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## **Beyond ADHD: Reaching the Unreachable Child**

Neurofeedback is best known in connection with remediation of Attention Deficit Hyperactivity Disorder (ADHD). It is clear that ADHD has become a convenient defining label, one that is applied to many childhood problems that are not classically attention problems. Many of these challenging children are likely to be referred for neurofeedback after standard remedies fail. This article expands upon the use of neurofeedback in treating conditions such as anxiety, depression, and severe mood swings, and, additionally, in treating motor and vocal tics, obsessive and compulsive behavior, and learning disorders.

The article also examines the use of EEG biofeedback in treating more extreme behavioral disturbances. This includes children who are rageful and explosive, emotionally disengaged, cold-blooded or sociopathic (the fire setters and torturers of animals), hypersexual, suicidal, and drug-involved. The remarkable case studies and

scientific evidence underscore the scope and utility of neurofeedback in healing the most dysfunctional, challenging, and disenfranchised children who are driven by significant brain-based disorders.

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ADD/ADHD has become a convenient defining label, one that is applied to many childhood problems that are not classically ADD/ADHD. The diagnosis has become a bit of a catch-all, one that increasingly gets a nod of affirmation, as the society gets used to this kind of wholesale labeling of our children. It is true that many of the other conditions that are swept up into the maw of the ADHD diagnosis have problems of attention and impulsivity associated with them. Thus, the association with ADHD is not entirely off-base. Also, the intent of the diagnosis is often merely to sanction a medical intervention for behavioral issues — the details to be sorted out later. In this article, we look at the “penumbra”, the partial shadow around ADHD from the new perspective of the Disregulation Model, which makes for a more natural connection between all of these different conditions. We also discuss the applicability of the Self-Regulation Remedy — neurofeedback — to these conditions.

In truth, the most neurofeedback clinicians have much experience with the challenging, more complicated cases. The classic ADHD is a bit like the hole in the donut. If 10 milligrams of Ritalin a day largely solves the problem, parents are less likely to mobilize to find another solution. The reservoir of parents who are categorically unwilling to medicate their children is not as large as it may appear. Accordingly, the biofeedback therapist is unlikely to see the easy cases dominating the practice. It is much more likely that children are referred after standard remedies have been exhausted or found wanting. Who are these children?

## **Impulse Control Disorders and Conduct Disorder**

The most obvious penumbra around ADHD includes the more severe disruptive behavior disorders: Oppositional-Defiant Disorder and Conduct Disorder. These are part of a classification called Impulse Control Disorders. Many of these children elicit the attention of the juvenile justice system. Left unresolved, these issues then show up in the prison system. Larry Dizmang, Chief of Psychiatry for the California Department of Corrections, found that among prison mental health referrals, some 75% of inmates had been diagnosed in childhood with ADHD, and some 75% of these had, in fact, been on Ritalin at some point in their lives. Attention Deficit Disorder and its clinical relatives apparently outlived the remedy in these cases. In fact, one major follow-up study found no difference in the adult years in measures of social pathology between those who were medicated in childhood and those who were not. Treatment of ADHD left little or no lasting benefit unless it was continued. The measures of social pathology included the following: antisocial behavior, criminality, suicide, addiction, and divorce. There is an urgent need for a more fundamental and lasting solution to the problem. Neurofeedback offers such a solution. This is particularly necessary for the emotional dysregulation that may accompany ADHD, which is not remediated by stimulant drug administration. Here we have the first major category of conditions, one of many, in which neurofeedback can address the needs of the “Unreachable Child”.

## **Anxiety and Depression**

The first category comprises children who are depressed or anxious. In the mental health field, anxiety and depression are the most prevalent reasons people seek help from professionals.

Increasingly, this is also becoming the case for children. A significant percentage of children are prescribed antidepressants rather than stimulants to help with their attention problems. The connection is not difficult to see: Children who are depressed or anxious cannot pay attention well. Also, depression often manifests itself in children in non-classical ways, such as acting-out behavior or surliness and being thin-skinned or prickly.

A few years ago a major study showed that ADHD could be classified in terms of three principal categories by features observed in the EEG. What gave weight to this classification was the fact that these three categories lined up neatly with medication response. Thus, one particular EEG feature, in which children showed a large EEG signal in the low frequency range around 4-8 cycles per second, was correlated with response to the stimulants. A second key EEG characteristic, elevations in EEG in the range of 8-12 cycles per second, was associated with a favorable response to antidepressants. Yet a third category, in which the EEG was highly uniform between the two brain hemispheres, was responsive to a third category of medications, the anticonvulsants.

Interestingly, the same three categories also held for people who came for help with anxiety and depression. And, the same correlations held for the medications. So, some of the depressed children would be helped with stimulants rather than the antidepressants, and some of the ADHD children manifestly responded better to the antidepressants than to the stimulants. This was an unambiguous demonstration that there were basic subtypes of dysregulation that could each masquerade as ADHD or as depression. In order to get at the heart of the matter, one had to look beyond the surface data and look at the core issue of what gives rise to the particular dysregulation.

Since our own concern is the administration of neurofeedback for these conditions, it was satisfying to observe that these different EEG patterns also lined up with neurofeedback protocols. In fact, they did so in an obvious way. Where the EEG was elevated at the lower frequencies, the training generally also had to be done at lower frequencies, and vice-versa. Where the EEG indicated that the two hemispheres appeared too tightly coupled, training to promote their differentiation proved helpful. The correlation of neurofeedback training procedures with medication efficacy supports the view that both have the specificity to deal with different aspects of dysregulation. Both are capable of telling us more than was apparent just from looking at symptoms, and both were revealing distinctions not supported by the standard classification schemes. It is clear that the response of the brain to both medication and neurofeedback speaks to a more fundamental truth about these conditions than mere symptom description affords. This appears to be a fundamental reality about dysregulation. There are certain simple patterns of failure from which many disparate and varied symptoms arise.

We found it quite possible to train the brain to recover from depression and to substantially reduce the anxiety response. As with attentional deficits, we are still talking about states of the brain, and the brain appears to have sufficient plasticity in most cases to allow it to function normally. The very first case of depression we treated was a young man who was unable to keep any kind of job because of his depression. It turned out that he had suffered a head injury in a pool accident some years before. He was not the same afterwards, but since there had been no skull fracture, it was not considered to be a medical problem. The depression was traceable to this event, and he never recovered from this incident. After some months of training, he told us that he was holding down three jobs. Quite possibly, the training helped his cognitive function in various ways also, such that he

was confident in pursuing employment; this, however, was never tested.

