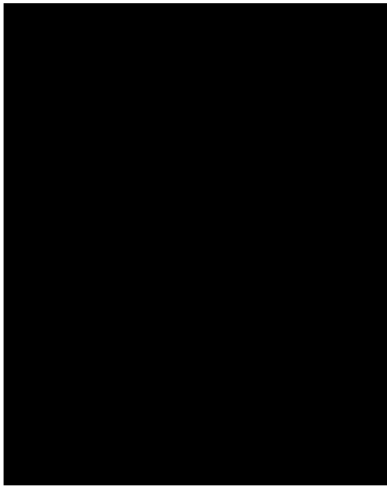


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An Introduction To  
**Biofeedback Technology**  
and the Medical Science of  
**Neurotherapy**



**Thought Waves**  
**Biofeedback Equipment and Training**

Compiled and Designed by Kjell Sheldon Neilson

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# PART 1

# What is Biofeedback?

*Biofeedback is a learning process in which people are taught to improve their health and performance by observing signals generated by their own bodies. It is scientifically based and validated by research studies and clinical practice.*

## Overview

The word "biofeedback" was coined to describe laboratory procedures that trained research subjects to alter brain activity, blood pressure, muscle tension, heart rate and other physiological responses often thought to have been beyond voluntary control. Biofeedback-assisted physical changes are accompanied by feelings of relaxation, improved motor control, and often by relief of dysfunctional physical and/or emotional symptoms.

Biofeedback is non-invasive. When used clinically, a therapist attaches sensors or electrodes to the body and these sensors provide a variety of readings--feedback--that is displayed on equipment, usually a meter or a computer, for the patient to see. One commonly used device called the electromyogram (EMG), for example, picks up electrical signals from the muscles. It translates the signals into a form that people can detect, such as a flashing light and/or a beeper, every time muscles become tense. If one wants to relax tense muscles, one must try to slow down or eliminate the flashing or beeping. People learn to associate sensations from the muscle with actual levels of tension and develop a new, healthy habit of keeping muscles only as tense as is necessary for as long as necessary. After treatment, individuals are then able to repeat this response at will without being attached to the sensors.

Other biological functions, which are commonly measured and used in these ways, are skin temperature, heart rate (EKG, BVP), sweat gland activity (GSR, SC), respiration, and brainwave activity (EEG).

Clinicians rely on electronic biofeedback systems in somewhat the same way that you would rely on a thermometer. Their systems can detect a person's internal bodily functions with far greater sensitivity and accuracy than a person can alone. With this information, patients can learn to make changes so subtle that at first they may not be consciously perceived. This information may be valuable, as both patients and therapists can use it to gauge and direct the progress of treatment.

Studies have shown that we have more control over supposedly involuntary bodily functions than we ever thought possible.

Researchers have proved that many individuals can alter their involuntary responses by being "fed back" information either visually or audibly about what is going on in their bodies. As a result, biofeedback can train individuals with techniques for living a healthier life overall - whether one has a medical condition or not



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## **1. Definition**

Biofeedback, or applied psychophysiological feedback, is a patient-guided treatment that teaches an individual to control muscle tension, pain, body temperature, brain waves, and other bodily functions and processes through relaxation, visualization, and other cognitive control techniques. The name biofeedback refers to the biological signals that are fed back, or returned, to the patient in order for the patient to develop techniques for manipulating them.

## **2. Origins**

In 1961, Neal Miller, an experimental psychologist, suggested that autonomic nervous system responses (for instance, heart rate, blood pressure, gastrointestinal activity, regional blood flow) could be under voluntary control. As a result of his experiments, he showed that such autonomic processes were controllable. This work led to the creation of biofeedback therapy. Other researchers expanded Miller's work.

Thereafter, research performed in the 1970s by UCLA researcher Dr. Barry Sterman established that both cats and monkeys could be trained to control their brain wave patterns. Sterman then used his research techniques on human patients with epilepsy, where he was able to reduce seizures by 60% with the use of biofeedback techniques. Throughout the 1970s, other researchers published reports of their use of biofeedback in the treatment of cardiac arrhythmias, headaches, Raynaud's syndrome, and as a tool for teaching deep relaxation. Since the early work of Miller and Sterman, biofeedback has developed into a front-line behavioral treatment for an even wider range of disorders and symptoms.

During biofeedback, special sensors are placed on the body. These sensors measure the bodily function that is causing the patient problem symptoms, such as heart rate, blood pressure, muscle tension (EMG or electromyographic feedback), brain waves (EEG or electroencephalographic feedback), respiration, and body temperature (thermal feedback), and translates the information into a visual and/or audible readout, such as a paper tracing, a light display, or a series of beeps.

