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The information contained herein includes both psychological and non psychological interventions. The delivery of psychological services requires a medical referral whilst non psychological services do not.

Each person is an individual and has a unique psychological profile, biochemistry, developmental and social history. As such, advice will not be given over the internet and recommendations and interventions within this website cannot be taken as a substitute for a thorough medical or allied health professional assessment or diagnosis.

Neurofeedback - EEG Biofeedback

A Drug-Free Strategy for ADHD, Learning Disorders and Other Conditions

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WHAT IS NEUROFEEDBACK?

EEG Biofeedback (or neurofeedback) is a learning strategy that works to improve the brain's ability to produce certain brainwaves. You can think of it as exercise for the brain much like the way exercise works to strengthen muscles.

When information about a person's own brainwave characteristics is made available to him/her, they can learn to change them. Neurofeedback instruments show the kind of waves a person is producing, making it possible for the individual to learn to change in ways to improve attention. It is essentially self-regulation training. It is ideally suited to those with ADHD and those with specific learning disabilities. The same training protocol is usually appropriate for both conditions.

Neurofeedback is based on the work of **Professor M. Barry Sterman of the UCLA School of Medicine, Departments of Neurobiology and Behavioural Psychiatry**. Professor Sterman recognised how brain function can be altered and normalised by operant conditioning of the EEG. QEEG and neurotherapy has been endorsed by the American Psychological Association as within the realm of psychologists with appropriate training. Neurotherapy training to decrease slow wave activity and increase fast, desynchronised EEG activity has been used for over twenty years to ameliorate ADHD and epilepsy and is well documented in scientific literature. More recently, EEG operant conditioning has been successfully applied to patients with mild traumatic brain injury.

Since 1976, several hundred clinicians, most notably **Dr Joel Lubar at the University of Tennessee, Susan and Seigfried Othmer (EEG Spectrum) and Len Ochs in California**, have used neurofeedback to produce dramatic improvements in ADHD children. Clinicians report that more than 80% of hundreds of children they have treated using biofeedback have achieved significant improvements.



Diagram: EEG Biofeedback in action

WHAT ARE BRAINWAVES?

Brainwaves are the electrical wave patterns found in every person's brain. An electroencephalograph (EEG) is an instrument which can detect brainwaves and discern whether they are strong or weak (amplitude) or fast or slow (frequency). Scientists commonly identify brainwaves in four categories:

beta: The fastest brainwaves, above 13 cycles per second (or hertz). Focused day-to-day activities and focused attentiveness are carried out in this state.

ALPHA: A slower brainwave, ranging from 8 to 12 hertz. This rhythm is characteristic of a relaxed yet alert state of awareness.

theta: The next slower waves range from 4 to 8 hertz. This rhythm is often associated with dreamlike imagery, sleepiness and deep relaxation.

DELTA: The slowest waves, from 0 to 4 hertz, predominates during dreamless sleep.

WHAT ARE THE CHARACTERISTIC EEG PATTERNS OF ADHD?

Children with ADHD appear to be less able to produce Beta activity above 14 hertz and experience excessive slow wave activity especially in the Theta region from 4-8 hertz. In fact, when challenged with academic tests, such children show greater increases in Theta and decreased beta from baseline readings. In order to concentrate and learn at peak performance, your brain needs to emit a high level of Beta waves. No wonder ADHD children have such trouble concentrating! A small percentage of ADHD children also exhibit excess high beta activity (greater than 23 Hz). It is these children who also have rumination, anxiety and sleep disorders.

WHAT ABOUT THE ASSESSMENT PROCEDURE

The assessment procedure begins with the proper evaluation and / or review of previous evaluations to determine that the clinical picture is consistent with ADHD and usually involves a QEEG (quantitative electroencephalogram - computerised EEG evaluation). If this pattern is present, neurofeedback training proceeds. Through neurofeedback training it is possible to increase beta and decrease theta, allowing for more focused learning in most children.

DOES NEUROFEEDBACK TRAINING CAUSE ANY DISCOMFORT?

None at all! Sensors used in training are attached to your skin to detect outgoing information from the brain. Nothing enters you or your brain.

