

## **A NEW HIGH-TECH MEDICAL BREAKTHROUGH: EEG NEUROFEEDBACK**

### **A. WHAT IS NEUROFEEDBACK?**

The brain whispers messages to the body through electrical impulses transmitted to the central nervous system. When the brain is injured, these electrical impulses, or brain waves, are disturbed, creating abnormal rhythmic patterns. When the brain continues to transmit these abnormal patterns, imbalances are created in the body. Since the body naturally desires balance, neurofeedback merely assists the brain in bringing itself and the body back into balance.

With the technological advancements on neurofeedback equipment, these whispers from the brain can now be amplified and projected on a computer screen as they are occurring in the brain. This capability is called “real time.” It enables a more skilled and precise interpretation of the brain wave patterns and provides the opportunity for correction of abnormal rhythmic patterns.

Current brain research has shown that neurofeedback can be an effective adjunct to the treatment of the following brain disorders:

- Open or closed head injury
- Anxiety and panic disorders
- Epilepsy
- Migraine
- Cluster Headaches
- Post concussion
- Learning disabilities (ADD, ADHD)
- Anoxia (oxygen deprivation)
- Dyslexia
- Clinical depression
- Whiplash
- Stroke
- Chronic fatigue syndrome/Fibromyalgia
- Obsessive Compulsive
- Cerebral Palsy
- Disorder

Neurofeedback is one of the most compelling examples of the body’s ability to self-regulate and brings itself back into balance. It offers individuals an opportunity to participate in their own healing process.

### **B. A NON-INVASIVE PROCESS**

Non-invasive sensors, or electrodes, are connected to specific sites on the surface of the head. The sensors enable the brain wave patterns to be displayed on the computer screen. By placing the sensors strategically on the head, specific areas of the brain can be trained to replace abnormal rhythmic patterns with normal rhythmic patterns.

The high-speed neurofeedback equipment can filter out and display a wide array of electrical patterns and frequencies produced by the brain. Two of the most significant ones are the beta, a fast wave, and theta, a slow wave. Generally, the client’s goal is to produce stronger beta waves and inhibit excessive slower theta waves. The computer assists the brain in recognizing normal rhythmic patterns by producing audio and visual reinforcement when they occur. The brain makes the appropriate corrections immediately.

### **C. NEUROFEEDBACK RESULTS**

Neurofeedback helps to improve functions such as concentration, short-term memory, speech, motor skills, sleep, energy level, and emotional balance. The results of the training are permanent unless another trauma or injury occurs. Once the brain’s normal rhythmic patterns have been restored, the neurofeedback training is

similar to the effect of training wheels on a bicycle. Once you learn to balance yourself, the training wheels are no longer needed. The body does not forget.

Margaret Ayers is the world's leading expert in EEG neurofeedback. She has patented the first digital EEG device that provides feedback in 1/1000<sup>th</sup> of a second. This is a revolutionary advancement and may soon prove to be one of the more significant contributions to the field of healthcare. A wide variety of disorders can become resolved this way, including many emotional problems, behavioral problems, and learning problems. There is even an application for improving athletic performance.

Margaret reports a woman had a stroke at age 46, resulting in extreme flexor adduction of the left arm with fist clenched. She also wore a brace on the left leg. She tried all types of therapy prior to EEG neurofeedback. She did not receive EEG neurofeedback until the age of 50. Within two sessions her arm opened and dropped away from her body. Now her hand has opened so that she is able to write with it. Her leg spasticity has decreased and she can walk without a cane.

Margaret tells of another man, age 80, who was in alpha-theta coma for two months in intensive care, and on a ventilator and respirator due to anoxia. He came out of the coma during the first EEG neurofeedback treatment and made a "thumbs up" gesture. The second day he was off the ventilator. The third day he was in a wheelchair. Now he is walking, driving a car, and is back home with his family. Prior to treatment his family was told that perhaps they should discontinue life support and let him die.

#### **D. NEUROLOGICAL SYMPTOMS THAT NEUROFEEDBACK MAY IMPROVE**

1. **ATTENTION DEFICIT HYPERACTIVITY DISORDER** – A neurological disorder in children, adolescents and adults where researchers suggest that the brain does not receive enough or appropriate stimulation. These brain activity deficits may result in loss of attention and memory related to inattention; aggressive behavior; oppositional behavior, learning difficulties; feelings of extreme agitation and unhappiness on the part of the sufferer; disruption of family and social relationships; restless behavior (which some researchers think is the attempt of the brain to desperately produce stimulation); depression; and anxiety.

This is an extremely uncomfortable condition, which some scientists think may have affect 20% of the population to some degree. It is very important that this condition be treated appropriately in children, as it can contribute to serious consequences in adolescents and adults, including: depression; increased possibility for drug and alcohol abuse; one's attempts to "self-medicate" agitation; low self-esteem; and criminal behavior. The research for the response of children with ADHD to the Neurofeedback treatment is very hopeful for those who do not like to give drugs to children.