Just as ADHD has several key aspects, or subtypes, depression also has many facets. Neurofeedback has helped to establish that depression depends somewhat on which hemisphere is affectively predominant. When the left hemisphere gets depressed, this often manifests through feelings of low energy, of helplessness and hopelessness. Training the left hemisphere readily helps this kind of depression. We often encounter this type of depression in teenagers; with recovery, the news for the parents may be ambivalent. The erstwhile lethargic couch potato now may become a normal teenager, smart mouth and all. But, depression is not the better alternative, even if the parents may have second thoughts about the recovery.

Another kind of depression involves the right hemisphere. This may express itself in very dark, suicidal depression, or in agitated depression that can even manifest in violence against others. The suicidal episode can appear to come out of the blue, or at least out of the blue of depression. It need not seem rational, or be understandable in terms of life circumstances. That's because this kind of depression is just another instance of the brain running amok. Fortunately, this kind of depression yields readily to brainwave training of the right hemisphere. In fact, even a single training session may be able to abort a suicidal episode. Of course, a single training session is not the answer to suicide. It is then necessary to train over the longer term so that the brain is less likely to fall into such a black hole again. In the last several years, we have also found it helpful to train the interaction between the hemispheres. Perhaps one hemisphere helps to stabilize the other. This supports the view of suicide as another instance of brain instability.

Suicidal events are difficult to treat medically. Typically, children are hospitalized until the suicidal episode passes, but there are no obvious medical remedies. This is one of those instances in which the neurofeedback remedy is an easier and surer path. Given the intractability of suicidality, the utility of neurofeedback almost defies belief. It must be recognized that neurofeedback in this instance zeroes in on precisely what needs to be done, namely improving stability in brain function and calming the right hemisphere. A more stable brain is less likely to undergo the excursion into suicidal behavior. We are once again confronted with persuasive evidence that the problem of suicide lies in the bio-electrical organization of the brain, the realm of frequency rather than that of neurochemistry. The whole matter of suicide in adolescence is the second example in which neurofeedback reaches the “Unreachable Child.”

A Harvard study has shown that major depression is an issue with about a quarter of ADHD children, and about a third are troubled by major anxiety. One in eight children contends with both. A subset of children who are both ADHD and depressed are of particular concern. These have recently appeared under the umbrella of “Bipolar Disorder” in childhood. This classification may involve as many as 20% of ADHD children.

### **The Bipolar Child**

It used to be that bipolar children did not exist. Or, at least, no one was raising this as an issue. Bipolar Disorder was seen as a progressive condition that showed up mostly in early adulthood, typically growing out of long-standing depression. No more than one out of 200 cases had origins that were traceable to childhood. The depression histories in these people were episodic, indicative of an underlying instability. Eventually these people would cycle between episodes of depression and episodes of mania.

More recently, a child psychiatrist named Demitri Papolos has gone public with his views that a commonplace finding in children is a set of symptoms reminiscent of bipolar disorder. It is characterized by wild mood swings and ultra-rapid cycling of behavior. Episodes of explosive behavior as well as mindless and violent defiance can alternate with periods of calm. These children might actually do well at school, but then crash and burn as they return home at the end of the school day. There may be marked irritability and oppositionality. These children may have racing thoughts, exhibit grandiosity and risk-seeking behavior, and yet be overly sensitive to criticism. There may be obsessive qualities as well as motor and vocal tics. These children tend to exhibit both sleep and appetite regulation problems. Perhaps as many as two-thirds of depressed children may be at risk of conversion to the bipolar pattern. Papolos even speculated whether there might be a common physiological basis for bipolar disorder, conduct disorder, and ADHD, since there is so much overlap between them. We trace all of these of course to some few characteristic patterns of dysregulation.

Now, one child psychiatrist does not get to rewrite the Diagnostic Manual of psychiatry just by writing a book and getting on the lecture circuit. His model of the “Bipolar Child” really came out of the growing observation by many psychiatrists of a class of children who are not responding to the classic stimulants or antidepressants, but rather need (in their medical opinions) to be treated with anticonvulsants and even the antipsychotics. It is a continual dance to try to medicate these children toward stability. Since these are major medications with lots of side effects, the usual story about ADHD could hardly suffice as a motivation. A new classification was needed to rationalize the new medication strategies, and Bipolar Disorder filled the bill. One particularly poignant case tells the story:

A neurofeedback practitioner in Ohio was working with an ADHD child when the mother suddenly stopped the training. Her pediatrician had told her that she did not need to spend all that money on neurofeedback. A little dose of Ritalin was all that was required. She took his advice. About a year later, the clinician encountered the mom at a local civic function, and inquired about her son. Well, after a few months of Ritalin, he started getting depressed. The pediatrician, however, remained of good cheer. *Okay, we'll just prescribe a little antidepressant, and that should take care of it.* A few months later, the child developed a pattern of uncontrolled rages. Then is when they started on a regimen of Neurontin; when that did not take care of it, Risperidol was added. At the time of the conversation, the child was on four major medications: a stimulant, an antidepressant, an anticonvulsant, and an antipsychotic. And, things were still dicey at home. The pediatrician continued to insist that EEG biofeedback was not necessary.

This case illustrates one factor that is empirically inescapable: Inappropriate medical management appears to set these children up for greater problems later. Papolos makes the point that these vulnerable children are not well-served by the standard stimulants and antidepressants, and that these can contribute to the children's subsequent difficulties. One reason we may be experiencing a national epidemic of childhood Bipolar Disorder is that the indiscriminate disbursement of stimulant medication to millions of our children is accelerating the destabilization of those who are vulnerable. One would never find this out from the studies, of course. The studies only ask the question, does the medication help, or does it not. The question of whether the medication actually makes someone worse is not even asked. Also, most studies are short-term, so the long-term impacts are not scientifically investigated in any event. To this day, there has been no large-scale controlled study of the long-term effects of Ritalin, even though it has been around since the 1950's.

The story of neurofeedback for bipolar disorder has been emerging over the past dozen years. This trend is reflected in the following narrative by a neurofeedback practitioner regarding his own bipolar son:

### ***My Bipolar Son***

My son Nick is currently 21 years old. Nick was a beautiful, happy infant who loved to be held. A precocious child, he began talking in complete sentences before he was one year old. One day, I found him picking out tunes on a toy piano when he was 4 years old. He had perfect pitch.

