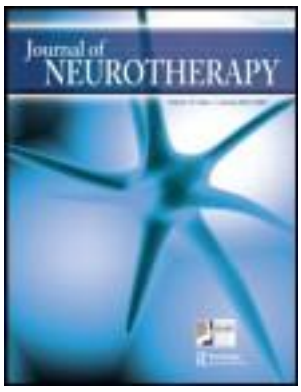

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Neurofeedback Therapy for ADHD and Related Neurological Disorders

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Neurofeedback Therapy for ADHD and Related Neurological Disorders

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This paper presents an overview of neurotherapy as a treatment for ADHD and related neurological disorders. Information was taken from personal interviews with healthcare professionals and from the currently available literature. The controversial nature of this form of treatment is highlighted. Case history information is included. It is concluded that neurotherapy is a viable alternative to other forms of intervention.

Forward

The conviction that ADHD and other neurological disorders have devastating effects on patients and families has been acquired by this writer through personal experience. I have struggled along with my two sons as they have grown from childhood into young adulthood with these problems. I have experienced the frustration associated with receiving inadequate attention and misdiagnosis from our healthcare community. It is very difficult to watch helplessly as young lives are wasted in a struggle with an elusive enemy. My oldest son was diagnosed with ADD at age seven. After receiving numerous forms of ineffective intervention and experiencing side effects with drug therapy, he chose to go through life with no therapeutic interventions. I watched as he battled in his struggle against inferiority. He fought to establish himself as a person of value in a society that does not easily understand an impairment of a person's perceptional abilities. The younger of these two experienced a struggle that more closely resembled a war. At one point in his development he floundered in his attempt to perform even the most mundane tasks of daily life. The heartbreak is made worse when you realize that this same person was an accelerated student in elementary and middle school. He had been tested to have an IQ of over 150 and yet at high school age he failed in every endeavor. His behavior degraded through stages of disruptiveness at home and at school, inability to attend, mania, depression, drug abuse, habitual lying, violence with peers resulting in arrest and ultimately hospitalization for bouts with psychotic episodes. These two are well on their way in the world now, but not without the scars of a difficult childhood.

It is my hope that through this review and ongoing studies in this area additional light will be shed regarding appropriate approaches to treat and even cure ADHD and other neurological disorders. If neurofeedback is indeed a major breakthrough, those in need should be made aware of its benefits. Scientific backlash should be quelled by empirical support. If it is a faddish cure-all, it should be unmasked to prevent further heartbreak for the afflicted.

Neurofeedback Therapy for ADHD and Related Neurological Disorders

The objective of this review is to explore some of the currently available information pertaining to neurofeedback and its application in the treatment of ADHD and other related disorders. This mode of therapy is evaluated as a therapeutic alternative to the conventional approach of pharmacological intervention. This treatment is highly controversial. Some say that neurofeedback is a new breakthrough in brain science. Some consider it a faddish cure-all that is without merit. It is of critical importance to resolve this issue since many in our society have been dramatically disabled by the disorder. It has

been estimated that approximately 5 to 10 % of all children are impacted. (Linden, Habib, & Radojevic, 1997) Many believe that these numbers are exaggerated and that the diagnosis is being misused. Others believe that there has been an increase in incidence and that it is due to some unexplained environmental factor. While the issue of prevalence is important, it is beyond the scope of this review. It is my assumption that the prevalence of ADHD and the magnitude of its disruptive effects on patients and their families is sufficient to warrant all the attention that it can be given by modern science.

Information for this study was gathered from a number of areas. Interviews were conducted with practicing mental health professionals. Among them a psychologist, a psychiatrist and a professional counselor. Each had a unique view of neurofeedback. Supporting information was taken from current journal articles covering research performed in this area. Additional information was taken from papers published on-line by various practicing professionals. It is recognized that clinical and anecdotal information is not as substantial as formal research. Notwithstanding, some clinical reports are used in order to provide an overview of the types of activity occurring in this field and perhaps to provide a better understanding of why there has been resistance from other theoretical camps. This review will begin with the more informal sources of information to introduce the areas of discussion and move from there to the more substantive sources of empirical evidence.