2. **STROKE** – Stroke is called a "brain attack." Stroke deprives the brain of oxygen-carrying blood, causing brain cells to die. Stroke affects 500,000-600,000 Americans each year. It is the leading cause of severe disability. The average age for a stroke is 61. The number of people who are having or have had strokes total 1.7 million in the U.S. Having a stroke can lead to a variety of different symptoms, depending on the location of the damage. There may be a motor paralysis on one side, or less severe weakness, or a sensory loss on one side.

A person may be left with difficulty in speaking known as aphasia, or difficulties comprehending what people are saying. There may be clumsiness and slurred speech. Confusion and loss of part of the field of vision can occur. These changes may be temporary or permanent. There may be incontinence, depression,

speech difficulties and memory problems. Strokes can cause muscle spasticity and paralysis. Most stroke patients experience major improvements over the first six weeks and may progress even further over the next six months.

Half of the survivors of a stroke have some form of paralysis, about one-fourth cannot walk and about one-sixth has difficulty speaking. Many will not fully recover their lost functions. Approximately 50% will become depressed at some time during the first two years after the stroke. It is one of the most under-recognized complications of a stroke. If you choose to be treated by neurofeedback, I strongly advise you continue in your existing rehabilitation program. Neurofeedback serves as an adjunctive treatment in your overall recovery.

3. **HEAD TRAUMA** – Neurofeedback has been demonstrated to reduce the symptoms of open and closed head trauma and mild traumatic brain injury.

a) **MILD TRAUMATIC BRAIN INJURIES** – There are approximately 325,000 new cases of mild traumatic brain injuries per year in the United States. Many cases are unidentified or misdiagnosed. The patients usually present, often several weeks after the date of injury, in the office of the physician or psychologist complaints of headache, agitation or rage, depression, poor concentration, and difficulty with higher order thinking skills. These patients also tend to have poor organization skills and report a feeling of dissociation.

Contrary to popular belief, individuals do not need to strike their heads, have loss of consciousness, have a skull fracture, skin tear, or bleeding, in order to sustain mild to moderate traumatic brain injury. While these situations can occur during the accident and contribute to the process of a brain injury, they are not the sole criteria utilized in determining whether or not an individual has had a brain injury. Other criteria include: any loss of memory for events immediately before or after an accident, loss of consciousness for less than 30 minutes, or any alterations in mental state at the time of the accident, such as disorientation, confusion, being dazed, or speech problems.

Unfortunately, MRI, CT, and X-ray will usually not reveal mild traumatic brain injury. The post-concussed patients frequently present themselves as neurologically intact during a traditional medical examination. To date, most research suggests that 80% of patients diagnosed with a mild traumatic brain injury experience resolution of all their symptoms within 6 to 18 months. However, research indicates that symptoms of head trauma can resurface late in life, so slowly that few ever attribute the symptoms to the earlier injury.

Sometimes these symptoms interfere with an individual's occupational activity. Deficits can surface in impaired or slowed cognitive processing, resulting in poor judgment, poor executive function, increased irritability, and disorganized planning skills in the work environment. For more information, I recommend the book, *Coping With Mild Traumatic Brain Injury* by Diane Roberts Stoler, EdD and Barbara Alders Hill (1998).

b) **TRAUMATIC HEAD INJURY** – Injuries involving the head are among the most common in our society. Each year in America, one million people are seen by medical doctors due to a blow to the head. Of that number, 50,000 to 100,000 have prolonged and disabling problems that will affect their ability to work and/or affect their daily lives. The physical effects of head injuries include such symptoms as seizures, loss of motor speed and coordination and the presence of abnormal movement such as tremors and spasticity.

Cognitive changes involve disorders of attention, concentration and memory, problems with understanding or producing speech, difficulties with initiating and planning daily activities, and poor reasoning and judgment. The behavioral effects include agitation and irritability, verbal and physical aggressiveness, impulsivity, depression and suicidal thoughts, and an egocentric or self-centered orientation in interpersonal relationships.

[**ED. NOTE:** For an excellent online book on head injury, I recommend you download *Traumatic Brain Injury Survival Guide* by Dr. Glen Johnson at [www.tbiguide.com](http://www.tbiguide.com).]

An all-digital real time EEG Neurofeedback evaluation can determine if you have suffered from a head injury that has left some impairment in your brain. Head injuries show up as large spikes and are easily recognizable. Using all-digital real time EEG Neurofeedback can correct out the abnormal pattern, creating normalization in the physical, emotional, or cognitive condition for most clients.

