, and norepinephrine to improve overall well being.

4) Your cerebral blood flow is being increased – Decreased CBF is associated with anxiety, depression, attentional problems, behavior disorders and impaired cognitive function.
Cranio-electro stimulation (CES) is a non-invasive brain stimulation technique that applies a small pulsed electric current across a person’s head. In order to achieve this, ear clips are attached to both ears, which each emit a low frequency electrical current. This small electrical stimulus stimulates endorphins, serotonin and norepinephrine neurotransmitter production. The ear clips are comfortable and often forgotten about a few minutes after treatment begins. The electrical pulse is set at a subthreshold level that is typically not felt by the client. During treatment the client controls the intensity and can increase or decrease the stimulus to the desired level. This method has proven to be both safe and effective for improving mood and decreasing stress and anxiety.

Transcranial Direct Current Stimulation (tDCS) has been used for over 100 years and is a non-invasive, painless brain stimulation treatment that uses direct electrical currents to stimulate specific parts of the brain. tDCS was initially used in stroke patients to help regain limb movement by stimulating certain areas of the brain; however, it is now used for a variety of mental health issues. A constant, low intensity current is passed through two electrodes placed on the head which modulates neuronal activity. Research has demonstrated that it can help improve symptoms associated with neuropsychiatric conditions such as depression, anxiety, addiction Parkinson’s disease, and chronic pain.

**Risks and Side Effects:** Those with any history of seizure activity should avoid using the neurotherapy equipment, as the light exposure in AVE and/or the electrical current from CES or tDCS might cause seizure activity in those with a predisposition. Those with implanted electrical devices (e.g., pacemaker), should not use CES or tDCS. General side effects for the neurotherapy equipment include minor headaches, which are rare and typically cease within several minutes, and minor skin irritation when using CES and/or tDCS. A brief sense of “dizziness” may also be experienced during the first time you use CES. All of the technologies mentioned have been studied extensively and are considered safe and effective.
SAMPLE OF RESEARCH STUDIES

Audio-Visual Entrainment


Audio-Visual Entrainment: History and Physiological Mechanisms - as published in the Association for Applied Psychophysiology and Biofeedback (AAPB) publication, "Biofeedback Magazine" Volume 31, Number 2 (Summer, 2003)

Audio-Visual Entrainment: Dental Studies - as published in the Association for Applied Psychophysiology and Biofeedback (AAPB) publication, "Biofeedback Magazine" Volume 31, Number 3 (Fall, 2003)


**Cranio-Electro Stimulation**

Kavirajan HC, Lueck K, Chuang K (2014). "Alternating current cranial electrotherapy stimulation (CES) for depression". Cochrane Database Syst Rev7:


**Transcranial Direct Current Stimulation**