Nick, however, became more difficult as he grew older. During his fifth grade teacher conference, his teacher broke down in tears. New to teaching, she sobbed that maybe she had gone into the wrong profession. Nick had worn her out. It was difficult to get baby-sitters for Nick; even his grandparents would make excuses why they couldn't watch him. One day I took him to a children's karate school. After one session, the karate instructor said he could not come back and that I should take him home and beat him. During a long distance bus trip with the Scouts, the parent chaperones wanted to send 10-year-old Nick back on a plane. They had had it with his impulsivity. They actually started a fund to buy his ticket. Nevertheless, at times he could be incredibly charming, loveable and sweet. Nick was neither mean-spirited nor angry. Some teachers could see past his problems, and loved him dearly. His younger sister adored him. Nick had a heart of gold.

Nick continued to get more difficult as he got older. In seventh grade, he started slowly downwards, and it was the beginning of disaster. Grades declined, and impulsivity increased. Having already broken a couple of bones, he broke three more bones in a

nine-month period. In high school, his impulsivity continued to increase. He started dyeing his hair unusual colors. Waking up and going to sleep became more and more of a power struggle. He wanted to stay up all night and sleep during the day. He could get by with very little sleep. We started getting telephone calls and letters from the school more and more frequently. In tenth grade, he crashed. His grades dropped to a 0.7 GPA. He went from detentions to suspensions and finally to expulsion. The school wanted him medicated for ADHD, but, because he had tics, we refused. My wife, a physical therapist, said she had seen too many children develop severe tic disorders who only had mild tics before the medication.

Nick was expelled from school on a Wednesday. I was going to an out-of-town EEG Biofeedback workshop on Thursday. I decided to take him with me. At times, such as traveling, he could be a delight to be with. I believe that divine intervention was involved. When we got there, the instructor wanted a volunteer, so I quickly volunteered Nick. The instructor (Professor Joel Lubar), who originated using EEG Biofeedback for ADHD back in the seventies, did a diagnostic evaluation known as brain mapping. During the break, he asked me if I knew that my son was ADHD and bipolar, with an addictive personality. Even though my father and my brother were bipolar, it had never crossed my mind that my son could possibly be bipolar — although, with the increased use of stimulants and antidepressants, very young children are now being diagnosed as bipolar. My father was not diagnosed until he was in his 50's, my brother not until his 40's.

I knew that Nick was ADHD, and we had second-mortgaged our home to buy the EEG Biofeedback equipment to treat him. This happened because one day while home sick I turned on the TV and I heard someone say there was a new treatment for ADHD. This was January, 1993. Again, I believe that divine intervention was involved. The new therapy was EEG Biofeedback, also known as

neurotherapy. After we researched the procedure, my wife and I decided it was cheaper to purchase the equipment ourselves and train in the use of it than to spend six months in California having Nick treated. We were, however, having a difficult time stabilizing him. One protocol would reduce his impulsivity and eliminate his tics, but eventually he would become too relaxed and begin sleeping too much (all night, after school, and during school). Using the opposite protocol would decrease his sleeping, but eventually it would decrease too much and he would sleep only a few hours a day. As his sleep decreased, his impulsivity returned. The workshop instructor, who used only one protocol for his clients, told us that EEG Biofeedback could not help Nick and that we would have to put him on medication. My wife and I felt crushed. My father was one of the first people in the United States to go on lithium, almost 30 years ago. My father died last year. We were told that the toxicity of the lithium hastened his death. For the last 15 years before his death, he had Parkinson-like tremors in both of his hands. We were told that the lithium caused the tremors. The tremors and the health problems my father developed from medications were frightening. Eventually, my father also benefited greatly from EEG Biofeedback, but the damage had already been done. We were concerned about the long-term consequence of medication, but felt Nick wasn't going to make it to adulthood if we didn't do something right away. We believed this impulsivity and risk-taking were life-threatening.

I consulted with the company that sold us the EEG Biofeedback equipment, and they said they had recently developed a protocol for Bipolar Disorder. We started treating him with the bipolar protocol in March (2000), and hoped we could get him turned around by fall when he would be allowed to go back to school. Over the summer he seemed to improve. His impulsivity decreased. He became more cooperative. His affect and sleep improved. Nick went back to school in the fall, and he stayed out of trouble. He made new friends. His grades improved to A's and

B's. Not only did the teachers like him, but he was voted the most improved student. My wife and I believe he could not have made it through school without EEG Biofeedback. If we had placed him on Ritalin, as the school was trying to force us to do, the stimulant would have aggravated his tics and precipitated even more serious emotional problems.

One more detail needs to be added to this remarkable story. Nick's mother at one point picked up the New York Times bestseller by Danielle Steele, *His Bright Light*, which is the story of her son Nick Traina. The similarities between the stories of the two Nicks goes far beyond the name they had in common. It was almost uncanny. Danielle's son Nick preceded the one of our story by just a year. He succumbed at age 19 to suicide in 1997, when the Nick of our story was still 18. The difference between the two trajectories was neurofeedback. And more neurofeedback. Can we really suggest that with neurofeedback the suicide may have been prevented? Actually, *yes*. In Bipolar Disorder suicide is not a rare occurrence at all. Perhaps as many as a third of such severely impacted individuals may succumb at some point in their lives. With neurofeedback, this fate can largely be prevented. This is something that should be shouted from the rooftops.

One other story illustrates the clinical complexity of Bipolar Disorder in children, particularly when medications are involved:

Ron was brought to clinic at about 13 years of age. His mother reported that he was struggling with focus and staying on task at school, so ostensibly the issue was garden-variety ADD. A mild ADD condition was confirmed in the testing, but the testing was done while the child was fully medicated. When the history was taken, however, it became clear here was a boy with much more significant issues: A four year history of hair-pulling (trichotillomania), and of obsessive thoughts and compulsive behaviors. As a result, he had no eyebrows or eyelashes, and he

had a bald spot on his scalp. He had been assessed for Tourette Syndrome some years before, because of mild tics when he was agitated. He tended to be anxious. He was routinely verbally inappropriate with his peers, but could be a real charmer with adults. He never made direct eye contact. He suffered from sleep problems and diminished appetite, quite possibly due to some of the medications he was taking. He had little interest in reading.

He had been on a large dose of Ritalin since the age of six (55mg), until it was changed to Concerta, just before neurofeedback was started. There was Remeron for sleep, Zoloft for anxiety and OCD, and Risperidol for good measure. Many of the obsessive/compulsive symptoms actually worsened with the changeover to Concerta.