- c) **WHIPLASH** – Many people do not know that they can sustain a head injury from whiplash, even if the outside of the head does not hit anything. The back and forward motion can cause the brain to “slosh” back and forth, hitting the front and back of the brain against the inside of the skull. It can also cause “tearing” of the neuro tissue. Victims of traumatic head injuries can develop symptoms like depression, anxiety, fatigue, confusion, inattention, irritability, or sleep disturbance. These symptoms are even more likely if you have been injured before with either two other whiplash injuries or a loss of consciousness from a car or sports accident. If you have had three or more accidents, you increase the likelihood that these symptoms would present themselves after a relatively “minor” accident and that the experience may be related to a neurological injury! Even though there are research indications that the symptoms of multiple injuries or old injuries may be more persistent than previously thought, it is still controversial.
4. **DEPRESSION** – Clinical depression is described as at least five of the following symptoms present during the same two-week period. Depressed mood, feelings of sadness, loss of interest or pleasure in previously enjoyed activities, significant loss of weight or weight gain, insomnia or oversleeping, fatigue or loss of energy nearly every day, feelings of worthlessness or inappropriate guilt, diminished ability to think or concentrate, indecisiveness nearly every day, recurrent thoughts of death or suicide (these symptoms can be caused by organic factors). If you have a history of injury see Whiplash/head trauma.

We forget that our emotions – happiness, anger, and sadness are generated in the brain. Disruption in brain functioning can cause depression and feelings of depression. Regulating brain functioning can improve mood. That is what antidepressant medications attempt to do. They try to restore the chemical state of the brain to where it is supposed to be, so that you will feel the way you should.

EEG feedback attempts to encourage the brain to generate electrical activity that is not associated with feelings of depression and encourage it to have types of brain wave activity associated with feelings of energy and well being.

5. **CHRONIC FATIGUE SYNDROME, FIBROMYALGIA** – “Tired all the time,” “The Yuppie Flu,” “Epstein Barr Syndrome,” “Effort Syndrome,” “Alpine Village Syndrome.” Though names change, the consensus seems to be the same. Medical science does not have conclusive decisions on what causes Chronic Fatigue Syndrome (or CFS). It has taken almost a decade for the medical community to acknowledge CFS as a disease entity instead of labeling it as a by-product of depression or psychosomatic illness. Many desperately ill people spent years not only suffering from a debilitating illness, but also being

treated as malingerers and hypochondriacs by medical practitioners as well as family members.

Chronic Fatigue Syndrome usually involves several of the following symptoms: Extreme and almost constant fatigue that is usually worsened by effort and physical activity – severe enough to interfere with normal daily activity. Headaches, dizziness, muscle aches, depression, fuzzy thinking, or cognitive confusion, problems with attention and memory, and irritability. All other causes for these symptoms have been ruled out.

The last sentence is extremely important. The symptoms above are all general indicators of physiological illness. They can be caused by a variety of factors: viral or bacterial infection, parasites, nutritional deficiency, allergies, hypoglycemia, hypothyroid, anemia, etc. CFS is a diagnosis given only if no standard test has indicated a cause. A CFS diagnosis basically means, “*We believe that you sick, but, we don’t know what is wrong with you.*” There are strong indicators that a significant percentage of individuals diagnosed with Chronic Fatigue Syndrome are actually suffering from a neurological trauma (Traumatic Head Injury; Post-Concussion Syndrome or Whiplash Syndrome.)

The usual neurological traumas associated with CFS-type symptoms are: car accidents; any concussion; any loss of consciousness; sports injuries; childhood accidents (i.e. hitting a tree, being hit in the head with a baseball bat, etc.); physical abuse (i.e. shaking, hit against a wall, etc.); any fall where the head is impacted; whiplash injury. Usually other head traumas like a stroke or epilepsy are not put into the CFS category, because (back to that final sentence), the cause is known even though the symptoms may be similar. Also, if the injury is more extreme, there are head trauma symptoms like paralysis and sensation loss or speech impairments that are clear indicators of head injury. However, for mild to moderate head injury, the symptoms are so general that these overlap CFS symptoms almost exactly.

The following indicators support the possibility that a significant percentage of CFS sufferers are actually experiencing the results of neurological trauma:

- a) Similarities between post-concussion and mild head trauma symptoms and CFS symptoms are very close.
- b) The presence of a history of neurological trauma in the majority of the CFS patients encountered. Usually they have two or more.
- c) New information that suggests that symptoms can appear years, even decades after the injury occurs. Some never go away.
- d) Neurological traumas are “geometrically” cumulative, according to experts. That means that multiple accidents and injuries produce effects on human thinking, emotions and personality greater than would be attributable to the severity of one single accident.  $1 + 1 + 1$  does not = 3. It equals  $1 \times 10 \times 100 = 1,000$ .
- e) Many of the biomarkers (physical abnormalities measurable on medical tests), of CFS, are consistent with the physiological effects of neurological trauma.
- f) Attribution theory – Research shows that human beings are no better than chance at correctly attributing why they do the things they do. We seem to be programmed to think of certain causes. If things go very badly for a person, that person may, as well as those around them, attribute it to the character or behavior of the person to whom it is happening. When people have CFS symptoms, they often take responsibility for them: they say, “*I’m lazy,*” or “*I’m stressed.*”