It will be shown that many well-intentioned proponents of this form of treatment, in their enthusiasm, have made claims that are unacceptable to many in the scientific community. It will also be shown that some well-intentioned members of the scientific community, in their enthusiasm to protect the public, have taken a skeptical position. The goal is to resolve the dilemma that is presented to the patients in the middle of such controversy.

General & Background Information

The mode of treatment evaluated in this review goes by many names. It has been called EEG biofeedback, neurotherapy and neurofeedback. For the sake of consistency in this survey the term neurofeedback is used.

Theodore LaVaque provides some interesting background information regarding the development of this phenomenon. (1996) A German physician, Hans Berger, first measured electrical brain activity as EEG (electroencephalogram) in the early 1920's. Berger observed that the characteristics of brain waves changed dramatically as the subject shifted from sitting quietly with eyes closed (slow wave or "alpha") to sitting quietly with their eyes opened (faster waves or "beta"). He also observed shifts when the subjects focused on solving a math problem. He identified the phenomenon that patterns change as attention changes.

Today computer technology has allowed the measurement of activity and the simultaneous display of the information in the form of graphics. The subjects are able to observe their own brain activity and make alterations that are conducive to their specific goals. Activity in the brain that is deemed to be positive is reinforced through reward interactively. Negative brain activity is discouraged. This operant learning process (LaVaque, 1996) is what allows individuals to voluntarily shift brain states or activities that might otherwise be uncontrolled.

The process has been compared to riding a bicycle. (Abarbanel, 1995) Through repetition of actions one learns to correct the balancing movements and to control the bike. New neural pathways are established as the skill is acquired. These pathways, according to some proponents, form a lasting and permanent addition to our mind's storage of memories. The objective is to have the new more healthful neuropathways become dominant and thereby affect a therapeutic change.

Neurofeedback is used in the treatment of numerous conditions. The list includes ADHD, learning disorders, epilepsy, addictions, closed head injuries, pain, post traumatic stress disorders, mood disorders, anxiety, Tourette's Syndrome, schizophrenia, headache, OCD (Obsessive-Compulsive Disorder) and many more. (Byers, 1995) The focus of this work will remain on ADHD with some reference to related conditions such as depression.

For the purposes of this survey it is useful to review a recent definition of ADHD. (Lubar, Swartwood, Swartwood, & O'Donnell, 1995, p. 84) It has now become clear that the primary symptoms of Attention Deficit / Hyperactivity Disorder - inattentiveness, impulsiveness and hyperactivity as well as their various manifestations - are really secondary outcomes resulting from an underlying neurological disorder. The basis of this neurological disorder may be decreased arousal and also associated with decreased noradrenergic activity (Zametkin et al., 1990), increased slow 4-8 hertz theta activity in frontal and central cortical regions (Mann, Lubar, Zimmerman, Miller, & Muenchen, 1991), and decreased glucose metabolism in both frontal cortical and certain subcortical regions. (Zametkin et al., 1990) This mode of therapy has a direct impact on slow wave activity. This change results in increases in arousal and metabolism.

Interview Information

For this writer, initial exposure to neurofeedback therapy as an alternative form of treatment occurred in late 1996. I had been exploring alternative treatments for my own son. He had experienced an acute psychotic episode, followed by mood disorders (depression, mania, lapses of judgment) along with attention deficit disorder. The acute nature of his condition was a shock to those close to him since all of his earlier childhood history had been normal. He had actually been an exceptionally bright and well-behaved child prior to his early teens. After onset this child struggled through two years of misdiagnosis and pharmacological interventions that quelled the storm of his major symptoms but came along with some severe side effects. Problems with local physicians had taken him in his search for help to a specialist. This specialist was a psychiatrist noted for his treatment of neurochemical imbalances and ADHD. He recommended that neurofeedback therapy be considered as an adjunct to drug treatment. In discussions (personal interviews, 1996 and 1997) he explained that, in his view, some good things were possible with this mode of treatment and that it is worth considering.