While the patient views the instantaneous feedback from the biofeedback monitors, he or she begins to recognize what thoughts, fears, and mental images influence his or her physical reactions. By monitoring this relationship between mind and body, the patient can then use these same thoughts and mental images as subtle cues, as these act as reminders to become deeply relaxed, instead of anxious. These reminders also work to manipulate heart rate, brain wave patterns, body temperature, and other bodily functions. This is achieved through relaxation exercises, mental imagery, and other cognitive therapy techniques.



As the biofeedback response takes place, patients can actually see or hear the results of their efforts instantly through the sensor readout on the biofeedback equipment. Once these techniques are learned and the patient is able to recognize the state of relaxation or visualization necessary to alleviate symptoms, the biofeedback equipment itself is no longer needed. The patient then has a powerful, portable, and self-administered treatment tool to deal with problem symptoms.

Biofeedback that specializes in reading and altering brain waves is sometimes called *neurofeedback*. The brain produces four distinct types of brain waves-delta, theta, alpha, and beta-that all operate at a different frequency. Delta, the slowest frequency wave, is the brain wave pattern associated with sleep. Beta waves, which occur in a normal, waking state, can range from 12-35 Hz. Problems begin to develop when beta wave averages fall in the low end (under arousal) or the high end (over arousal) of that spectrum. Under arousal might be present in conditions such as depression or attention-deficit disorder, and over arousal may be indicative of an anxiety disorder, obsessive-compulsive disorder, or excessive stress. Beta wave neurofeedback focuses on normalizing that beta wave pattern to an optimum value of around 14 Hz. A second type of neurofeedback, alpha-theta, focuses on developing the more relaxing alpha (8-13 Hz) and theta waves (4-9 Hz) that are usually associated with deep, meditative states, and has been used with some success in substance abuse treatment. Through brain wave manipulation, neurofeedback can be useful in treating a variety of disorders that are suspected or proven to impact brain wave patterns, such as epilepsy, attention-deficit disorder, migraine headaches, anxiety, depression, traumatic brain injury, and sleep disorders. The equipment used for neurofeedback usually uses a monitor as an output device. The monitor displays specific patterns that the patient attempts to change by producing the appropriate type of brain wave. Or, the monitor may reward the patient for producing the appropriate brain wave by producing a positive reinforcer, or reward. For example, children may be rewarded with a series of successful moves in a displayed video game.

Depending on the type of biofeedback, individuals may need up to 30 sessions with a trained professional to learn the techniques required to control their symptoms on a long-term basis. Therapists usually recommend that their patients practice both biofeedback and relaxation techniques on their own at home.

### **3. Research and General Acceptance**

Preliminary research published in late 1999 indicated that neurofeedback might be a promising new tool in the treatment of schizophrenia. Researchers reported that schizophrenic patients had used neurofeedback to simulate brain wave patterns that antipsychotic medications produce in the brain. Further research is needed to determine what impact this may have on treatment for schizophrenia.

The use of biofeedback techniques to treat an array of disorders has been extensively described in the medical literature. Controlled studies for some applications are limited, such as for the treatment of menopausal symptoms and premenstrual disorder (PMS). In recent years, neurofeedback has been used successfully with Attention Deficit Disorders in school children as well as adults with concentration problems.



Extensive research has been done on the efficacy of EEG neurofeedback for ADD/ADHD, most notably by Dr. Joel Lubar. There are several good resource websites for reading-up on the latest research in neurofeedback and biofeedback. The Association for Applied Psychophysiology and Biofeedback ([www.aapb.org](http://www.aapb.org)), the Biofeedback Foundation of Europe ([www.bfe.org](http://www.bfe.org)) are two of the best.

Biofeedback has been researched in the areas of Pain Management, Migraine and Tension Headaches, Depression and Anxiety Disorders, PTSD, Sleep Disorders, Brain Injury and Stroke, Chronic Fatigue and Fibromyalgia, Autism, Asberger's, Tourettes, and Epilepsy.

The efficacy of neurofeedback is enhanced by other adjunct therapies such as: Cognitive-Behavioural therapy, relaxation techniques, guided imagery and body-work techniques.

Neurotherapy, as a self-empowering educational tool has often been the therapy of choice by parents and teachers of young children who are looking for an alternative to medication to assist with concentration problems.

#### **4. Applications**

This specialized type of training allows people to gain control over physiological reactions that are ordinarily unconscious and automatic. Malfunctions in these automatic responses contribute to a wide variety of medical problems. In study after study, biofeedback has shown the ability to help bring such counterproductive reactions back into line, providing significant relief for many of the people who try it.