The response to EEG training was dramatic: By Session 13, the eye lashes and eye brows began to grow back, and the trichotillomania was completely resolved by 20 sessions. Keep in mind, however, that these types of symptoms are known to wax and wane. We were not done, by any means. Although he remained rude and insulting to his peers, his social behavior in general was improving, as was his schoolwork. By this time, his mother reduced his Concerta to 36 mg. (at her own initiative). His sleep was improved on half the original dose of Risperidol. The mother took Ron to the psychiatrist to see the improvement in the hair pulling — all hair having grown in completely. This doctor refused to sanction weaning from the medications, and was adamant about the boy going back to the original dose and increasing counseling from once to twice per week. The mother became very angry about the doctor's unwillingness to see Ron's improvements and fired her, giving charge of the boy's meds to his family doctor.

Doctors will, of course, insist that all sorts of studies be done to validate neurofeedback for Bipolar Disorder before they would

recommend it, and they will, no doubt, fight it tooth and nail, all the while promoting their favorite medications. But there aren't any large-scale controlled studies on Risperidol and Zyprexa for bipolar children either. Physicians are just experimenting on our children, one drug at a time, or even piling one drug upon another indiscriminately, in an almost desperate effort to stabilize them. When these practitioners are challenged, their answer is disarmingly simple: The drugs are observed to work. But, neurofeedback has been observed to work as well. Our evidence is of the same quality as theirs: Clinical observation of improvement. Parents of bipolar children have every reason to try neurofeedback, even if their children are currently satisfactorily medicated. This is because the medical approach to stabilization appears never to be quite finished. The brain keeps changing, and the challenge keeps getting larger over time. The antipsychotic medications have a uniform history of adverse long-term effects. These children need all the help they can get. We therefore see Bipolar Disorder as the third major category in which neurofeedback can reach the "Unreachable Child."

### **Complex Partial Seizures, or Temporal Lobe Epilepsy**

Harvard neurologist, George Murray, said more than ten years ago that Temporal Lobe Epilepsy was under-recognized by mental health professionals by a factor of twenty-five. Matters have not gotten much better since. What Murray was talking about, of course, are the various behavior problems traceable to subclinical seizure-like brain activity that isn't recognized as such. Neither psychiatrists nor psychologists are likely to think in terms of seizure-like brain activity as a model for explaining behavior. Neurologists, who are interested in seizures, may still not concern themselves about subclinical manifestations. Moreover, they are generally not knowledgeable about the deviant behavior of children. So Temporal Lobe Epilepsy falls between the chairs.

The symptoms that characterize this disorder include principally the following: Rages, explosive behavior, mood swings, and irritability. These all look familiar from the above Bipolar Child category. What has happened is that these children, who have by and large failed to get a neurological diagnosis of seizure disorder, are coming under the purview of child psychiatrists who give them a psychiatric diagnosis of Bipolar Disorder. The treatment, of course, is the same: Anticonvulsants (although psychiatrists call them Mood Stabilizers.) We're actually not quite done with the symptom list. The more severe cases produce hallucinations, phobias, delusions, and paranoia. But, Papolos lists most of these, too, under his designation of Bipolar Disorder. So, our conjecture is further supported: Bipolar Disorder has become a socially more acceptable designation for the subclinical part of Temporal Lobe Epilepsy, and the latter term tends to be reserved for those cases where there are overt seizures.

This is where we arrived, with the story of our son, Brian. Clinically, seizure-like brain activity is just treated as an instability that needs to be calmed down. We think this is accomplished by "toughening up" the brain through neurofeedback, so that it isn't so readily disrupted in its function by the inevitable adverse activity at the seizure focus. We expect that this adverse activity continues to go on — the EEG tends to confirm that — but, the rest of the brain becomes more resistant to the "spread" of the seizure throughout the cortex.

We have tended to emphasize the subclinical effects of seizure-like activity, both because this is by far the bigger piece of the puzzle and because it is so universally overlooked. However, neurofeedback also has a role to play with overt seizures. This is how the field originally got started. Back in the late sixties, Barry Sterman of the UCLA School of Medicine found serendipitously that the seizure threshold could be raised in cats that had been

trained to produce a particular EEG rhythm, namely the resting rhythm of the motor system. This could be tested by means of chemically induced seizures. The first work with human subjects using this EEG training technique was in connection with the control of seizures. Even now, the fundamental research underpinning EEG biofeedback is better for seizures than for any other condition.

To date, the medical management of seizures leaves a lot to be desired. Particularly when it comes to complex partial or temporal lobe seizures, some thirty percent of patients cannot be made seizure-free. Hence, there is a great need for a complementary technique such as neurofeedback. Even in cases where seizure control has been achieved, there is often a considerable price paid in terms of medication side effects, loss of cognitive function, and sacrifice of quality of life. Even a rare breakthrough seizure prevents people from getting drivers' licenses, etc.

Neurofeedback can be helpful to most people with a seizure disorder. It may permit reduction in the number of medications required; it may allow a reduction in medication dosage; it may increase cognitive function and improve sleep; and it may even eliminate seizures. If the entire history of the field is lumped together, an overall improvement in seizure incidence of 60% has been demonstrated in numerous studies. The range of improvement goes all the way from zero to 100%. In all cases, patients in the studies were already under state-of-the-art medical management, so the effect of the neurofeedback was additive. We have helped a number of children successfully avoid surgery for uncontrolled seizures.

One child in particular comes to mind. He was being treated at UCLA, where it was determined that he responded badly to all medications that were tried. Surgery was recommended to the parents. However, before they assented to that irreversible

measure, they wanted to consider alternatives. They decided to try the neurofeedback, figuring that they could always do the surgery later if nothing worked. Within 25 training sessions, the boy became seizure-free. He was also improving cognitively. He was given a battery of tests, which were reviewed by UCLA professionals. The parents brought back the report to us for our review. In it, we noticed the following statement: Mother reports that child is “seizure-free.” We were aghast. Why was this in quotation marks, we wondered. Clearly, the neurologists always rely on parental reporting. If the child had become seizure-free upon taking one of the new medications, the same report would not have been in quotation marks. But, when the parents came in gushing about something called neurofeedback, the medical immune system set about to inoculate itself against this potential contagion. This is how neurofeedback can coexist with the medical world for thirty years and not be noticed.

It turns out that this youngster continued training for another two years. He was quite a surly kid, and not nice to be around. The parents were hopeful that more could be done. It took quite some time, but, eventually, a smile could be coaxed from this boy, and his attitude toward life became more positive. He never had another seizure.

Conversely, there is the report of a child who on whom surgery was performed for seizures, but the seizures continued. Then, a vagal nerve stimulator was implanted, and still the seizures continued. Since the professionals were fresh out of ideas, the mother asked about whether neurofeedback might be tried. “Too experimental,” she was told. But, perhaps it was time to try the “experiment”.

