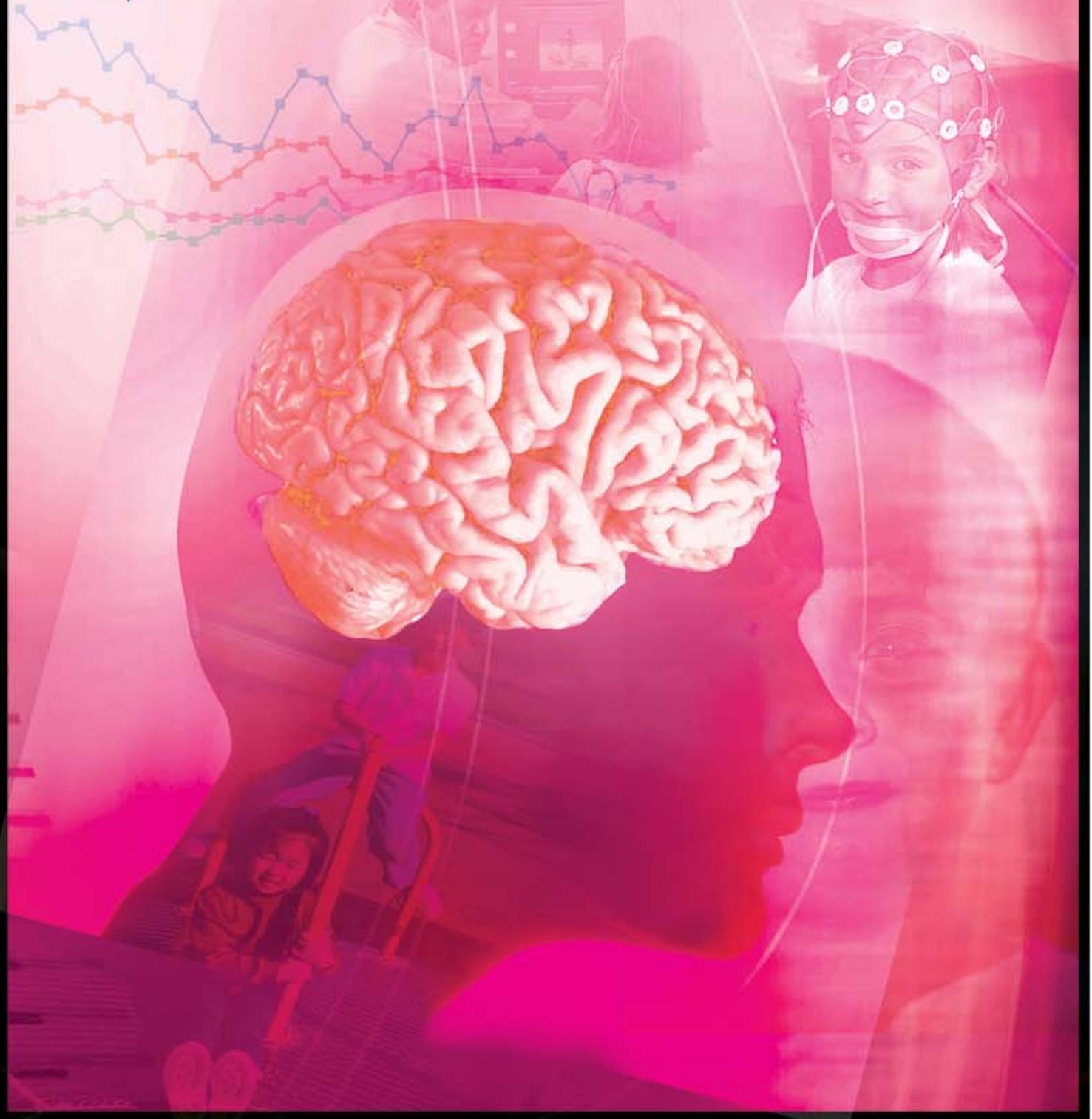


# NEURO CONNECTIONS



July 2007 *Newsletter*

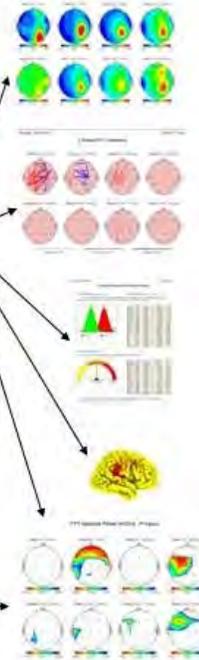
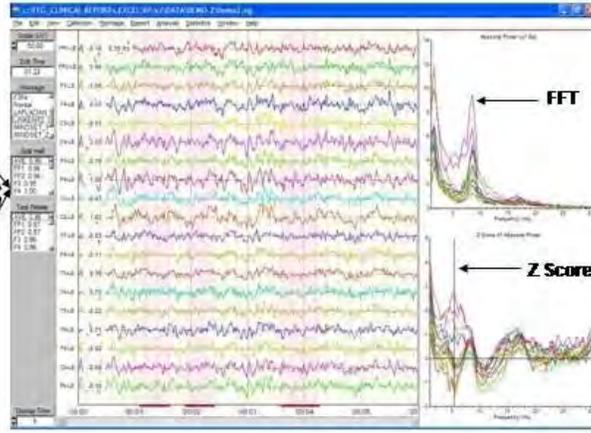
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A joint newsletter from the  ISNR  
& the  AAPB Neurofeedback Division

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## LETTER FROM ISNR CO-EDITOR



Greetings from Europe! Writing this letter on an Italian computer from Venice, Italy may provide you with some smiles. As we are always aware there are many dif-

ferences and similarities among all of us, even in computers, so if there are a few typos or characters that should not be there just chalk it up to the wonderful differences that we all enjoy.