Although it's not a sure cure, biofeedback helps many people with chronic pain, including the pain of arthritis, muscle spasms, and headache (both migraine and tension headache). It can reduce tension and anxiety, combat chronic insomnia and fatigue, alleviate depression, reduce hyperactivity and attention deficit disorder, and even help overcome alcoholism and drug addiction. Some people have found it helpful for controlling high blood pressure or an abnormal heart rate. It's also useful for retraining, reconditioning, and strengthening muscles after an accident or surgery, restoring loss of control due to pain or nerve damage, and overcoming urinary (or bowel) incontinence.

For asthmatics, biofeedback offers the possibility of controlling bronchial spasms and reducing the severity of attacks. Many victims of Raynaud's disease (periodic loss of circulation in the fingers) have been able to rectify the problem through biofeedback. The technique has helped others deal with digestive disorders such as ulcers, irritable bowel syndrome, acidity, dysfunction of the oesophagus, and difficulty swallowing.

Biofeedback is under study as a potential aid in the treatment of a number of other ailments as well, although results are more mixed. It may help relax the muscles in temporomandibular joint syndrome (TMJ). It appears to reduce the severity and frequency of seizures in some (though not all) epileptics. It can help ease the symptoms of chronic fatigue syndrome. It has even been tried as a remedy for chronic constipation, motion sickness, and the uncontrollable tics and compulsions of Tourette's syndrome.

### **Basic Summary of Applications:**

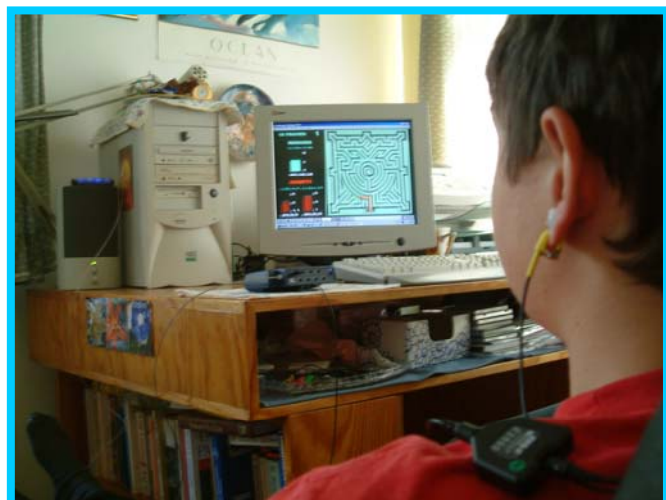
- Migraine headaches.
- Tension headaches.
- Other types of chronic pain.
- Disorders of the digestive system.
- Incontinence.
- High blood pressure.
- Cardiac arrhythmias (abnormalities in the rhythm of the heartbeat).
- ADD/ADHD (Attention Deficit Hyperactive Disorder).
- Raynaud's disease (a circulatory disorder that causes uncomfortably cold hands),
- Epilepsy.
- Paralysis, spinal cord injury and other movement disorders.
- Tourette's Syndrome.
- TMJ (temporomandibular joint syndrome).
- Chronic fatigue syndrome.
- Asthma.
- Alcoholism and drug addiction.
- Digestive disorders such as ulcers, irritable bowel syndrome, acidity, dysfunction of the oesophagus, and difficulty swallowing.
- Chronic constipation.
- Motion sickness

## **5. How the Treatments Are Done**

Biofeedback is not a passive treatment. It requires intensive participation as the client learns to control such normally involuntary ("autonomic") functions as heart rate, blood pressure, brain waves, skin temperature, muscle tension, breathing, and digestion.

At the client's first session, the client might be asked a few questions about his own health and that of family members. The biofeedback therapist will then apply sensors to various points on the client's body. The location depends on the problem that needs treatment. If the client has migraines, sleep problems or mood disorders, for example, the electrodes are often attached to his scalp. To treat heart problems or muscle tension, the electrodes will be placed on the client's chest, or on the skin covering the problematic muscle. Other possible sites include the hands, fingers, shoulder, back and jaw.

The sensors are connected to a computer with appropriate software, or another piece of monitoring equipment that provides instant feedback to the client on the function he or she is trying to control. The tension in a particular set of involuntary muscles or circulation to a specific part of the body may be focused upon. Some biofeedback machines signal changes graphically on a computer display. Other monitors beep, buzz, or blink to indicate the strength or level of the function targeted.





The therapist will teach the client mental or physical exercises that can help affect the dysfunction that's causing a problem. One can easily gauge one's success by noting any changes in the intensity, volume, or speed of the signals from the machine. Gradually, the client will learn to associate successful thoughts and actions with the desired change in their involuntary responses.

Once the client has thoroughly learned an effective pattern of actions, they will be able to assert control without the aid of the feedback device.