Nearly every child with seizure disorder can be helped to a certain extent with neurofeedback, either in terms of quality of life, medication dose, or seizure incidence and severity. As long as the

parents and the child approach the training with modest expectations, there should be no reluctance to include neurofeedback into the overall treatment program. So, seizures represent the fourth area in which neurofeedback can help the “Unreachable Child.”

## **Tourette Syndrome**

Tourette Syndrome is characterized by motor and vocal tics. This by itself might not appear to be such a big issue, although children may suffer ostracism and ridicule when their tic behavior is obvious. Of somewhat greater concern is that Tourette Syndrome is also characterized by a tendency toward obsessive behavior. Jointly, these symptoms point to a nervous system with a very high set-point in terms of activation. It is as if these brains never rest during the waking state. They seem to be running at high revs like the old Italian sports cars. This means that, on the good side, Touretters may often be highly accomplished, very creative, highly motivated, competitive, and even driven to perform at peak levels. In its more extreme forms, however, there may be thrill-seeking, episodic rage, hyper-masculinity, and indiscriminate sexual expression. Often, the tics will take the form of copycat behavior; this may, in extreme cases, even take the form of copycat crime, including violent crime. Also associated with Tourette Syndrome is a kind of Jekyll-Hyde behavior, in which periods of relative normalcy alternate with episodes of out-of-control behavior.

The core issues here are high activation and instability of state. These nervous systems need profound calming, and neurofeedback can be the pathway toward the normalization of state greater stability. Of greatest concern clinically are those children with Tourette Syndrome who have other major crises in their lives. For example, even minor brain injury can significantly exacerbate Tourette symptoms. Psychological trauma can have the same

effect. Medications such as Clonidine and Tofranil can be helpful in controlling the behavior in garden-variety Tourette Syndrome, but the medications have much less effect when dealing with a combination of Tourette Syndrome and traumatic brain injury or psychological trauma. That is where neurofeedback can do so much more than medication alone.

Because medication can often remediate the common symptoms of Tourette Syndrome, chances are that only the more severe cases ever come to the attention of a biofeedback clinician. Children may have first gotten tics after the administration of stimulants, and now the tics remain, even though the stimulant medication has been discontinued. Children may have become symptomatic after a seemingly minor encounter with a brick wall on a tricycle, the kind of accident from which children usually walk away unscathed. Children may become symptomatic when put through the wringer of a divorce in the family. They may become intractably symptomatic when their sexual precocity leads to abusive and exploitative relationships. These are not situations analogous to ADHD, where twenty to forty neurofeedback training sessions constitutes a remedy. Long-term training may be necessary, involving a variety of training protocols to address various aspects of the dysregulation, and of the trauma response. But, the rewards for such long-term training may be significant. We have seen children shed their diagnosis of Tourette Syndrome over a period of years, whereas cohorts who go the medical route are subjected to ever more complicated drug regimens.

Perhaps the most difficult Tourette Syndrome child we ever encountered was on five major medications, including both Orap and Haldol. Yet his behavior was still totally out of control. After forty sessions of neurofeedback, the insurance company decided to stop paying for the treatment. The parents were determined to see the training continue — it was the only thing really helping their son — and so, they obtained a remote-use system to train their

child on their own. Their son got a biofeedback session every morning before he went off to school. Progress was considerable. After three years, we saw the young fellow again, at which point he was down to one medication, and his behavior was no longer an issue. He also no longer needed the biofeedback routinely. Every once in a while, he would tell his parents that he wanted another session. He knew how the biofeedback was helping him.

In another child, where the family could not afford the full cost of treatment, EEG biofeedback was combined with Clonidine. The more the boy did EEG biofeedback, the less Clonidine he needed. After some months of training, the boy went off to summer camp. Even during his stay at camp, he would be given time out to go to his biofeedback sessions. At the end of the summer, he was invited back for the next year. His mother was close to tears. She said that invitation was, in fact, the first time that anyone had ever said anything nice about her son. The boy continued his progress, and, after another year, he could hold the gains without support from Clonidine. He would no longer meet the criteria for Tourette Syndrome today.

Here we have a fifth class of conditions in which neurofeedback can help to rescue the “Unreachable Child.”

### **Traumatic Brain Injury**

Perhaps the greatest medical tragedy in the twentieth century is the way in which traumatic brain injury has been dealt. By proceeding in the usual medical perspective of treating it as an organic condition, attention was restricted to those aspects of traumatic brain injury that could be documented on tests of structural injury — CAT scans and, now, MRI, SPECT and PET scans. If the complaints were not supported by such tests, they were not taken

seriously, and the victims were often accused of exaggerating or of faking their symptoms and of malingering.

Recently, an attorney for an insurance company had the experience of bumping his head on a partition in the men's room of a restaurant, after the light suddenly burned out and he had to find his way in the dark. He returned to be with his guests, sustaining only a mild headache and some dizziness and disorientation. But then, he lost his position at his law firm. He could no longer function as the hot-shot attorney that he had been. He could not organize or plan his activities. He could not think coherently. He had low energy. He had sleep problems. In short, he had suffered a minor head injury. It dawned on him that he was suffering all of the symptoms that he had been accusing patients of faking. Here, finally, was some poetic justice. This man's injury, such as it was, would not show up on a CAT scan. Yet, it was sufficient to destroy his career and his self-image. The message is that we must consider traumatic brain injury as a brain software problem, rather than as one of brain hardware. Even if there is no tangible evidence of loss, there may still be functional deficits. Quite simply, if confronted with conflicting evidence, one must go with the evidence of functional deficits, of software failure.

Neurologist, Antonio Damasio, recognized this possibility in his book *Descartes' Error*, saying that problems of brain timing could account for the degradation of function that we see in head injury. Exactly! Just as with ADHD, where we likewise detect no grievous flaw in structural studies of the brain, traumatic brain injury is a matter of disturbed brain timing. If that is the case, then neurofeedback should be considered the remedy — and, in fact, it is! Rarely are results as striking and as significant in neurofeedback as they are with recovery from head trauma.