We seem to have a resistance to attributing thoughts and feelings, or biochemical processes to injury. Individuals who have had brain surgery and who were happy even tempered individuals before their surgery, who later become tired, depressed and cognitively confused and irritable, tend to attribute those negative and problematic thoughts and feelings to “*something wrong with them*” or extraneous circumstances. It may take a lengthy education process to connect the injury to feelings and behaviors.

g) Neurological trauma is seriously under or misdiagnosed in this country. Individuals who have had a gunshot wound to the head are treated for major depression instead of neurological trauma. Criminal pathologists administering tests to death row criminals found every one of them had neuropsychological test scores indicating head trauma, as well as a history of head trauma. Every thought you have, every emotion you feel, every action you decide to or not to take is related to brain activity. Understanding how brain wave activity influences how we think and feel, and finding ways to move brain wave activity back to pre-injury patterns, in order to promote emotional health and cognitive activity, is one of the most promising avenues of treatment.

6. **MIGRAINE AND CLUSTER HEADACHES** – A migraine headache is a form of vascular headache, which affects millions of people daily. It is thought to be an inherited disorder. There are two types of migraine headaches. The common migraine accounts for about 80-85% of migraines. The classic migraine, or migraine with aura, accounts for most of the remaining 15-20%. The aura, which is a symptom of a brain malfunction, may consist of flashing lights, blurred vision, numbness, weakness, or difficulty speaking.

Both types of migraines can be associated with severe, throbbing head pain. The most common other symptoms associated with migraine headaches are nausea and vomiting. Migraine headaches are generally aggravated by bright light, loud noise, and activity. They can last from a few hours to several days. The pain of migraines can range from very mild to debilitating. The occurrence of migraine headaches generally begins from childhood to early adulthood.

Many migraine headaches respond to a simple over-the-counter pain remedy taken in combination with lying down in a dark, quiet room and napping. Some find that a cool wash cloth or ice bag diminishes the pain. Prescription pain medications, however, are all too often needed in order to adequately control the pain of migraines.

Digital real time EEG Neurofeedback has helped many migraine sufferers. An initial EEG evaluation will determine if your pattern is similar to the pattern of migraine sufferers. If a “migraine” pattern is observed, then relief usually takes about 20-30 sessions.

**CLUSTER HEADACHE** – It is estimated that 1 million Americans currently suffer from cluster headaches, and the condition is five to eight times more common in men than in women. The first cluster episode usually occurs sometime between ages 20 and 45, and in about half of cases it occurs at night. In about 70% of sufferers, a cluster headache is triggered by drinking alcohol.

They are called cluster headaches because the attacks come in groups. The pain arrives with little, if any, warning and it has been described as the most severe and intense of any headache type. It generally lasts from 30 to 45 minutes, although it might persist for several hours before it disappears. Unfortunately, it can reoccur later in the day. Most sufferers experience one to four headaches a day during a cluster period.

The cluster cycle can last weeks or months and then disappear for months or years. Clusters often occur during spring or autumn and, thus, are often incorrectly associated with allergies. Approximately 10% of the sufferers, however, experience chronic cluster headaches that occur all year long. Analgesic medications do not usually relieve the pain from cluster headaches. Common symptoms include: swelling around the eye, dropping of the eyelid, excessive tears, bloodshot eyes, runny nose, steady and sharp pain that quickly gets worse, peaking within five to 10 minutes. The pain of a cluster headache has been described as piercing, burning, throbbing, pulsating, and so excruciating that most victims cannot sit still and feel compelled to rock in a chair, walk back and forth, or band their heads against something.

If you begin treatment with neurofeedback, I advise you to make a journal of one month in advance of when a headache occurs, how long it lasts, and its intensity on a 1-10 scale. Neurofeedback can help most sufferers from cluster headaches. Results vary, but in general, 5-25 sessions are needed.

7. **CEREBRAL PALSY** – Cerebral palsy is a physical disability. About 700,000 adults and children have the condition in America. It occurs by an injury to the brain during, before, or after birth. “Cerebral” refers to the brain and “palsy” to the lack of motor control. The term cerebral palsy describes not merely a single affliction, but an entire spectrum of closely related chronic disorders, which appear in the first years of life and impair the body’s ability to control movement. The disorders are caused by faulty development of or damage to motor areas in the brain that disrupt the brain’s ability to control movement and posture.

The symptoms depend on where and how much damage was done to the brain. There are rarely two people who have the same cerebral palsy, and the symptoms can range from very mild to severely disabled. Some signs can be: poor muscle control, difficulty with fine motor tasks (such as writing or using scissors), hearing, and vision impairments, speech impairments, seizures, poor balance, and a small minority have mental retardation. Cerebral palsy does not always cause profound handicap.