Among the feedback instruments you're most likely to encounter are the following:

**Electroencephalographs (EEGs)** measure brain-wave activity. Conditions that may benefit from training on these machines include attention deficit/hyperactivity disorder, tooth grinding, head injuries, and depression (including bipolar depression and seasonal affective disorder).

**Electromyographs (EMGs)** measure muscle tension. Therapists use them to relieve muscle stiffness, treat incontinence, and recondition injured muscles.

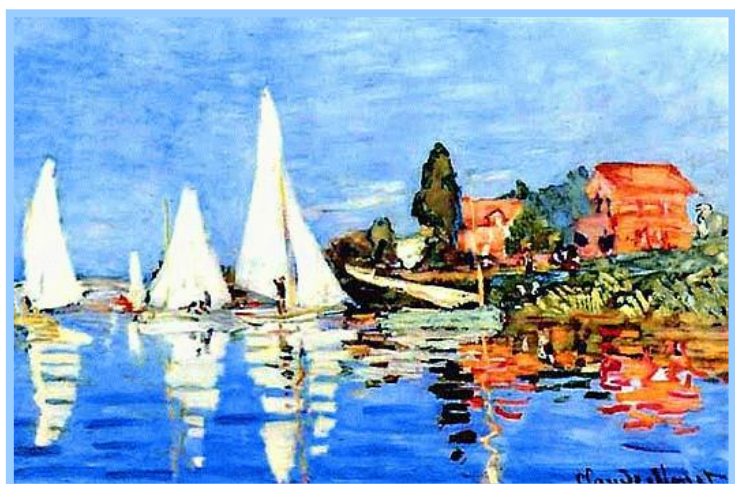
**Skin Temperature Gauges** show changes in the amount of heat given off by the skin, a measurement that indicates any change in blood flow. These gauges are used in the treatment of Raynaud's disease, high blood pressure, anxiety, and migraines.

**Galvanic Skin Response Sensors (GSRs)** use the amount of sweat you produce under stress to measure the conductivity of your skin. They are often used to reduce anxiety.

**Electrocardiographs (ECGs)** monitor the heart rate and may be useful in relieving an overly rapid heartbeat and controlling high blood pressure.

**Respiration Feedback Devices** concentrate on the rate, rhythm, and type of breathing to help lessen symptoms of asthma, anxiety, and hyperventilation and promote relaxation.

*Along with biofeedback training, the therapist may also give instruction in deep breathing, meditation, visualization, and muscle relaxation--all of which may aid in relieving stress-related symptoms.*



**Treatment Time:** Sessions usually last between 30 minutes and 1 hour.

**Treatment Frequency:** In most cases, people can learn to raise or lower their heart rate, relax specific muscles, lower blood pressure, and control other functions in 8 to

10 sessions. Some problems, such as attention deficit/hyperactivity disorder, take longer--sometimes up to 40 sessions. Depending on the severity of the problem and the technique used, therapists suggest you attend 1 to 5 sessions per week.

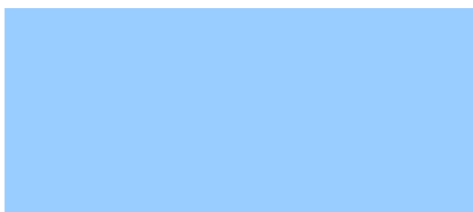
## **Preparations**

Before initiating biofeedback treatment, the therapist and patient will have an initial consultation to record the patients medical history and treatment background and discuss goals for therapy.

Before a neurofeedback session, an EEG is taken from the patient to determine his or her baseline brainwave pattern.

Biofeedback typically is performed in a quiet and relaxed atmosphere with comfortable seating for the patient. Depending on the type and goals of biofeedback being performed, one or more sensors will be attached to the patient's body with conductive gel and/or adhesives. These may include:

- Electroencephalography (EEG) sensors. These electrodes are applied to the scalp to measure the electrical activity of the brain, or brain waves.
- Electromyography (EMG) sensors. EMG sensors measure electrical activity in the muscles, specifically muscle tension. In treating TMJ or bruxism, these sensors would be placed along the muscles of the jaw. Monitoring electrical energy in other muscle groups might treat chronic pain.
- Galvanic skin response (GSR) sensors. These are electrodes placed on the fingers that monitor perspiration, or sweat gland activity. The term “skin conductance” is used to monitor levels of anxiety.
- Temperature sensors. Temperature, or thermal, sensors measure body temperature and the changes that result from therapeutic interventions.
- Blood-volume Pulse (BVP) monitors changes in blood flow to the extremities.
- Heart rate sensors. A pulse monitor placed on the fingertip can monitor pulse rate. ECG sensors are used above the area of the heart, on the chest.
- Respiratory sensors. Abdominal and thoracic breathing sensors assist the client in relaxation therapy and deep breathing exercises. Respiratory sensors sometimes monitor oxygen intake and carbon dioxide output.