CAN YOU BECOME ATTACHED OR ADDICTED TO NEUROFEEDBACK?

No! The equipment is used to learn abilities which are independent of it. Individuals learn to voluntarily control their brainwave activity through operant conditioning.

HOW LONG DOES THE TRAINING TAKE?

Neurofeedback training typically takes 30-40 sessions depending on the severity of the disorder and other comorbid symptoms present. The first six sessions are completed as quickly as possible and then the frequency of training reduces to two or three times per week. With regular attendance, total training can be completed in four to six months. Each training session lasts approximately 30-45 minutes.

If regularly attended, promising changes are often observed around the 10th session.

IS THE TRAINING SAFE?

Neurofeedback has no negative side effects. Frank Duffy, M.D. Director of Clinical Neurophysiology Children's Hospital, Boston; Professor of Neurology, Harvard University at the end of his literature review concluded that:

"The literature....suggests that EEG Biofeedback should play a major therapeutic role in many difficult areas." In his opinion, "if any medication had demonstrated such a wide spectrum of efficacy it would be universally accepted and widely used."

The training can be undertaken in conjunction with medication, diet and physical therapy or cognitive behaviour therapy. In most cases, improvement in brain function continues long after training has ceased.

WHAT ARE THE RESULTS?

Parents and teachers of children who receive neurofeedback training have reported dramatic behavioural improvements such as:

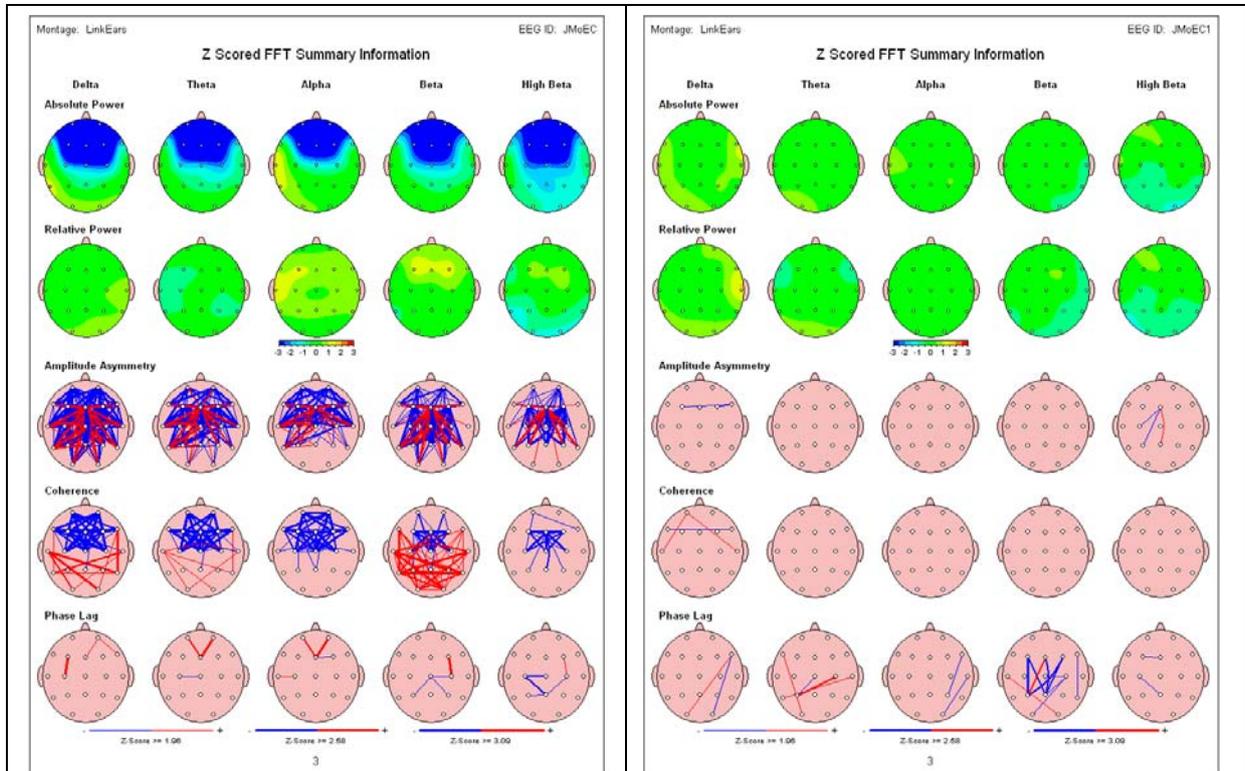
- More efficient brain function
- Improved self control
- Less hyperactivity and impulsivity
- Improved focus and attention
- Less depression / mood swings
- Improved sleep
- Less resistance to change
- Improved interpersonal effectiveness
- Reduced stress and anxiety
- More energy, sense of aliveness
- Peak Performance