Welcome to the July edition of the *NeuroConnections*. This edition is focused on pediatrics and neurofeedback. Neurofeedback and research is being employed on younger and younger children which enables us to understand development even better. Databases are being developed for younger children, although, I think there is only one that reaches down to below six-years-of-age. If you are like me, parents of very young children are seeking services and we need to address the need.

Dr. David Kaiser, as always, contributed a thoughtful article: a case study of his work with his own child. He has used the SKIL database for children to locate a very important finding and associated it to the development of children. He, along with Dr. Barry Stermann, have developed the new children's database for SKIL. Do read this very interesting article.

Dr. Nicholas Dogris has written an article regarding working with children via the LENS system. You will find his observations and thoughts most helpful.

Kimberly Weeks has been investigating the issue of pediatrics and neurofeedback in reference to what students are trained to employ. As always her findings leave us searching for ways to influence the training institutions to provide more regarding the research and clinical techniques of QEEG and neurofeedback to students.

See you all in San Diego for the ISNR Conference in September!!!

*Merlyn Hurd, PhD*

## LETTER FROM AAPB CO-EDITOR



Welcome to the summer, 2007 edition of *NeuroConnections*. For this issue, our focus is on neurofeedback interventions for disorders emerging in childhood and adolescence. The issue includes an eclectic mix of science and practice, representing the contributions of a group of clinicians who are leading the way in integrating new developments into clinical practice.

Over the past decade, Kirt Thornton and Jonathan Walker have each published a series of pioneering papers re neurofeedback treatment of learning disabilities.

In the current issue, **Dr. Walker** contributes an informative discussion of reading disability EEG signatures, while **Dr. Thornton** discusses reading disability patterns which may not be evident during standard eyes closed qEEG, emerging only when brain activation patterns during reading are compared to a task activation database. **Paul Swingle** contributes an engaging discussion of trauma responses in children that may mask as disorders of attention, memory or conduct. **Pete Van Deusen** brings our topic into clinical focus with a lively discussion of communication strategies to potentiate successful pediatric neurotherapy outcomes. He highlights practical suggestions for capturing the attention and imagination of young clients, communicating findings and expectations to parents, and engaging the entire family as active partners in therapy. **JJ Durgis** offers several exciting case histories illustrating the power of the LENS system, in the hands of a skilled clinician, to quickly establish symptom breakthroughs in the autistic child. **Leslie Sherlin** offers readers an early glimpse into emerging research in Independent Component Analysis (ICA) that will soon empower the clinician to target neurofeedback interventions to specific deep brain structures. **Gail Durgin** discusses emerging technologies in brain computer interface that are likely to bring direct brain control to the next generation of video game platforms.

After you read this issue, try your hand at our crossword puzzle, featured on page 21. The answers to this month's puzzle can be found within the stories in this issue.

*Roger Riss, PsyD*  
Editor, AAPB Neurofeedback Division

*Roger Riss, PsyD*  
Editor, AAPB Neurofeedback Division

## LETTER FROM THE ISNR PRESIDENT



This is the last presidential column that I will be writing in the newsletter. It has been a privilege to serve you in this capacity and to work with my board. We needed to accomplish much this year

and this board was willing to take out the time it took to accomplish several very time consuming but very necessary tasks which will make the running of this organization much more efficient and will save us time and money which can now be spent over the next few years in further efforts to solidify our presence in the neuroscience community and increase our visibility as providers of a needed and powerful methodology that can help many patients to lead healthier and more satisfying lives.

I have told you in previous letters about some of things we accomplished this year. Among the first was finding the newest and best technology to deal with the publishing of our Journal. That same program is also allowing us to organize and review the submissions to the conference. Time saved on that task has given the conference committee an opportunity to focus on other important tasks.

If you have visited our new website, you already know that the conference committee assembled a stellar line up of presenters from the US, Europe and Australia. Many of these presenters have never been to our conference in the past and are presenting information of the forefront of Neuroscience. Their presentations will give us an overview of the newest findings and trends in Neuroscience that will affect our research and our practices for the next decade. Several of these presenters will also be providing us with workshops that will give us an added opportunity to understand and find ways to incorporate this information in our work. Since the speakers represent both researchers and clinicians they will hopefully meet all the different interests of our members.