Neurofeedback can help by placing the sensors across the sensory motor cortex. While results vary, many sufferers gain improvement in their motor coordination.

8. **ANXIETY AND PANIC DISORDER** – Having a panic attack is one of the most frightening experiences a person can have. All of sudden, you feel terrified for no reason. Your heart is beating fast and hard and you might get chest pains. You may have a hard time breathing or get a choking feeling. You start feeling dizzy and start sweating. You start having stomach problems or feel like you need to throw up. You shake, tremble, or tingle. You are feeling out of control and maybe like things are unreal. You feel like you are either going to die (usually of a heart attack) or go crazy, or both.

Panic attacks can happen at any time and any place without warning. They often happen in grocery stores, malls, crowds, or while traveling. Most end up living in constant fear of another attack and may stay away from places where they had an attack. They become highly anxious. For some people, fear takes over their lives and they are unable to leave their homes. Panic attacks don’t last long, but they are so scary they feel like they go on forever. It usually starts when people are young adults, around 18 to 24 years old.

Sometimes it starts when a person is already under a lot of stress, for example, after the death of a loved one or after having a baby. Women are twice as likely as men to develop panic disorder. According to the National Institute of Mental Health, the sensations of panic attacks often mimic symptoms of a heart attack or other life-threatening medical conditions. As a result, the diagnosis of panic disorder is frequently not made until extensive and costly medical procedures fail to provide a correct diagnosis or relief. About 1.7% of the adult U.S. population, ages 18 to 54 (approximately 2.4 Americans), has panic disorder in a given year.

Neurofeedback has helped many sufferers of panic disorder. For some, neurofeedback is all that is needed. Others may need to combine it with standard psychological treatments such as cognitive therapy, EMDR, and relaxation techniques. Anxiety and panic is almost always located in the right hemisphere. Each person needs to be properly screened for head injury or other underlying problems. If none seem to exist, then typically a person will start to feel a difference after between 1 and 10 neurofeedback sessions, but they must be consecutive. If there are underlying problems, those will need to be addressed in conjunction with

the anxiety. The total length of treatment ranges from 20-35 sessions. Twice weekly visits will speed progress, but three sessions per week is the maximum.

9. **OBSESSIVE-COMPULSIVE DISORDER** – People with Obsessive-Compulsive Disorder (OCD) either have a problem with thoughts that repeat themselves over and over (obsession) or find themselves repeating behaviors over and over (compulsion). Sometimes a person is stuck between both. They know it's excessive or unreasonable but still can't stop it. Most keep their rituals a secret, like washing of the hands way too often to get germs off or double and triple checking to the doors to make sure they are locked. OCD usually begin in adolescence or early adulthood, and most onsets are gradual. About one to two percent of the population has this disorder.

As with most disorders, there is a wide range of severity from mild to disabling. It often creates a lot of anxiety for the person if they try to resist their compulsion. The disorder is chronic in most cases, and, even with medications, relief is not complete. The severity of the disorder cycles, but it seldom disappears completely. Some of the most prevalent compulsions are: repeated checking of doors, locks, electrical appliances or light switches; frequent cleaning of hands or clothes; strict attempts to keep various personal items in careful order; mental activities that are repetitious, such as counting or praying. These behavior often interfere with a person's usual routine, work or personal functioning.

An all digital real time EEG Neurofeedback evaluation can make the diagnosis. The OCD pattern resembles a stair step on the EEG. The treatment involves reducing theta in the cingulated gyrus area of the brain.

## **E. QUESTIONS AND ANSWERS: WHY NEUROFEEDBACK CAN HELP YOU**

### **Q: WHAT IS NEUROFEEDBACK?**

**A:** Neurofeedback is a type of biofeedback. The body has limited capacity to sense information coming from inside itself. However, if you monitor any biological process, amplify it, and feed it back to the brain, your brain can change it. As an example, if you place a special skin thermometer on your finger, you can raise or lower its temperature at will just by focusing on the gauge. Neurofeedback is the monitoring of the brain waves with the goal of changing the patterns that cause problems. It is the modern application of the EEG (electroencephalogram) machine.

### **Q: WHY HAVE YOU CHOSEN TO USE NEUROPATHWAY'S EEG FEEDBACK MACHINE?**

**A:** There are many types of EEG machines manufactured in the world. All are based on either attempting to convert analog signals to digital, or average the EEG to produce secondary data. These methods result in a split second to a full second delay in feedback to the brain. Engineers have tried to solve this problem for decades, and many in the field didn't believe it would ever be possible. Margaret Ayers, a pioneer in the field of neurofeedback, was able to discover the answer to this problem, and in 1995 received a patent for the first real time all digital EEG neurofeedback device.