CASE STUDY 1

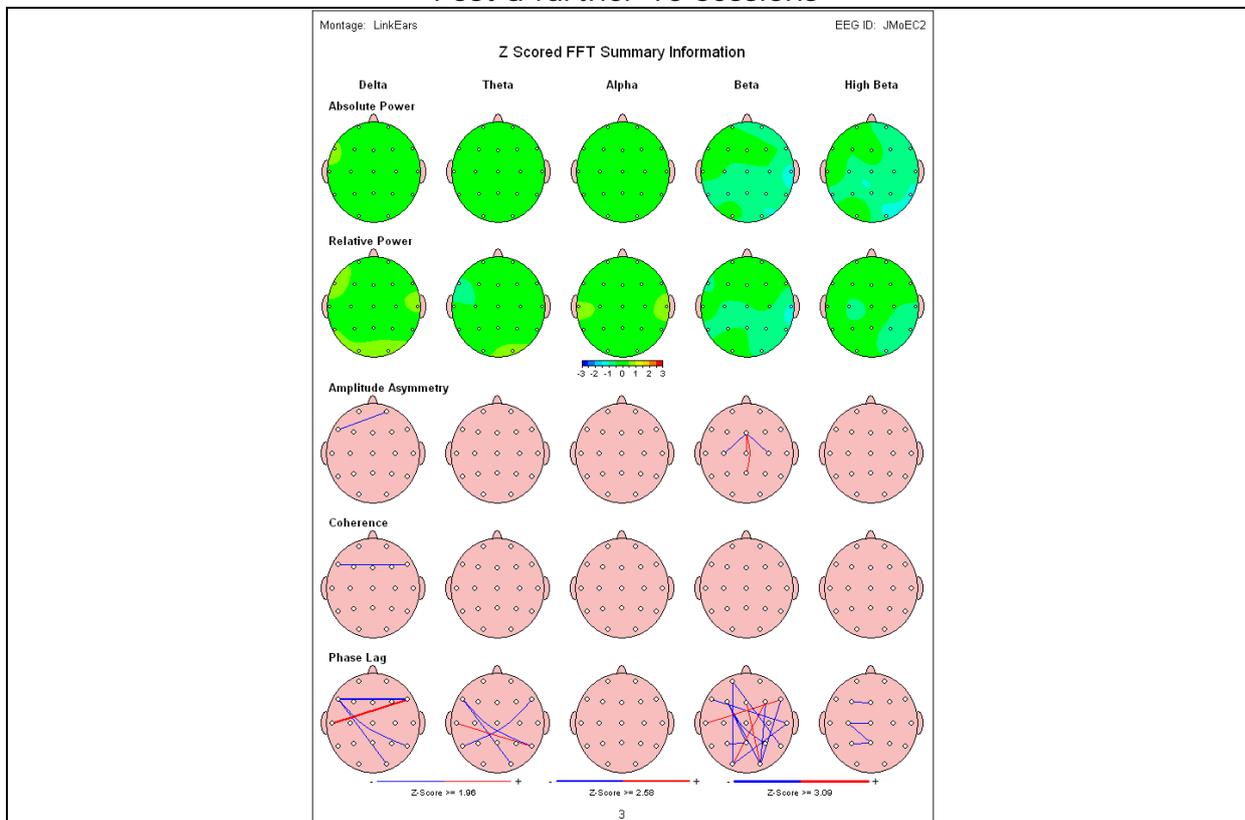
Following are qEEG results for a 9 year old boy with a brief history and follow up report from the boy's mother.