The next exposure to neurofeedback was with the counselor that he had recommended. In her presentations (personal interviews, 1996 and 1997) a new ray of hope was introduced that had not been seen in a very long time. She reported that her practice was centered on a new mode of treatment called neurofeedback. She maintained that many believe it to be the most dramatic breakthrough in the treatment of brain related disorders in our lifetime. She went on to say that it is making some of the other traditional forms of therapy obsolete. It is a therapy that holds the promise for a non-invasive and long lasting change (cure) with no side effects. She cited one of her own clients who had been diagnosed with dissociative identity disorder. This patient was integrated (multiple personalities brought together) in only four sessions. Conventional therapy for dissociative identity disorder requires an average length of treatment of two years. (Davidson & Neale, 1996) The implication of what she was saying was a stunning revelation. My son had been enduring drug therapy and all of its side effects with only limited remission of his condition. The counselor concluded by recommending that an informed decision be made regarding treatment and offered supporting information. She went on to recount various case histories of patients that she had helped with neurofeedback.

This interview and the claims made by the practitioner are significant to this review in a

number of ways. First, it highlights the emotional aspect of the introduction of a new and promising therapeutic intervention. The human suffering to patients and their families is dramatic. They want to believe in new "miraculous" cures. Perhaps we have come to expect these things from our modern medical and scientific community. Second, it is easy to see why some would question the validity of such claims. Further, it becomes more clear why some theorists and practitioners might be threatened by such statements.

The next exposure to the idea of this form of treatment was through a discussion with a well-respected psychologist that practices in the area of ADHD and related disorders. (personal interviews, 1996 and 1997) His advice was to use caution. Many of the professional associations and support organizations associated with ADHD have not accepted neurofeedback as a viable treatment alternative. Much of the information available to the public is anecdotal and based on case histories from limited practices. His position was that claims of cure are not based upon scientific fact and thereby should be viewed skeptically. Neurofeedback had been a part of his practice at one time but had been eliminated in favor of pharmacological intervention. Drug treatment, in his estimation, is more cost-effective and well accepted in the mainstream of the medical community.

It is important to note that this practitioner makes a good point in support of drug intervention. Many persons afflicted with this and other neurological disorders have been helped dramatically by medications. Many that a few years ago would have been condemned to a life of compromise, or in some unfortunate cases institutionalization, are now leading happy and productiv e lives because of breakthroughs in this area. The future holds even more promise as more is discovered in the area of brain chemistry. The question that arises is not whether drug intervention is good or bad. The question is whether or not it is the best intervention.

Curiosity led to some investigation regarding the advice that is being given by leading support organizations. CHADD (Children and Adults with Attention Deficit Disorders) is a well-known national level support organization for those afflicted with ADHD. In a published position statement (CHADD, 1995) this organization makes their position very clear. They warn that many treatments have been advocated for ADHD that have not been proven effective. They continue by stating that other treatments are completely inconsistent with current knowledge about the disorder. Their specific warning is, ".... parents should be wary of investing time, money and their child's interests in unproven, questionable treatments, such as EEG Biofeedback." (p. 1) They express their support for behavior management, parent training and medications such as psychostimulants. They continue by expressing their disfavor with warnings like, "Impressive statements have been made about treatments that are unproven or yet to be evaluated in accord with scientific standards ... parents become desperate for a "silver bullet" treatment ... and become vulnerable to exaggerated or misleading claims." (p. 3) Their recommendation is that parents, " ... only provide their children treatments that have been scientifically proven to be safe and effective ... to be suspicious of overstated and exaggerated claims (of) treatments that claim to treat a wide variety of ailments ... EEG Biofeedback is the controversial therapy of the moment." (p. 4)

There is an obvious conflict of opinions within the healthcare community. The next steps in this survey are to review the available information pertaining to what is actually being accomplished with this treatment clinically and then to follow that effort with a look at completed research.