It is so fast that it responds in 1/1000<sup>th</sup> of a second the true speed of the senses. The client actually sees the primary EEG waveform and data in real time. Such an advance in technology has produced an EEG machine that is able to treat brain disorders not otherwise treatable by the last generation of EEG machines. This includes stroke, open head injury and coma. Real time all digital EEG also shortens the time needed for treating disorders that responded well to the last generation neurofeedback machines, such as attention deficit disorder. Since this technology is so new, clinicians are exploring possible new and innovative



applications, such as its potential to speed up and enhance the results of psychotherapy.

**Q: HOW DOES THE TRAINING WORK?**

**A:** Not all minds work alike. In fact, if you could see a brain map of people's brains as they function, they would probably look as dissimilar as their faces or bodies. There are real and very significant differences.

Imagine for a moment that brains are like radios. Some are "tuned in" properly and have clear, strong reception. Others get a lot of static or may hear two competing stations at the same time. Of course, brains are not radios, but the fact is that some brains don't focus or "tune in" very well. Their EEG brainwave patterns show abnormal or competing centers of attention. Sadly, people with these brains spend so much of their attention and energy trying to focus that they have little time left for the external world. So their attention wanders or they become easily frustrated and act out. Very often they are quite bright and have the necessary brainpower to be successful in the world; it's just not focused properly.

Neurofeedback trains these brains to filter out and tune in. The client trains his own mind how to focus. Once the skills are learned and repeated often enough (usually 20 to 40 half-hour sessions) the brain never forgets.

We place three noninvasive, completely painless electrodes on your scalp. These wires are connected to a computer, which translates the signals into visible patterns on the monitor. The pattern represents your brain's electrical activity occurring on the surface of your skull in real time. Just like fingerprints, no two people have the same EEG pattern. Each person is unique. However, when there are problems, recognizable patterns emerge that are not normal for one's age or state of consciousness. We then set the filters to that the abnormal patterns are inhibited. A yellow bar is displayed on the monitor. You lower this bar to a certain number. Every time your brain fires within normal limits, you hear a tone. This feedback lets you know that you are inhibiting out this abnormal pattern. I use different electrode placements on you scalp depending on the nature of the problem.

**Q: COULD YOU EXPLAIN MORE ABOUT BRAINWAVES?**

**A:** Your brain produces four distinct types of brain wave, which are labeled in Greek letters. People usually have a mixture of frequencies at any given time, but the dominant frequency varies depending on the state of consciousness and on individual differences. Beta is considered to be fast waves, measuring 15 Hertz and above. Alpha is 8-12 Hertz. Theta is 4-7 Hertz. Delta is 0.5-3.5 Hertz. Normal focused waking state consists of primarily Beta waves in the brain. When you close your eyes and relax, Alpha waves tend to be produced. Theta normally is only produced briefly when you are starting to fall asleep. Delta is normally produced when you are asleep.

When you have brain irregularities caused by injury, your brain may have too much Theta being produced when you are supposed to be awake and alert. By learning to inhibit this abnormal amount of theta, a person can make great improvements in their problem.

**Q: HOW LONG DOES THE TRAINING TAKE?**

**A:** Sessions are usually one to three per week, but each person is different. Some receive benefit almost immediately while others may need 100 sessions or more. It depends on how old the injury is, the age of the person, the type of problem, and many other factors. Typically ADD requires about 20-45 sessions. Those

with mild stroke or minor head injury often require 30-60 sessions. Application for alcoholism takes 30-40 sessions. The good news is that help is available and many people no longer need to suffer from lifelong conditions related to brain injury.

**Q: HOW CAN I EXPECT TO FEEL AFTER A SESSION?**

**A:** Depending on what frequency is being trained, you may feel a little tired, as if you worked hard, or sleepy and a little spacey for a while after the session. This is natural, as you are doing the equivalent of aerobic training or weightlifting with your brain.

**Q: WILL THE TRAINING LAST, OR IS IT TEMPORARY?**

**A:** The type of neurofeedback training we offer here is permanent. Your brain is returned to its original healthy state. Neurofeedback helps to improve functions such as concentration, short-term memory, speech, motor skills, sleep, energy level, and emotional balance. The results of the training are permanent unless another trauma or injury occurs.

**Q: CAN NEUROFEEDBACK HELP WITH ADD AND ADHD?**

**A:** Recent research suggests that individuals with ADD/ADHD tend to have elevated Theta brainwave activity and low levels of Beta brainwave activity. Symptoms of ADD/ADHD are usually reduced when brainwave activity is changed. Neurofeedback is commonly used as an adjunct or alternative treatment to medication and behavior management.

With the Neuropathways EEG machine, most adults and children who have ADD/ADHD report improvement in the areas of 1) school and job performance due to an increased ability to focus, pay attention, and concentrate, and 2) social relationships due to an increased ability to demonstrate self-control.