One problem with this model is that very minor head injuries that can lead to significant problems. Is there a child who grows up

without having *some* head injuries of this kind, whether it is being hit by a baseball bat on the playground, or falling out of the grocery cart onto the terrazzo, or hitting one's head on the bottom of the pool, or doing headers in soccer, or suffering a minor concussion on the football field, or knocking heads on the basketball court, or hitting the windshield in a minor fender-bender? If these events are problematic, why isn't everyone running around head-injured? It is a matter of vulnerability. Those who suffer from minor insults to the brain are those who are "set up" for it by being predisposed to dysfunction in one way or another. This means, first of all, the ADHD child. It also means the child who suffered a traumatic birth, because head trauma is cumulative. It means the brain on drugs; the brain with Tourette Syndrome; the brain that is prone to depression or anxiety; the brain that is prone to head pain, or to sleep irregularities. In short, traumatic brain injury pushes a person over the cliff to which he is adjacent. If the brain is at the edge of instability anyway, trauma of any kind may push it over that edge. Another way to look at this is to view traumatic brain injury as a problem in brain timing, making all pre-existing timing problems worse. This means that, in traumatic brain injury, we are not seeing a distinct population, but rather all of our favorite subjects whom we already know from other contexts. We see the same symptom clusters we are used to working with, only they are exaggerated in severity.

Because head injury is so ubiquitous, people tend not to think in these terms. Often, when parents are asked during an intake session whether their child has ever suffered a minor traumatic brain injury, the answer is no. These events just don't leave much of a memory trace, because they are not considered to be medical issues. A child may be taken to the emergency room with a profusely bleeding scalp, but if there is no skull fracture, the child is just as likely to be sent home with a patch. And life goes on. The subsequent poor academic performance is never tied back to what the child may have suffered on that day.

Because the effects of traumatic brain injury are possibly not taken seriously, not recognized, not tested for, and not addressed as such, we have, indeed, another case of the “Unreachable Child.” The other major factor is that so very little that can be done within the medical model that is actually helpful with these conditions. The field of medicine tends to be in denial with respect to problems that cannot be helped. A software solution is required for the software problem. A timing solution is required for the timing problem. That is where neurofeedback fits. Hence, we have in traumatic brain injury a sixth major category of the “Unreachable Child.”

### **Drug Taking and the Pathway to Addiction**

In all of the above categories, we have conditions for which the child cannot be held responsible. When it comes to drug-seeking behavior by teenagers, we have a self-inflicted problem that may be just as intractable. The activity is not seen as harmful, or at least not harmful in the near term. And, there is presumably a payoff for the consuming the drugs of choice. This is not something where parental persuasion or professional counseling or even long-term psychotherapy is likely to have much impact. Drug-taking is just not seen as a big deal, so counseling gets no “purchase” on the problem. Another solution is required.

In line with the model that we have been proposing, drug-seeking behavior should be seen in terms of a self-selected solution to a software problem. Some drugs may be chosen to feel good, but many more are chosen in order to feel less bad. In some fashion or other, the drugs of choice offer a positive payoff to the person over the longer term. They can be seen as a ham-fisted attempt at state-management, one that is not awfully far removed from what psychiatry itself is trying to accomplish. For example, we know of many sober and deliberate people — successful corporate types —

for whom marijuana serves a specific and useful role. As far as we are concerned, the argument as to whether marijuana can serve a useful medical role is already answered affirmatively. It can help stabilize the brain against seizures, for one thing. It can also calm the profoundly overaroused brain. As with some other medications, however, the short-term benefit may be purchased at the price of a long-term cost in brain function. Another remedy is needed, and it is neurofeedback.

If drugs afford a positive payoff for the user, then the remedy must also fulfill that need for enhanced functionality or improved mental state. It is pointless to simply wag the finger of disapproval. Willpower is frankly overrated. With neurofeedback, we can train the brain so that drugs are not necessary to achieve the improved level of function. We simply get to that level of functionality another way. When this is accomplished, drug use will quite naturally fall away. We have had many clients come into the office volunteering the information that they are no longer using marijuana, drinking too much, or smoking. No one mounted a campaign to get them to stop. The brain was simply no longer well-served by these “medications,” so they fell by the wayside. In fact, on many occasions, the clients are themselves astonished at their own behavior, saying things like “I forgot to use!” Well, when a client forgets to use, there is clearly no longer a problem of dependency or of addiction.

In addition to the problem of brain functionality, there is the issue of reward. A persuasive case can be made for the proposition that drug dependencies are a response to a “Reward Deficiency Syndrome,” in which the brain is deficient in its capacity for self-soothing and for internal reward. EEG training clearly addresses this aspect as well. The key frequencies trained in order to get rid of addictions are those related to our experience of satiety and pleasure. What neurofeedback manifestly does not do is replicate the experience of euphoria that accompanies much drug use. For

neurofeedback, then, satiety is the operative word more than pleasure. The training for addictions brings about a sense of completion, of being at peace with oneself, and of a healthy and loving connection with others. What neurofeedback clearly does not do is replace one addiction with another. It is not methadone. It brings the contentment of serotonin more than it does the euphoria of dopamine.

For the adolescent who is tempted by drugs, the remedy is to train the brain — a software solution to a software problem. With neurofeedback, even full-blown addiction is but a waystation toward recovery. In that regard, we have just completed a four-year study in which the addition of neurofeedback to a standard residential treatment program more than doubled the success in terms of relapse-free performance over a three-year follow-up. This study has just been submitted for publication. If this can be accomplished with dyed-in-the-wool addicts, surely even more can be done with adolescents who are just starting out on their life with drugs. Thus, we present the seventh major category of the “Unreachable Child” to which neurofeedback is uniquely applicable.

### **Psychological Trauma**

When it comes to the whole realm of psychological trauma, we are dealing with another area like traumatic brain injury, where the problem is largely hidden. In this case, it is also somewhat vague and unquantifiable. Yet, mental health professionals know that there may be a huge long-term adverse fallout to such traumatic events as the early sexualization of our children, physical and psychological abuse in the home, predatory behavior in the dating environment, and even mere academic failure. This may show itself in the more intractable eating disorders, in hypervigilance, and in heightened reactivity. Neurofeedback can be profoundly

helpful in allowing the self to heal from prior traumas. This work utilizes protocols that are very different from the ones used for ADHD. They will not be discussed further here. For present purposes, let it suffice simply to assert that recovery is possible when neurofeedback is part of a comprehensive treatment program for eating disorders or for other post-traumatic stress reactions. Hence, this is the eighth major category in which neurofeedback is the essential ingredient to reach the “Unreachable Child.”