Pre Neurofeedback Training

Post 120 Sessions



Post a further 10 sessions



CASE STUDY 2

Below are the QEEG summaries of a 9 year old male who was referred by his GP.

He presented at the clinic with an extended history of extreme violence and multiple school suspensions, distractibility, academic failure, long term self harm and suicidal ideation. He was placed in a special ED/BD (emotional and behaviour disordered) unit for 18 months and has had 2 admissions to a child psychiatric unit in a NSW hospital

Over the years his diagnoses have included Autistic Spectrum Disorders, severe ADHD, Learning Disabilities, Oppositional Defiant Disorder, severe anxiety, and episodes of Bipolar Disorder.

Prior to attending this clinic he had received / followed the following therapies: medications (5 types including stimulants and antidepressants), acupuncture, homeopathy, dietary changes, nutritional supplementation, chelation (oral, transdermal and intravenous), counselling, child directed play therapy, kinesiology, primitive reflexes, chiropractic and cranial manipulations, various diets and supplemental regimes, massage.

Interventions at LDPS included a combination of the following strategies [Samonas Sound Therapy](#) via bone conduction (50 hours) to overcome his auditory processing and learning difficulties, Bowen (15 sessions) and craniosacral therapy (Upledger-25 sessions) to ameliorate his anxiety and restore parasympathetic and sympathetic balance in the autonomic nervous system, neurofeedback (140 sessions i.e. 70 hours of retraining brainwave patterns) to ameliorate his anger, aggression and mood swings.

During all of these interventions he was on a strict gluten and casein free diet and was taking dietary supplements to normalise his individual biochemistry as recommended and supplied by the doctor who referred him.

At the end of the training his mother reported that he is now doing well in the mainstream classroom, catching up academically, participating in sport (in and out of school), "home life is now a dream", he is getting along with the rest of family, and actually has his own friends who visit the house.

His mother reports that she can now look forward to a brilliant life for him while maintaining a managed recovery via diet and nutritional supplements.

When children are successfully trained to increase SMR activity (12-15 Hz) they show decreased activity levels. When they are taught to increase 15-18 Hz (beta) and reduce slow wave theta activity (4-7 Hz), their attention span and ability to learn math's improves.

Over the past decade, several small controlled and moderately large clinical studies show that neurofeedback significantly helps children with ADHD who have problems with maths. EEG biofeedback training was rated as having an efficacy rating of 4 on a scale of 1-5 (with 5 being the best).

EEG biofeedback was shown to be as effective as Ritalin on numerous measures in two small studies conducted by clinicians Rossiter and LaVaque in 1995, and Fuchs, Birbaumer, et al, 2003. Alhambra et al in 1995 demonstrated that 16 of 24 patients taking medication were able to lower their doses or discontinue medication totally after successful training.

Linden et al in 1996 compared 16 children trained with neurofeedback to those on a waiting list. Results from parent behaviour rating scales indicated increased intelligence scores and a decrease in inattentive behaviours. This result confirmed the earlier findings of Lubar et al in 1995 who demonstrated an increase in intelligence scores and academic performance with successful neurofeedback training.

A larger study by Kaiser and Othmer (2000) with 1,089 ADHD clients with moderate pre-training deficits also showed that neurofeedback training of sensorimotor and beta waves led to significant improvement in attentiveness and impulse control. These positive changes were measured on the test of variables of attention (TOVA).

In 2002, Monastra, et al worked with 100 children taking Ritalin who also received academic support and whose parents were receiving counseling. Half of these children received EEG biofeedback. Results on the TOVA and an ADD evaluation scale indicated similar improvements to the previous studies. Only those children who had completed neurofeedback training were able to sustain their improvements without Ritalin.