**Q: WHAT IS ADD/ADHD?**

**A:** Attention-Deficit Disorder is separated into two types: Inattentive Type (ADD) and Hyperactive-Impulsive Type (ADHD). People with ADD usually exhibit one or more of the following symptoms: inattention, distractibility, disorganization, daydreaming, lack of foresight, carelessness, forgetfulness, lack of motivation, lack of persistence, and procrastination.

People with ADHD typically exhibit one or more of the following symptoms: hyperactivity, fidgeting, restlessness, excessive talking, and impulsiveness. Individuals with ADD or ADHD often have significant difficulties with learning, concentration, school or job achievement, behavior control, social relationships, and self-esteem.

**Q: IS THERE ANYTHING YOU CAN SUGGEST FOR ME TO DO SO THAT I IMPROVE MY TRAINING SESSIONS?**

**A:** Yes, eat a high-protein, low-sugar diet. Do light exercise, walk, or swim as often as possible. You should drink 8-10 glasses of water daily. You should get plenty of sleep, especially before and just after your session. If possible, avoid all refined sugars and aspartame. If you like red meat, eat lean meat. If you are a vegetarian, include whole proteins in your diet. Take nutritional supplements to maintain a healthy body and brain.

**Q: IF I AM ON PRESCRIPTION DRUGS, CAN I STOP TAKING THEM?**

**A:** Your physician is the only one who can advise you to reduce, increase, or eliminate dosage for you. Never attempt to change your prescription without medical advice. It's important that you notify your physician you are receiving EEG neurotherapy. Children with ADD and adults with genetic unipolar depressions are often able to gradually decrease or even discontinue their medication. Keep in contact with your physician.

**Q: WHAT IF I AM TAKING MEDICATIONS?**

**A:** Most medications do not interfere with getting results with EEG neurofeedback. The exceptions are benzodiazepines and muscle analgesics.

**Q: HOW MUCH DOES THIS TRAINING COST?**

**A:** The fee for the initial 60-minute evaluation is \$150. This includes an intake screening to get a history of your symptoms and how they adversely affect your life, your medical and family history. Take an initial EEG reading and determine whether you are a candidate for this type of treatment. Each follow-up treatment session is \$60 per 45-minute session (actual time on EEG is 30 minutes).

**Q: IS THIS TREATMENT COVERED BY INSURANCE?**

**A:** Very often your medical insurance will reimburse you for most of the cost of treatment. You will need to have your primary treating physician write "neurofeedback evaluation and treatment" on a prescription pad.

**Q: WHO CAN BENEFIT FROM EEG NEUROFEEDBACK TRAINING? WHAT TYPE OF RELIEF HAVE INDIVIDUALS FOUND FROM THIS TRAINING?**

**A:** Individuals who benefit from this work have usually experienced functional loss or deterioration due to at least one brain injury previously diagnosed as:

- ADD/ADHD (Attention Deficit Disorder with or without hyperactivity).
- Dyslexia.
- Learning disabilities.
- Autism and pervasive developmental disability.
- Open and closed head injury.
- Whiplash/concussion.
- Coma.
- Epilepsy.
- Stroke.
- Migraine and cluster headaches.
- Anoxia (oxygen deprivation).
- Birth injuries.
- Genetic unipolar depression.
- Cerebral palsy.
- Post-brain virus.
- Fibromyalgia.

- Post-neurosurgical trauma.
- Parkinson’s Disease.

After training, many individuals have reported varying degrees of recovery of previously lost or deteriorating functions such as hearing, sight, handwriting, and speech. Others report improved walking (gait), arm/hand coordination, and increased attention at both work and in school.

Some clients experience dramatic, permanent decreases in mood swings, anxiety, anger and depression. This is often accompanied by a generally improved quality of life and heightened sense of well being. Many parents and educators have also reported significant improvement in ADD/ADHD and learning disability children who have completed this work.

**Q: WHO DISCOVERED THIS TECHNIQUE?**

**A:** The protocol used in many offices is based on decades of research by many people in the field. While there are many names, most credit is due to Drs. Alyce and Elmer Green and Dr. Dale Walters from the Menninger Institute; Dr. Wanda Wyricka and Dr. Barbara Brown in Southern California.

However, the most credit is due to Margaret Ayers, who designed the Neuropathways EEG feedback machine and developed the advanced protocols.

**Q: DO I NEED TO WORRY ABOUT THIS EQUIPMENT DOING SOMETHING TO ME?**

**A:** No, the equipment does not send any electricity into you or in any other way do anything to you. It works like a mirror, showing you how your brain is functioning, and telling you if you are on the right track.