### **Problems of Attachment: Attachment Disorder and the Autism Spectrum**

Perhaps the most treatment-resistant condition in the mental health field is one in which children are not afforded early nurturing of their emotional life, where they are either neglected or traumatized early in life. This phenomenon is unfortunately increasingly commonplace, with children in orphanages around the world, or being raised by mothers with their own mental health or drug dependency issues. Children come into this world ready to engage emotionally with their mothers. If that opportunity is not available, severe overactivation of the nervous system and extreme emotional dysregulation is almost certainly the outcome. Later, these children become largely unmanageable. They are very difficult to relate to and to soothe. Their behavior becomes unpredictable, going from clingy attachment at one moment to irritability and rage behavior the next. Because of the relative intractability of this condition, scientists have proposed that this period of early emotional learning could be a “critical period,” meaning that, if the learning does not occur within a certain window of time, the opportunity is forever lost for that child.

However, we have shown it possible to train emotional regulation in these children, even years later. This confirms that, even in this severe disorder, we are dealing with a software rather than a

hardware problem. Emotional regulation can be learned at any point in time. Of course a price is paid in not learning this early on, but there does not appear to be a critical period for emotional regulation. Over the years, we have learned how to challenge the EEG to stimulate the key cortical-subcortical linkages that are involved in this basic regulation of our emotional circuitry, thus giving us access to our empathic selves. Remarkably, the pathways of connectivity to the emotional self are already in place at birth, and remain entirely intact through any trauma, although they may remain disrupted in organization until subjected to the reorganizing challenge of EEG training. The problem is that if the sinews of emotional connectivity are even functionally disrupted, these are almost impossible to restore through talk therapy alone. Hence, the need for neurofeedback as a starting point.

We have confirmed that our core emotional circuitry involves the right hemisphere preferentially. Hence, this condition is trained almost exclusively by means of right-hemisphere training. We also work on the interaction between the two hemispheres, in order to bring the two hemispheres into closer coordination. In all its aspects, neurofeedback brings the brain into better communication with itself.

One very heart-rending story needs to be told to give some concreteness to these discussions. It is the story of Kyle, a six-year-old boy who was accepted into foster care by the family that was also dealing with him professionally in a nursery school. Kyle had just been removed from a foster home for starting a fire, and he was undoubtedly headed for a residential treatment center or psychiatric hospital. Kyle had an incredibly abusive past. His birth parents had also been foster children, and, likewise, had a history of neglect and of both physical and sexual abuse. This was now being propagated to the next generation. There had been numerous hospitalizations of Kyle related to deficiency of care and overt abuse. When Kyle was initially placed in foster care, where

he was together with his biological younger brother, he actually tried to kill his younger brother, as well as the family dog. In a second foster home, he was both beaten and burned by his foster father.

Kyle ended up as one of the most difficult children encountered in the foster care system. His behavior was defiant, uncontrollable, and erratic. He exhibited all the features of Reactive Attachment Disorder at the worst end of the distribution. Outside of three to four hours of sleep, he had extensive screaming episodes. He had daytime seizures and night terrors. As his new foster parents were at the point of giving up on Kyle and putting him in a psychiatric hospital, they found out about neurofeedback through their therapist neighbor. They were skeptical, but also desperate, and so took Kyle for his first session immediately.

After only the first session, Kyle slept for twelve hours. With this sort of encouragement, Kyle was trained daily for a couple of weeks, and twice a week thereafter. Soon, he related better to his new foster mom, and he cried for the first time. He began to show empathy for other living things. The constant need for food stopped. Kyle eventually allowed himself to be held, and he surprised the parents and himself with the changes in his emotions. Eventually, both parents became qualified in neurofeedback, so that they could conduct the training directly with their foster child.

Progress continued in leaps and bounds. There are improvements cognitively and in motor skills, along with continuing improvements in emotional regulation. It has now been two-and-a-half years since the foster parents first took Kyle into their home. They have just completed the process of adopting him. The healing that occurred here could not have been accomplished without skilled and loving parenting by James and Kim Vieira, but it also could not have been accomplished without neurofeedback.

We place the spectrum of autistic disorders into this same general classification. Autism is also at the core a disorder of attachment. Whereas in the above case of Reactive Attachment Disorder (RAD) the “mother” is emotionally unavailable, unpredictable, or unreliable, in the case of autism, the child’s own nervous system is unavailable for attachment. This may be for reasons that are genetic, metabolic, or developmental. The outcome is similar to RAD in that these children end up with highly overactivated nervous systems — but, in this case, we see an absence of relating rather than a highly variable and unstable way of relating to others. Because of an internal disconnect, the autistic child may sustain no real sense of self and of other people. The very ground for the construction of a relationship may be missing. Fortunately, this, too, may be trainable. The outcome is more uncertain in this case, because the difficulty arose primarily from an organic condition. We know that we have a hardware problem here as well as a software problem.

Neurofeedback simply has to be tried, and one discovers how far we may go in each particular case. We may expect to go a long way toward calming the highly overaroused nervous system, but we may also help with the basics of emotional engagement. Often, these children will spontaneously take up language as a result. This can happen so suddenly that we must assume that they already knew language — only they did not bother to use it because the problem was more fundamental: Namely, in the issue of engaging in relationship. The problem was one of communicating with the other, not of knowing language. So, instead of having a left-hemisphere speech problem, we have a right-hemisphere problem of emotional relating. The training proceeds much the same as it does with RAD. This is the ninth major category in which neurofeedback can help to meet the needs of the “Unreachable Child.”

## **Learning Disabilities**

The final category is that of learning disabilities. It is included here almost as an afterthought, because learning disabilities are not like drug-taking or conduct disorder or suicidality in calling attention to themselves. You don't end up in family or juvenile court because of learning disabilities alone. These are chronic issues that lack drama, and don't usually lead to crises demanding intervention. On the other hand, prisons are full of learning-disabled inmates. It is a much bigger issue that ADHD in the schools. It undoubtedly impacts hugely, though quietly, on self-esteem.

Learning disabilities are clearly a brain software issue in most cases. They are generally thought to be intractable to intervention. Most remedies have to do with work-arounds and accommodations. Yet, we know that neurofeedback can have an impact on these conditions, too. Learning disabilities should therefore be included as the final, tenth category of conditions for which neurofeedback may be helpful and should be considered for the "Unreachable Child."

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## **The Problem of Irrational and Episodic Violence in Children**

Our society is struggling with the entire problem of child-on-child violence, particularly after the events at Columbine High School in Littleton, Colorado. Against the background of what has already been discussed in this article, it may be useful to explore this issue directly. It is now possible to see this perplexing issue as arising out of several core mental health concerns:

- 1) Conduct Disorder-a cousin of ADHD

- 2) Childhood Depression
- 3) Bipolar Disorder
- 4) Tourette Syndrome
- 5) Temporal Lobe Epilepsy
- 6) Traumatic Brain Injury
- 7) Drug-mediated release of inhibited behavior
- 8) Reactive Attachment Disorder.