Individuals who use a pacemaker or other implantable electrical devices should inform their biofeedback therapist before starting treatments, as certain types of biofeedback sensors have the potential to interfere with these devices.

Biofeedback may not be suitable for some patients. Patients must be willing to take a very active role in the treatment process. And because biofeedback focuses strictly on behavioural change, those patients who wish to gain insight into their symptoms by examining their past might be better served by psychodynamic therapy.

Patients with specific pain symptoms of unknown origin should undergo a thorough medical examination before starting biofeedback treatments to rule out any serious underlying disease. Once a diagnosis has been made, biofeedback can be used concurrently with conventional treatment.

Biofeedback may only be one component of a comprehensive treatment plan. For illnesses and symptoms that are manifested from an organic disease process, such as cancer or diabetes, biofeedback should be an adjunct to (complementary to), and not a replacement for, conventional medical treatment.

## **7. Side effects**

There are no known side effects to properly administered biofeedback or neurofeedback sessions.

## **8. What the Treatment Hopes to Accomplish**

Biofeedback is a "mind over matter" form of therapy that has only recently begun to filter into mainstream medicine. Although ancient Greek, Chinese, and Indian healers were convinced that the mind could influence the body, either causing illness or curing disease, the concept fell into disrepute as Western medicine began to discover the infectious agents and chemical malfunctions that lie at the root of so many familiar ailments. It was only when modern instrumentation made it possible to measure subtle changes in unconscious physical reactions that medicine once more turned its attention to the mind-body connection.

Although biofeedback is able to remedy certain ailments through disciplined mental effort, it differs from other forms of mind-body therapy such as meditation and yoga. It does not rely on maintenance of some sort of theoretical balance or harmony in order to achieve its effects. Instead, it seeks control over specific, measurable physiological reactions that have somehow gone awry. As such, biofeedback can prove especially useful for any disorder caused or aggravated by involuntary muscular tension or tightening.

## PART 2 What Is Neurotherapy?

*Neurotherapy is direct training of brain function, by which the brain learns to function more efficiently.*

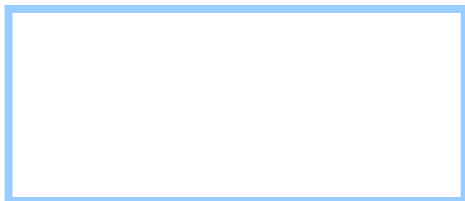
### Overview

Neurotherapy is also called "EEG Biofeedback" and "Neurofeedback." It involves helping a person learn how to modify his or her brainwave activity to improve attention, reduce impulsivity, and to control hyperactive behaviours. It is a painless, non-invasive treatment approach that allows the individual to gain information about his or her brainwave activity and use that information to produce changes in brainwave activity. In Neurotherapy, individuals are trained through the use of computerized biofeedback equipment to change their brainwave activity.



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## 1. Introduction to Neurotherapy

Neurofeedback is direct training of brain function, by which the brain learns to function more efficiently. We observe the brain in action from moment to moment. We show that information back to the person and we reward the brain for changing its own activity to more appropriate patterns. This is a gradual learning process. It applies to any aspect of brain function that we can measure.

Neurofeedback is also called EEG biofeedback, because it is based on electrical brain activity, the electroencephalogram, or EEG. Neurofeedback is training in self-regulation. It is simply biofeedback applied to the brain directly. Self-regulation is a necessary part of good brain function. Self-regulation training allows the central nervous system to function better.

Neurofeedback addresses problems of brain dysregulation. The types of dysregulation are numerous, including the anxiety-depression spectrum, attention deficits, behaviour disorders, various sleep disorders, headaches, migraines, PMS, and emotional disturbances. It is also useful for organic brain conditions such as seizures, the autism spectrum, and cerebral palsy.

Indeed, with neurofeedback the symptoms may be entirely suppressed. A person with diagnosed Attention Deficit Disorder may be able to train the brain to pay attention. A person coming in with migraines may no longer have them. (However, that person may still have a greater "vulnerability" to migraines than the average person on the street.) A person with epilepsy may no longer have seizures. (Although that person still retains a vulnerability to seizures.) A child with severe rages and temper tantrums may not express them again.