**Q: ARE THERE ANY OTHER TERMS FOR NEUROFEEDBACK?**

**A:** Yes, it is also called neurotherapy, EEG biofeedback, and brainwave biofeedback.

**Q: WHY DOES MY NEUROLOGIST TELL ME THAT EEG FEEDBACK WON’T HELP?**

**A:** One of the most widely accepted dogmas in neurology is the fixed nature of connections in the adult human brain. It had always been assumed that once this circuitry has been laid down in fetal life or in early infancy, there is very little one can do to modify it in adulthood. Indeed, this presumed absence of plasticity in the adult brain is often invoked to explain why there is so little recovery of function after brain injury and why neurological ailments are so notoriously difficult to treat.

Yet, recent modern neuro-imaging techniques have shown that brain “maps” can and do change dramatically. Research published in the past three years has also demonstrated that the brain, from infancy through adulthood, can change. This is one of the most important principles driving the changes we see as a result of neurofeedback. If neurofeedback is done correctly, once the brain has retained itself and remapped new neural pathways, the work is permanent. It should not regress unless there is further insult or injury to the brain.

**F. NUTRITIONAL SUPPORT FOR NEUROLOGIC HEALTH**

During the last 30 years, we have learned much regarding nutritional supplements and diet – what to eat and

not to eat. How to lower our cholesterol, keep our arteries from clogging, keeping our heart strong, to help our endurance, to help our digestion – the list goes on and on. The brain, however, has received little attention with respect to nutrition.

In the last few years, researchers have proven that our brain cells are influenced by what we eat. Unfortunately, the typical American diet is not conducive to healthy brain cells. We eat the wrong foods; we get too much sugar. We eat too many calories and get little or no exercise. Our brain makes certain chemicals called neurotransmitters directly from amino acids in the food we eat. For example, dopamine and norepinephrine are alertness chemicals made from tyrosine found in high protein foods. Serotonin, which is inhibitory and calming, is made from tryptophan. There are about 50 neurotransmitters that have been identified.

There is growing concern as we age about maintaining neurologic health and brain function. By the year 2030, we will have 80 million Americans over 65. Many will have memory and brain disorders, including dementia, cerebrovascular disease, and disorders like Alzheimer's, Parkinson's, ALS, etc. One way memory is destroyed is through a disruption of the neurotransmitter systems. Let's look at the latest research for neurological health, and actions you can take now to preserve and enrich your brain's functioning and health.

1. **MULTIVITAMINS** – The evidence is overwhelming that a moderate dose of vitamins and minerals is good for you. Especially for the brain and for all ages. They can improve and help intellectual functioning and emotional well being. Pregnant women should take multivitamins with their doctor's advice to help guarantee healthy babies. Most adolescents and adults in today's culture eat diets lacking basic vitamins and minerals essential for proper brain functioning. A multivitamin is absolutely essential for older people who tend to need more nutrient help to support an aging brain.

One of the more important vitamins for the brain is the B vitamins, notably folic acid. An amino acid in our blood that few doctors knew about until recently is now considered a major factor in brain breakdown. It's called homocysteine, and too much of it can accumulate in blood, helping clog and destroying blood vessels, including those that feed the brain. Taking modest doses of B vitamins, especially folic acid can stop and reverse homocysteine build-up.

2. **ANTIOXIDANTS** – A multivitamin is not enough. Most brands do not contain sufficiently high amounts of brain-protecting vitamin E, vitamin C, alpha lipoic acid and coenzyme Q10. These four antioxidant supplements are absolutely essential. Alpha-lipoic acid helps to neutralize the effects of free radicals on the body by enhancing the antioxidant functions of vitamin C and vitamin E.

An additional benefit of this nutrient is that it assures the proper functioning of two key enzymes that convert food into energy. Coenzyme Q10 is an antioxidant similar to vitamin E. It also plays a crucial role in the generation of cellular energy, is a significant immunologic stimulant, increases circulation, has anti-aging effects, and is beneficial for the cardiovascular system.

Experts also recommend ginkgo biloba and Pycnogenol™ as powerful brain protectors. It is better to take several antioxidants instead of just one, because they do not work in isolation, their brain-protecting powers are much stronger when they work together. Synergy is a phenomenon whereby two or more vitamins combine to create a stronger vitamin function. Balance is very important for the proper functioning of all vitamins. Scientific research has proved that an excess of an isolated vitamin or mineral can produce the same symptoms as a deficiency of a vitamin or mineral.

**EAT FOODS HIGH IN ANTIOXIDANTS** – Fruits and vegetables are loaded with various antioxidants. Scientific experiments show the power of antioxidant-packed foods on the brain. Feeding animals common high-antioxidant fruits and vegetables, such as blueberries, spinach, and strawberries, has slowed down brain deterioration, revved up mental faculties and even reversed memory and learning losses in animals. Highest antioxidant containing foods are brightly colored fruits and berries and green leafy vegetables. Snacking on berries, cherries, grapes, apples, prunes, raisins (preferably organic) instead of the usual chips could make all the difference in intellectual power and emotional well-being.