Clinical Information

According to Theodore J. LaVaque (1996), patients with impulse and attentional problems who are treated with neurotherapy learn

to shift voluntarily from the inattentive state reflected by slow wave (Theta) activity to the attentive state reflected by faster activity (Beta). In his practice subjects describe themselves as realizing when they are losing focus and working to re-establish attention. In his opinion they are more accurately discriminating their alternative states and are internalizing the ability to exert voluntary control.

Joel Lubar (1997) in his position statement on the treatment of ADD/ADHD with neurofeedback maintains that this therapy is a powerful adjunctive technique to be used in the treatment of attention problems, task completion, organizational skills, impulsiveness and mild hyperactivity. He reports that the majority of his patients completing treatment show marked improvement. He lists the results of treatment as:

- Improved behavior and learning.
- Improved school grades.
- Increased self-esteem.
- Better job performance.
- Greater realization of innate potential.
- Higher IQ scores.
- Improved parent-teacher behavior rating scores.

Finding practitioners who agree with the recommendation for a new therapy is of some value to a prospective patient and family but several questions remain as the empirical evidence is weighed:

- What results have been demonstrated?
- Are the assumed effects long lasting or temporary?
- How does it compare with other forms of treatment?
- What are the dangers?

Empirical Evidence

What Results Have Been Demonstrated?

In a paper presented to the Annual Conference of The Society for the Study of Neuronal Regulation by Lynda Thompson, and Michael Thompson, (1995) a case history of 15 boys treated with neurofeedback training was presented. Symptoms were a mix of severely inappropriate behavior, immature social interactions, Attention Deficit Disorder and Learning Disabilities. The unique aspect of their work was the study of severely socially impaired children who also exhibited the symptoms of ADD and LD. Nine of these children met all the criteria for Asperger's Syndrome. This is a neurological disorder in which the symptoms rarely change with traditional approaches. Parental, school reports of social behavior, intellectual testing, school report cards, feedback from parent-teacher interviews, ADD check-lists and the TOVA (Test of Variables of Attention) were the measures used. All 15 boys demonstrated improvements in all areas of functioning. Of the 15, 13 are now off medications (two remained on low doses for specific situations). All improved in academic functioning by at least a year's growth in standard tests in their first six months of training (some showed as much as five year's growth in grade equivalent scores). The most dramatic change observed was the shift toward normalization of their social interactions. This was the first major change noted by the families.

Three other difficult cases were also presented. Prior to receiving neurofeedback they had, "considerable intervention both from the school systems and from other clinical resources. All previous efforts ... had minimal benefit" (p. 2). The results of treatment for these patients were that they began developing friendships and no longer required behavior management at school. An issue raised for future research was to determine the degree that biofeedback actually accelerates neurological maturation.

A controlled study was performed that links cortical activation levels to Theta wave activity. (Mann, Lubar, Zimmerman, Miller, & Muenchen, 1992) The study demonstrated that reduced glucose metabolism as evidenced in PET scans correspond to decreased cortical arousal and increased Theta activity. This evidence provided

an 80% predictability for ADHD group membership. This is important in that one of the goals of neurotherapy is to directly reduce Theta wave activity.