Electrodes are applied to the scalp to listen in on brainwave activity. The signal is processed by the computer, and information about certain key brainwave frequencies is made known. The ebb and flow of this activity is directed to the client, who attempts to change the activity level. Some frequencies are promoted, while others are diminished. This information is presented to the client in the form of a video game. The person is effectively playing the video game with his or her brain. Eventually the brainwave activity is re-trained back toward more desirable patterns. The frequencies targeted, and the specific locations on the scalp where we listen in on the brain, are specific to the conditions we are trying to address, and specific to the individual.

Over the years, certain training protocols have been developed that are helpful with certain classes of problems such as attention, anxiety and depression, seizures and migraines, as well as cognitive function. There are a number of assessment tools we use to help us decide which protocols to use. These are simple neurodiagnostic and neuropsychological tests.



## 2. How Is Neurotherapy Performed?

Brainwave activity is measured with an electroencephalograph (EEG). The EEG Biofeedback equipment is connected to the individual with sensors that are placed on the scalp and ears. The sensors are safe, do not prick the skin, and are painless. After adequate connection to the scalp and ears are made, the individual's brainwave activity can be observed on a computer monitor.

Neurotherapy practitioners who administer Neurofeedback will help the client learn to change his or her brainwave activity. The client does not need to know a lot about Neurotherapy or biofeedback to be effectively trained. Clients are taught to play computerized games using their brainwave activity. Changes in client brainwave activity are fed back to the individual through visual and/or auditory information by the computer. One example is a game where clients move a figure through a maze. The figure does not move because of the client's motor activity (e.g., pushing a button or moving a stick). Instead, the figure moves whenever the client produces specific brainwave patterns. When desired levels of brainwave activity occur, the individual is reinforced, because the figure moves through the maze. By this method, clients learn to change brainwave activity. Clients also practice maintaining learned brainwave states when engaged in school or work related tasks (e.g. reading, writing). This will help them use what they learned from neurofeedback in their daily activities.



### **3. What is Attention-Deficit Disorder?**

Attention-Deficit Disorder is a disorder that can be separated into three types:

- 1) Attention-Deficit/Hyperactivity Disorder, Combined Type (includes both symptoms of inattention and hyperactivity-impulsivity),
- 2) Predominantly Inattentive Type (sometimes referred to as ADD) and
- 3) Predominantly Hyperactive-Impulsive Type (sometimes referred to as ADHD or Hyperactivity Disorder).

Dr Daniel Amen has described six separate types of "Attention-Deficit". The Diagnostic and Statistical Manual (DSM) is often the main reference point, which uses the three types described above.

Individuals with Attention-Deficit/Hyperactivity Disorder, Combined Type have six or more symptoms of inattention and six or more symptoms of hyperactivity-impulsivity that have been present for six or more months.

Individuals with Attention-Deficit Disorder, Predominantly Inattentive Type (ADD) exhibit six or more symptoms of inattention and less than six symptoms of hyperactivity-impulsivity. They usually exhibit some of the following symptoms: inattention, distractibility, disorganization, daydreaming, lack of foresight, carelessness, forgetfulness, lack of motivation, lack of persistence, and procrastination.

Individuals with Attention-Deficit Disorder, Predominantly Hyperactive-Impulsive Type (ADHD) usually exhibit six or more symptoms of hyperactivity-impulsivity and less than six symptoms of inattention. They usually exhibit some of the following symptoms: hyperactivity, fidgeting behaviour, restlessness, excessive talking, inappropriate running and climbing, often "on the go," can't wait turn, interrupt others, and impulsive.

Many individuals display symptoms that can be included under any of the three types of attention-deficit disorder. Individuals with an Attention-Deficit Disorder, e.g. ADD or ADHD often have significant difficulties with learning, concentration, school or job achievement, behaviour control, social relationships, and self-esteem. Further, Attention-Deficit Disorders are often associated with other disorders, such as Learning Disorders, Oppositional and Conduct Disorders, Tourette's, Anxiety, and Depression. Neurofeedback can be used to treat individuals with all three types of attention-deficit disorders, as well as some of the associated disorders.

### **4. What Results Are Expected from Neurotherapy?**

Through changes in brainwave activity, reductions in ADD/ADHD symptoms are expected to occur. Individuals who have experienced neurofeedback therapy have also reported improvements in school or work performance, social relationships, and self-esteem, as well as reduction in irritability and oppositional behaviour. Neurotherapy practitioners will use various assessment instruments to determine whether the desired changes in brainwave activity and/or behaviour have occurred. Individuals should be aware that Neurotherapy can have a significant effect on seizure activity of those with seizure disorders. This effect, however, is usually positive (i.e. a reduction in seizures).



While you should not experience negative side effects from Neurotherapy, you may experience additional benefits. Some individuals report increased relaxation, reduced stress, and a heightened sense of control over their bodies, thoughts, and feelings during or immediately after treatment sessions.