Most likely, specific cases of child violence are traceable to incendiary combinations of some of these risk factors.

Many other issues probably play into the secular increase we have seen in youth violence over the last several decades:

- a) the decline of a stable home-life for so many children
- b) dietary impoverishment; \\
- c) glucose dysregulation
- d) food intolerance
- e) toxic heavy metal burden
- f) the effect of violence on television
- g) the destabilizing effect of inappropriate medication
- h) the relative devaluation of the individual through the vast increase in school size.

Although the effect is difficult to quantify, the constant rehearsal of violent and destructive behaviors in the entertainment media should be of concern, particularly its effect on the vulnerable mind that we have herein highlighted. It is deemed acceptable in our society for children to experience every emotion around thrill-seeking, violence and senseless death, and to do so in a context which obscures the traditional clarity of moral choices.

Ultimately, the only way to trump the manufactured tension of movies and video games is to replicate the experience in life itself, i.e., to direct and produce one's own play.

One of the more sinister implications of the calculus of violence is that people are unlikely to value others more highly than themselves. A diminished self-appraisal is therefore contributory to the escalation of violence. Likewise, if there is a sense of limited prospects to make a positive difference in the world, the temptation looms large to act destructively. There is then a reversal of the usual scale of values. Another aspect of violence, as with other thrills, is that it allows children to feel alive. In this regard, violent behavior can be seen as another manifestation of the Reward Deficiency Syndrome that has been used to model addictive behavior.

However that may be, it remains true that, the more deviant the behavior we observe, the more likely it is that we can attribute it to a brain-based problem rather than to the outcome of a deliberative process congruent with the person's values. As we have proposed, most of these brain-based problems can be conceptualized, first and foremost, as issues of brain software. These problems are accessible to a software-based solution: Neurofeedback training. Anyone who is truly concerned about the declining mental health status of our children must consider neurofeedback as part of a program to redress these deteriorating conditions. Likewise, anyone who is concerned about the effect of violence on our society must consider neurofeedback as part of a comprehensive public health strategy.

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### **The Other Side of Genius**

We have addressed some of the more intractable conditions encountered. There is another perspective on these conditions that we must attend to: The troubled child in the successful family.

Many parents find themselves challenged by children who, if genetics were indeed in charge, should be doing well. Both parents see themselves as reasonably functional adults, perhaps successful professionals, and they sometimes wonder just why it is that *their* child is struggling in school. Or, both parents reflect on the fact that they themselves were high flyers during their early schooling, whereas their child is just keeping up. Yet other children show promise in a variety of areas, but seem to be struggling in one particular area that seems to hold them back generally.

One explanation may lie in the realm of genetics, as suggested. Partners often marry someone with similar tendencies: Impulsivity may be a shared trait, and thrill-seeking behavior as well, particularly among those who marry young. Parents may have had a shared interest, dare we say it, in certain recreational drugs during their youth. In other words, the styles of their brain functioning may be similar. Consider, if you will, that a certain degree of obsessiveness can be helpful in achieving one's goals. And, hypomania comes close to defining the successful corporate personality these days. The successful person seems to be one who moves through life with a bit of a forward tilt. When these tendencies compound from both the maternal and paternal side to form the genetic endowment of the child, it should not come as a surprise that some children are pushed over the cusp of optimum performance into dysfunction. Following David Comings, M.D., we call this "the other side of genius."

If this possibly describes the situation in your own family, it may be useful to try to understand your situation from the standpoint of "shadow syndromes," the subclinical manifestation of established clinical syndromes. The most common of these is, of course ADHD, or Attention Deficit Hyperactivity Disorder. This is the most commonly diagnosed disorder of childhood. Yet, it is also clear that many, if not most, CEO's of startup enterprises would

probably have been diagnosed with ADHD in their youth if the diagnosis were popular at that time. Clearly, there is a certain good side to the condition. The restlessness of ADHD in the classroom pays off in entrepreneurship. There is a certain tolerance for risk-taking and adventure that is positive in the new executive. The ADHD person has been described as a “hunter in a farmer's world,” geared to novelty on the one hand, and undone by drudgery and routine on the other. In this view, ADHD is not so much a disorder as it is a style of brain-functioning that is optimal for some challenges and not for others. In some skills — tests calling for quick decisions, for example — ADHD children often excel.

So: When the call comes from the teacher that your son should be on Ritalin, the temptation may be to say, “He's okay, I was just like that when I was young.” That may be true, but it could also be the case that your child is more challenged by his brain than you were at his age. What might have been a shadow syndrome in your own case could be a real challenge for your child. For reasons not yet fully understood, our children seem to be facing greater mental health challenges than did earlier generations.

Some other conditions that can often masquerade as shadow syndromes are Tourette Syndrome, Obsessive-Compulsive Disorder (OCD), and Bipolar Disorder. In its shadow syndrome manifestation, TS and OCD can lead to great professional success. There can be a steely determination, a driven disposition, a thrill-seeking or risk-taking orientation, relentless competitiveness, and the gift of high energy level that won't quit. One can even be egged on by long-held grudges that never seem to subside. Children endowed with the shadow syndromes of their parents may face much more debilitating expressions of TS and OCD — pronounced motor and vocal tics; stuttering; hair-pulling; hypersexuality; perseveration, etc.— that can lead to social rejection and

profound loss of self-esteem. Again, this constitutes “the other side of genius.””

Then, there is Bipolar Disorder. What may simply exist as long-term mood swings in the shadow syndrome, leading to episodic bouts of high creativity and exceptional productivity in the successful adult may lead, in the child, to more problematic behavioral instabilities showing up as uncontrolled rages and wild swings in mood. The new remedies of mood stabilizers look to many like a life sentence of underachievement. People don't like how the medications make them feel, and they report that they lose their edge. Once children reach adulthood, they typically discontinue these medications with reckless abandon. We have here another case of “the other side of genius.”

History has given us many examples of an intimate link between genius and dysfunction, particularly in connection with bipolar disorder. This connection can possibly be explained by looking at the brain as a control system. Any feedback control system obeys the general rule that, as higher overall gains are approached, the system runs the risk of becoming unstable. If high mental performance were connected with high gain (which would be no surprise), then the correlation with brain instability would be explained. By training the brain toward stability with neurofeedback, we are able to train the brain both to function at a high level *and* to maintain stability under challenge conditions. Hopefully, the time has arrived where we can dispense with this particular Faustian bargain between high performance and mental well-being, and ease the parental concern about the genetic endowment they may have bequeathed their child.

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