Research on the impact of neurofeedback on Wechsler (WISC-R) scores was performed by Michael Tansey (1991). His study showed that WISC-R profiles "normalized" as a result of training and that there was significant remediation of learning disorders. He studied 211 children with a history of learning disabilities. An average of 27.9 sessions was performed in a single blind condition. As observed, Theta band waves were reduced by 64.3% through the neurofeedback regimen. Twenty-two of the 24 subjects showed increases in their full scale IQ of at least one standard deviation (15 IQ points), with the remaining 2 cases showing an increase of 14 and 13 IQ points. Both verbal and performance IQ scores increased for all subjects. Tansey observed that these results are more significant in light of recent research pertaining to the stability of Wechsler scores for learning disabled populations. Various studies of groups from 7 months to 17 years show very little impact of many years of remedial education and/or (conventional) psychotherapeutic intervention for the learning disabled.

Recently a similar study was performed to measure the effectiveness of neurofeedback training for ADHD (Lubar et al., 1995). The subject pool consisted of 23 children and adolescents ranging in age from 8 to 19 years. The test occurred over a 2 to 3 month period during which an intense regimen of neurofeedback training was administered. Treatments were given daily (Monday through Friday) in one-hour sessions with the goal of completing as close to 40 sessions as possible. Findings indicated that there were significant improvements in TOVA scores, significant increases in WISC-R scores and improvements in parent ratings.

Additional research was performed using the Kaufman-Brief Intelligence test to measure IQ and parental behavioral reports of inattention (Linden et al., 1997). The test was made up of 18 patients, 9 in an experimental group and 9 in a wait list (control) group. Sessions were performed twice weekly with a total of 40 sessions completed. It was found that the experimental group demonstrated a significant increase in composite IQ. The increase was nine points higher than the control group. The treatments also reduced inattentive behavior as reported by parents. It was proposed that the increases in IQ were the result of the treatment having an impact on the subjects' ability to attend and concentrate rather than actually increasing their intellectual potential.

Are the effects long lasting?

Follow-up of a patient treated ten years earlier confirms the long-term stability of the neurofeedback regimen according to Michael Tansey (1993). Since this is a new procedure there is relatively little hard evidence of the long-term effect of therapy. This is a follow-up of one of the first feedback patients treated. The subject was a boy, age 10, who was classified as perceptually impaired at age 7 ½. He had about average intelligence potential but exhibited a high degree of anxiety and hyperactivity. To read he had to move his head from side to side in order to track the words across a line of print. As of his third feedback session (medications had been discontinued), his behavior was marked by an absence of his presenting symptoms of motoric activity, high distractibility, low frustration tolerance and poor self-control. During the course of treatment he became able to read, tracking smoothly along a horizontal axis while keeping his head stationary.

Before treatment, in grade 4, he was placed in a special education setting and was found to be about one year behind expected levels. After treatment he was placed in a normal class setting and achieved a C in Reading and a B in Spelling with a total of 3 A's, 3 B's and 4 C's, no D's and no F's. Feedback training was terminated after his first report card with concrete evidence of

improvement. Follow-up on progress was performed through his first year to ensure the lasting effects of treatment. Additional reports were made after two years. Ten years after treatment this subject continues to succeed academically and personally. Starting in grade school, Jr. High and High School he was voted to positions of honor and responsibility. Currently he is earning a 2.5 GPA in college.

It is proposed that the experience of this first learning disabled child with neurofeedback demonstrates that "he exercised his brain out of a dysfunctional state which enabled him to prosper personally and academically from grade 4 through college." (Tansey, 1993, p. 5)

Other studies have suggested that neurofeedback leads to long term symptom reduction. Andrew Abarbanel, researched the scientific basis of neurofeedback therapy. (1995) He proposes that neurofeedback results are more persistent than those with stimulant medication. His findings suggest that the changes achieved can become permanent. His research pertains to a process called long-term potentiation (LTP). According to Abarbanel:

"LTP is defined formally in terms of laboratory measurements; it is a stable and relatively long-lasting increase of synaptic response to a constant afferent volley following brief high-frequency stimulation of the same afferents ... it is likely that the marked plasticity of neurons in the limbic system contributes to this circumstance; specifically, these neurons respond to repetitive afferent signals by increasing the efficacy of their synapses in rapid and long-lasting fashion." (p.8)

Of particular significance to ADHD is that it has been demonstrated that similar stimulation induces LTP in the prefrontal cortex. His suggestion is that neurofeedback results are more persistent than those with stimulant medication because neurofeedback and stimulants may operate at different locations with different receptivity to long-term potentiation.