## **5. How Successful Is Neurotherapy?**

Some clinicians and researchers have reported remarkable success in the treatment of ADD/ADHD with Neurotherapy. Others still consider Neurotherapy to be an experimental procedure. Several research studies reporting successful treatment outcomes with ADD/ADHD have been published over the last 20 years. In addition, there are increasing numbers of clinician reports being added to computerized data bases that attest to the effectiveness of Neurofeedback as a treatment for ADD/ADHD.

Some major reasons why practitioners are committed to providing Neurotherapy are: to attempt to help individuals for whom other approaches have failed, to help individuals who do not want to use medications for years, and to add to the scientific evidence related to the use of neurofeedback.

## **6. What Are the Potential Side Effects of Neurotherapy?**

Unlike the use of medications for treating ADD/ADHD, Neurofeedback rarely produces negative side effects. In fact, lack of side effects is a major reason for the use of Neurotherapy.



## PART 4

## Biofeedback in Your Practice

Adding Biofeedback and Neurofeedback into your present practice allows you to have a new and powerful tool to augment any therapeutic interventions you already may be using. As you become more familiar and confident with using and applying neurofeedback or biofeedback techniques, biofeedback may begin to take preference as the modality of preference for various disorders.

Success allows for more of the same, and at this time in the history of South Africa, people are looking for effective treatments with or apart from drug therapy. Skillful changes in lifestyle, emotional reactions and self-regulation may be effectively trained with the assistance of neurotherapy. As the efficacy of biofeedback is studied, especially in conjunction with other therapeutic modalities, its use will soar. International research studies are becoming more available through the Biofeedback Foundation of Europe (BFE).

Taking the time to practice with yourself and your family and friends on your new Biofeedback equipment is essential to becoming proficient and flexible in providing effective therapy. Hands-on work is the most useful form of learning neuro/biofeedback techniques. Books and manuals are plentiful and most are available from the bookstore at [www.aapb.org](http://www.aapb.org).

Certification is available through the Biofeedback Certification Institute of America (BCIA). Applications and information are available on-line at [www.bcia.org](http://www.bcia.org). There are now several correspondence courses acknowledged by the BCIA, which satisfy most of the required coursework towards certification.

Local training is now an increasing priority with Thought Waves as more neurofeedback therapists receive advanced training overseas— returning with the hope to assist other practitioners. As fellow pioneers in the fledgling field of biofeedback, Thought Waves seeks to provide opportunities for clinical training and advancement. Peer support within provider workshops at various levels of expertise may prove to be essential in developing the profession in southern Africa. The Biofeedback Association of Southern Africa (BASA) is presently being established. Watch the Thought Waves website [www.neurofeedback.co.za](http://www.neurofeedback.co.za) for further information.



# PART 4      Equipment

## **What Will I Need To Set Up My Biofeedback Practice?**

Thought Waves can provide you with everything necessary to set up your own biofeedback/Neurotherapy practice.

In this section the some basic equipment necessary is discussed, other items including the different sensors and peripherals can be chosen to suit your requirements and can be discussed before ordering.

## **In This Section**

- 1. ProComp Infiniti Encoder**
- 2. ProComp2 Infiniti Encoder**
- 3. BioGraph Infiniti Software**

## **Contact Details**

**South African Agents for Thought Technology Montreal, Canada:**

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## Technology Platform features:

- Powerful data-acquisition
- Cutting-edge multimedia biofeedback
- A library of application specific Clinical Suites
- Clinical tools for assessment and training
- Extensive data review and analysis functions
- Personalized session reports
- Enhanced trend reporting on client progress
- Full screen channel and script editors when using the Application Developer Suite

**The ProComp Infiniti** is an eight-channel, multi-modality encoder that has all the power and flexibility you need for real-time, computerized biofeedback and data acquisition in any clinical setting.

Housed in an ergonomically designed case and requiring only a USB port, ProComp Infiniti can be used with any IBM-compatible laptop or desktop PC. The new high-speed TT-USB connection allows for higher sampling rates. The first two sensor channels provide ultimate signal fidelity (2048 samples per second) for viewing raw EEG, EMG and EKG signals.

The remaining six channels (256 samples/sec) can be used with any combination of sensors, including EEG, EKG, RMS EMG, skin conductance, heart rate, blood volume pulse, respiration, goniometry, force, accelerometers<sup>2</sup>, torsionmeter<sup>2</sup> and voltage isolator.

What's more, not only can ProComp Infiniti capture data in real time by connecting directly to the PC via its fibre-optic cable, but it can also store data on a Compact Flash memory card for uploading later to the PC.

In short, ProComp Infiniti covers the full range of objective physiological signals used in clinical observation and biofeedback in any environment.