Functional neuroimaging studies carried out on individuals with ADHD have shown abnormal functioning of the anterior cingulate cortex (ACC) during tasks of selective attention. In a recent fMRI study (2006) the effect of neurofeedback training on the neural substrates of selective attention in children with ADHD was investigated. Fifteen un-medicated ADHD children who had no other comorbidities (co-existing conditions) were randomly assigned to the neurofeedback training group (experimental group) and the other five children were assigned to the control group (no neurofeedback training). The children were scanned (fMRI) while they performed the Counting Stroop test. Prior to neurofeedback training activation was evident in the left superior parietal lobule in all the children. After neurofeedback training, only those in the experimental group showed significant activation of the right anterior cingulate cortex, the key neural substrate of selective attention. (Johanne Levesquea et al, Neuroscience Letters, Vol 394, Issue 3, 20 February 2006, p 216-221)

HOW LONG DO THE RESULTS FROM TRAINING LAST?

Long term follow up of adults who, as children, received neurofeedback training for ADHD indicates that, in most cases, the improvement appears to be permanent. A follow up at six months is recommended for those who undertake the training.

WHAT OTHER CONDITIONS CAN BE TREATED WITH NEUROFEEDBACK?

Neurofeedback has a wide application including:

- [ADD / ADHD](#)
- Addictions
- [Anxiety and Panic Attacks](#)
- [Autism Spectrum Disorders](#)
- [Asperger's Syndrome](#)
- [Chronic Pain](#)
- [Chronic Fatigue Syndrome](#)
- [Depression](#)
- Developmental Disorders
- Emotional Instability
- [Epilepsy](#)
- [Post Concussive Syndrome / Head Injury](#)
- Headaches and Migraines
- [Specific Learning Disabilities](#)
- Peak Performance
- Pre Menstrual Syndrome (PMS)
- [Post Traumatic Stress Disorder \(PTSD\)](#)
- [Sleep Disorders](#)
- [Stress](#)
- Stroke
- Tourette's Syndrome

WHAT DOES TRAINING ACCOMPLISH?

Essentially three tasks:

1. It enhances the ability of the individual to access and maintain different states of physiological arousal
2. It enhances and supports the mechanisms by which the brain manages cortical hyperexcitability
3. It reinforces equilibrium states i.e. homeostasis / allostasis

Thus, neurofeedback training can be seen as education of the brain. i.e. harnessing the brain's intrinsic ability to learn about itself!

Neurofeedback training helps the central nervous system to become more adaptive and responsive, instead of remaining reactive.

WHAT IS EEG BIOFEEDBACK TRAINING ALL ABOUT?

ANSWERS FOR CHILDREN & ADOLESCENTS

From an article by Sue and Siegfried Othmer - [EEG Spectrum](#)

An article written by Dr. Siegfried Othmer and Susan Othmer

Siegfried, Chief Scientist of the EEG Institute

Susan Othmer is Clinical Director at the EEG Institute

www : <http://www.eeginfo.com/>

- Do you sometimes have the experience of working through a problem, and you just lose your thought?
- Does it seem like your brain is changing channels on you?
- Do you know the feeling of wanting to listen to somebody, but pretty soon you catch yourself thinking about something else?
- Have you ever experienced wanting to follow through on a project, but one thing or another keeps distracting you?
- Have you been criticised for doing something and you don't remember doing it?
- Are you sometimes bothered by your own behaviour?
- Do you think the way others judge you is unfair?

Your brain is part of who you are, but sometimes it may seem like your brain has a mind of its own. Sometimes your brain doesn't do what you want it to. Perhaps you and your parents/teachers have never thought about it in those terms. When people complain about your behaviour, or your inattention, they are talking to you, and blaming you. They are not saying, perhaps your brain is not functioning well today.

However, scientists today are discovering ways of seeing the brain in action when it is working on a problem. And we can see differences when some brains have problems with learning disabilities, with paying attention, with behaviour etc. By putting electrodes on the scalp, we can listen to the electrical activity of the brain. This is called the "**electroencephalogram**" or EEG. The electrical noise the brain puts out can tell us how well it is working. Much of the brain's activity is rhythmic, like music, or like waves on the ocean. And just as the ocean has rough and quiet times so the brain also shows us rough (difficult) and easy times. With a little feedback to the brain we can begin to train the brain to calm the rough seas and work more smoothly.



WHAT IS FEEDBACK ALL ABOUT?