Is it as effective as drug treatment?

Recent studies have shown that neurotherapy is an effective alternative to stimulants and may be the treatment of choice when medication is ineffective, has side effects, or there is a compliance problem with taking medication. (Rossiter & LaVaque, 1995) Comparisons were made with 46 patients, 23 used neurofeedback and 23 used stimulants. They were matched by age, IQ, gender and diagnosis. The Test of Variables of Attention (TOVA) was administered before and after treatment. The results showed improvement in TOVA scores in both the feedback and the medication groups with no significant difference between the two groups.

Discussion

The diverse positions held regarding neurofeedback and the dramatic results being reported clinically have prompted other researchers to tackle the issue of its validity. In their review of the subject Siegfried Othmer, David Kaiser, and Susan Othmer (1995) concede that the knowledge base regarding this treatment is increasing primarily through clinical use as opposed to controlled research. Statements from their paper include:

"The clinical findings leave the matter of efficacy for ADHD beyond any reasonable doubt ...data taken from the various studies reviewed supports the model that neurofeedback is effective in changing neurological function which contributes to the symptomology of ADHD ... improvements in IQ scores are found in all of the studies ... behavioral improvements were noted in all of the studies." (p. 27)

"We suggest, in summary, that the TOVA results obtained in actual clinical settings are sufficiently cogent and robust to justify the

enthusiasm for EEG training which is building among clinicians, and to justify the interest of academic researchers. Finally, the above data should cause any objective researcher to desist from asserting that clinicians may be premature in using this technique clinically. In particular, contamination by placebo factors does not invalidate the finding of significant improvement." (p. 36)

"We believe that the discoveries now being made in the field of EEG biofeedback portend a watershed in the field of mental health and of education as the implications of these findings are gradually assimilated." (p. 37)

These researchers take the evidence in support of neurofeedback therapy quite seriously. Some believe that, in the future, it could become the preferred mode of treatment. Certainly families with children affected by ADHD would be served by a treatment that has no drug-induced side effects and that can bring about a permanent change.

The aspect of permanent change (cure) is what has caused many to reject this mode of treatment as too radical. Other new ideas have received a similarly cool reception from the scientific and medical community especially when they promise to rearrange modes of treatment. During the course of this investigation one healthcare professional made the observation that large pharmaceutical companies provide funding for support groups related to various disorders and that this may explain some of the resistance. While it is possible that there is some sort of influence being exerted that pertains to funding, it is more relevant to this review to make the observation that this notion is even being entertained as a possibility by some in our healthcare community. The possibility may be outrageous but patients, after being made aware of this idea, are left with a feeling of doubt regarding whether their best interests are being served. Also during the course of this investigation another healthcare professional expressed the opinion that little work is being done to research neurotherapy in the "mainstream" of science and medicine. This is true, not because of some conspiracy from powerful companies, but because of a negative reaction to the premature claims of results made by its proponents.

It is for this reason that more studies by unbiased researchers are needed to confirm or disprove these findings. These studies should be performed with larger numbers of patients, long-term follow-up and double blind approaches. The information gained would either more firmly establish the viability of this treatment or more authoritatively classify it as a poor or useless mode of intervention.

What are the Potential Dangers?

Until additional research is completed individuals and families are left with a difficult decision. The evidence that is available today must be weighed comparing potential benefits to possible problems. The decision is whether to take a chance with a relatively new treatment. The hope is to limit drug side effects and affect a permanent change or cure. The negatives risked are possible wasted resources (time and money) and potential exposure to side-effects that are yet undefined. Regarding exposure to unknown side effects, there have been no problems reported with proper application. The treatment does have an active influence that can bring about very positive changes. The only negative aspect uncovered during this investigation was that when used improperly, as with other powerful interventions, problems could be enhanced rather than alleviated. (Othmer et al., 1995) This highlights the importance of working with highly skilled and reputable healthcare professionals.