## **Benefits for you and your Clients**

- Ability to expand your clinical practice quickly and economically by adding training rooms
- Power to train in home environment, thereby enhancing long-term compliance and improved outcomes
- Capacity to monitor peripheral measures as well as EEG for greater flexibility

**The ProComp2™** is a compact yet powerful two-channel device that allows clinicians to set up a second clinical system – or to empower their clients by offering them a take-home device that is convenient to wear on a headband or a shirt collar.

The ProComp2 contains a built-in EEG sensor (simply connect an extender cable for EEG monitoring and biofeedback), and it can use any two of the ProComp Infiniti sensors. The ProComp2 system contains all the peripherals to easily connect it to a desktop or laptop IBM-compatible PC.

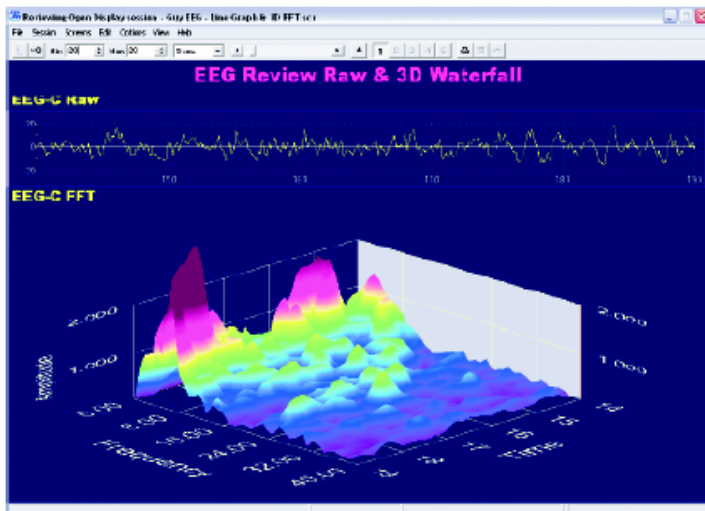


### **Biofeedback and Data Acquisition**

State-of-the-art multimedia biofeedback: With its audiovisual capabilities and exciting animations to deliver physiological feedback in many creative ways, the Infiniti Software ensures that you have a multitude of options to choose from when trying to reach a diverse client population.

### **Timesaving features allow flexible training routines:**

The BioGraph Infiniti software allows you to load up to 5 feedback screens during a session and switch between them, on the fly. This, and other timesaving features, lets you rapidly adapt the training task to your client's needs. It provides an increasingly challenging and diversified feedback environment, without having to stop, load a new screen and restart the session.



Whether you are a clinician looking for a versatile biofeedback tool or a researcher who needs a powerful data-acquisition system, the BioGraph Infiniti™ platform is designed to offer you the most complete and adaptable software solution. One of our top design goals was to make BioGraph Infiniti™ the most powerful clinical tool possible. The program's ability to record accurate data, to track a client's learning curve both within and Across recording sessions and to generate reliable reports are among its top features.

# Recommended Reading

## General Reading List

### **The A.D.D Book**

**New Understandings, New Approaches to Parenting Your Child**  
**William Sears, M.D. and Lynda Thompson, Ph.D.**  
**NY: Little, Brown and Co, 1998**

### **Getting Rid of Ritalin**

**How Neurofeedback can Successfully Treat A.D.D Without Drugs**  
**Robert W. Hill, Ph.D. and Eduardo Castro, M.D.**  
**Hampton Roads, Charlottesville, VA, 2002**

### **The Neurofeedback Book**

**Michael and Lynda Thompson**  
**AAPB, Wheat Ridge, Colorado, 2003**

### **Healing A.D.D**

**...the 6 types of A.D.D**  
**Daniel G. Amen, MD**  
**NY: Berkley Books, 2001**

### **A Mind at a Time**

**How Every Child can Succeed**  
**Dr Mel Levine**  
**NY: Simon and Schuster, 2002**

## Clinical Reference Literature

### **Biofeedback**

**A Practitioner's Guide**  
**Ed: Mark S. Schwartz and Frank Andrasik**  
**NY: The Guildford Press, 2003**

### **Foundations of Biofeedback Practice**

**Carol J. Schneider, Ph.D. and Edgar S. Wilson, Ph.D.**  
**AAPB, Wheat Ridge, Colorado**

### **Clinical Behavioral Medicine**

**Ian E. Wickramasekera**  
**NY: Plenum Press, 1988**

### **Clinical Applications of Biofeedback and Applied Psychophysiology**

**A Series of White Papers**  
**AAPB, Wheat Ridge, Colorado**

[www.aapb.org](http://www.aapb.org)