Apart from all the other things the brain has to do, it also has to watch itself do it. It has to pay attention to itself, and control itself. This is called internal feedback. We can now add external feedback loops which tell the brain how it is doing.

Your brain can be taught to raise the temperature of your hand. This is called biofeedback. If we give the brain feedback on its own electrical activity, we call it EEG biofeedback or neurofeedback. With EEG biofeedback your brain can learn to control itself better.

EEG biofeedback is being used by clinicians and scientists to help with a variety of conditions such as attention, learning and behaviour problems. However, there is still more research needed to answer questions like what distinguishes those who benefit from training; what changes really take place in the brain as a result of training; what are the long term benefits of training; how does this training compare to the effects of medication for certain conditions. This training is offered on the basis of past work where results have shown that it has helped children with their homework, do better in sports and improve their relationships with family and friends. It is also recognised that children have problems today that will not wait until researchers have sorted everything out.

Training is guided along the way based on the results that we get. We need to work out the best kind of training to do for each person. Since our brain has two hemispheres, or halves, and because they function differently, we have to train them differently, and then we have to train them to talk to each other more easily. Everyone may be just a little different to everyone else, and we have to work that out too.

Testing will be done at the outset, and throughout the training process in order to monitor progress in the training. Other testing or referral to other specialists may be necessary to guide the training and to achieve the maximum benefits. You will probably have lots of questions as you go through training. Please feel free to ask them at any point as the training works best if you know what it is all about, and if it has your full commitment and interest.

The training won't feel like work to you, but your brain will be working all along trying to figure things out. Your part is to pay attention to the process as best you can, and that may not be easy for you. It helps if you care about the results. The program is about making your brain function better for you, so that some of the things that are difficult for you now will function better in auto-pilot mode. This program is something you can do for yourself. No one can make you do it, or make you care. That has to come from you. But if you go through the program, I believe that you will benefit from it over the long term, and in fact you may just end up being very proud of what you have achieved.



WHAT CAN YOU EXPECT TO GET OUT OF THE TRAINING?

You are the captain of a sort of team, namely all of the mental and emotional resources that your brain possesses. This training is about making you a better captain, and also about making all the players on the team know their jobs and be able to cooperate better. Whilst in most children with learning, attention and behaviour problems, all the different players on the team are by themselves capable, it is the working together and the interaction that isn't going well. This training is about getting the internal teamwork going.

When the brain is trained and functional, it doesn't have to worry about getting things done. Things simply get done. For example, if you ride a bicycle well, you don't even have to think about what to do while you are riding. You do it automatically.

So, brainwave training, as EEG Biofeedback is also called, is about making a better auto-pilot.

Things need to run on automatic pilot. You shouldn't have to work at paying attention; you shouldn't have to strain at reading; you shouldn't have to force yourself to be interested in something. If your brain works well, then these things should take care of themselves. However, you have lived with your brain all your life, and you may not be aware that what is hard for you may be easy for lots of other people. It may seem almost unfair that when your brain is working well, it is also not working very hard. Success in this training should mean that the hard things get easier for you.

Putting things into auto-pilot mode is also important because the brain has to take care of many things at once. For example, while you work on a maths problem in class, you can still be attentive for the moment when the teacher wants your attention back. So, the more we can make things easier for your brain to handle, and the more we can put things into auto-pilot mode, the more your brain can pay attention at the higher levels to what is really important.

In summary then, this training can be very important for your future. We are talking about the brain you will be depending upon for the rest of your life.

FURTHER READING SUGGESTIONS

- Samonas Sound Therapy
- ADD / ADHD
- Anxiety
- Autism
- Asperger's Syndrome
- Pain Management
- Chronic Fatigue Syndrome
- Depression
- Alternative and Complementary Strategies for Epilepsy
- Post Concussive Syndrome / Head Injury
- Learning Disabilities
- Sleeping Disorders
- Bodywork, Breathing and Movement for Sensory Integration, General Health and Wellbeing
- Comprehensive Neurofeedback Bibliography, By Prof. D Corydon Hammond
- Explaining Neurofeedback by Jay Gunkelman