As with all new treatments, the decision to proceed or to wait is a personal one. There is enough evidence in favor of this mode of treatment to proceed with caution. Perhaps neurotherapy should be considered as an adjunct to conventional treatments. If the effects are indeed significant and

long lasting then the result will be a reduced dependence on medications. If there is no effect, the medications are in place to provide the needed intervention. There is no guarantee that it is safe. There was no evidence discovered during this review that there are dangerous side effects. Further, the potential benefit to patients and families that are affected by this disorder is enormous. In most cases, these people have been told that they have a condition that will persist throughout life. The fortunate ones are permanently dependent on drugs to reduce their symptoms and must live with the accompanying unwanted side effects.

It is my hope that the politics of funding, if they are at play in this situation, can be put aside. It is also my hope that any negative stigma assigned to this mode of therapy by the scientific community can be overcome with additional research. Perhaps new discoveries in the area of brain science will contribute to its understanding and acceptance. Certainly more definitive information is needed to reduce the controversy and the related distress to prospective patients.

Follow-up

Shortly after this work was completed, this writer was forced to make a difficult decision for or against neurotherapy. The condition of my youngest son had worsened. After five years of struggling with a devastating form of illness (mental disorder), our family was no closer to knowing what was troubling our child. The cause of the illness remained a mystery even to the healthcare practitioners involved. The only thing that came close to making sense was the possibility of a closed head injury that had occurred at age 8. Theoretically, a microscopic lesion could have occurred that subsequently interfered with his brain development. In any event, our hand was forced when our son's psychologist and psychiatrist divulged that they had been in discussion regarding where to hospitalize the young man for what they saw as the onset of another psychotic episode. Other bad news had been received that the boy was showing signs of psychopathy, a particularly difficult form of personality disorder. This news was devastating to the family since the majority of mental health professionals feel that the condition is resistant to most forms of psychotherapy. The prospect of hospitalization was also ominous since there is the danger of permanent damage from anti-psychotic medication in addition to the isolation and helplessness experienced.

After completing the research outlined above, the decision to employ neurotherapy was made. The doctors were not informed of the decision until the therapy was completed. The secrecy was partly to relieve them of any responsibility and partly due to the pressing nature of the situation. The boy was immediately sent to a neurotherapist in Dallas, Texas. An intensive program of therapy was initiated that included two sessions of training per day. It was to continue for a period of two weeks. After five sessions, the boy reported that he did not want to tell anyone about how he felt or even get up out of the chair from his therapy for fear that his feeling of well-being would go away. His mother who was with him in Dallas began to report that she was experiencing a level of closeness with her son that had been lost for the last five years.

When he returned home it was immediately apparent that there had been a remarkable change. There was expressiveness in his face that had not been seen since he was a young boy. There was a return of his impish grin as his whole face expressed the joy of each moment. What was experienced was the return of a son that had been lost to mental illness for five years.

At this writing it has been over six months since this young man received neurotherapy. He was not hospitalized. He did not require anti-psychotic medication. Actually, he discontinued all of his mood stabilizers and other medications as soon as he returned. During these last six months he has successfully completed high school, taught himself classical guitar and held a job waiting tables in a restaurant for his spending money. He is now discussing college and looking forward to

utilizing his exceptional IQ to the best of his ability.

This case history demonstrates the potential for neurotherapy as an effective intervention for patients with neurological disorders. The indecision on the part of his healthcare team along with the degree and duration of suffering are indications of the need for better dissemination of the existing empirical support to the healthcare community. This writer is left with the question of what might have been if neurotherapy had not been employed for this young man. We are indeed very thankful that it was.

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