Besides working on the general management of our society's everyday needs and welfare, this Board has taken on the task of reviewing our By-laws and Policies and Procedures. The By-laws had not been revisited

*Continued on page 6*

## LETTER FROM AAPB NEUROFEEDBACK DIVISION PRESIDENT



### CHANGING MINDS—

**Getting Health Care Practitioners, Educators, and Politicians to Understand the Value and Advantages of**

**Neurofeedback for Various Conditions**

Neurofeedback is a powerful way to normalize brain function or produce superior brain function (peak performance). Those of us who do neurofeedback in our practices see the dramatic and consistent effects this training produces on a daily basis. It offers obvious advantages over other modes of therapy. Typically, it remediates the problem, rather than temporarily suppressing it, like drugs. It is safe and non-invasive, with rare to no side effects or complications. It is holistic. It puts the client in charge of the problem, thus enhancing a sense of control and raising self-esteem, leading to more successes and a better quality of life. There is virtually no downside to neurofeedback training.

Despite its great value in many conditions, only a small minority of health practitioners use it. Those who do not do it or refer it need to be persuaded of its value, so that it can be used in the great number of conditions for which it is the most efficacious and permanent therapy available. How can we change their minds?

Recently, Howard Gardner wrote an instructive book, *Changing Minds*, on the art and science of changing people's minds. (Harvard Business School Press, Boston, 2004). He examines six realms, or arenas, in which changes of mind take place. I will address five of the six arenas and make some suggestions which should help us to change people's minds about neurofeedback.

### 1. THERE MUST BE LARGE-SCALE CHANGES INVOLVING HETEROGENEOUS OR DIVERSE GROUPS, SUCH AS AN ENTIRE NATION.

In order to change the mind of a whole nation, we would probably need to persuade our president. It is probably too late to persuade our current president of the value of neurofeedback for normalizing attention and learning as part of the No Child Left Behind Act. There is evidence that the majority of children with ADHD and learning disabilities can be taught (through neurofeedback) how to pay attention and learn normally. Neurofeedback has also demonstrated great efficacy in reducing criminal behavior and addictions. I believe that we could almost empty our prisons with neurofeedback and truly rehabilitate those in our prison system. We should be interviewing the current and aspiring legislators to inquire if they are aware of the value of non-invasive, non-drug remedies such as neurofeedback for problems and might be willing to provide for such care in their health plans and prison reform programs. We should begin with a neurofeedback lobby. Perhaps AAPB or the neurofeedback section could hire a marketer/lobbyist to press our agenda.

### 2. INSTITUTIONS MUST BE PERSUADED.

It seems reasonable to think that neurofeedback would appeal to institutions dedicated to learning. After all, it is a learning technique. There have been a few times where an educational leader has become persuaded of the value of neurofeedback and been able to get it into the special education curriculum (for example, in Westchester County, New York). Neurofeedback should be part of the curriculum in schools—if the child has a

session every day, the training time is only a few weeks, to learn how to pay attention, read, do math well, etc. Our best success in the schools has occurred when we are able to persuade the principal or headmistress of the value of neurofeedback and get them to commit one or more of their employees to learn how to do the training. Then they can bill the parents for the training, which pays the salary of the trainer, and makes a small amount of money for the school.

With regard to colleges and universities, the dean and other administrators must be persuaded of the legitimate research potential of the approach and of developing training programs in this burgeoning field. The success of programs like those at The University of North Texas and The University of Tennessee could be quoted to such administrators. Dr. Bodenhamer-Davis and Dr. Lubar could talk to administrators to persuade them to adopt similar programs.

With regard to medical schools, there have been only occasional successful training programs, usually within psychology or psychiatric training programs. It should also be taught to neurologists, social workers, and other health care professionals. Our efforts should be primarily directed to persuading directors of those training programs. They need to understand that neurofeedback can give their graduates an edge in treating clients/patients, and that it can be an additional way for their graduates to boost their income. They must be disabused of the erroneous ideas that neurofeedback is “just a way of learning to relax” and “not scientifically respectable.” We must give leaders our vision of neurofeedback as the future of making the brain work better and creating better and healthier students and clients.

*Continued on page 6*

### ISNR MISSION STATEMENT

To promote excellence in clinical practice, educational applications, and research in applied neuroscience in order to better understand and enhance brain function. Our objectives are:

- Improve lives through neurofeedback and other brain regulation modalities
- Encourage understanding of brain physiology and its impact on behavior
- Promote scientific research and peer-reviewed publications
- Provide information resources for the public and professionals
- Develop clinical and ethical guidelines for the practice of applied neuroscience

### AAPB NEUROFEEDBACK DIVISION

#### MISSION STATEMENT

To improve human welfare through the pursuit of its goals. The specific goals are:

- The encouragement and improvement of scientific research and clinical applications of EEG technology and neurofeedback.
- The promotion of high standards of professional practice, peer review, ethics, and education in neurofeedback.
- The promotion of neurofeedback and the dissemination of information to the public about neurofeedback.
- The division is organized for the purpose of carrying on educational and scientific objectives and is not to be operated for profit.

LETTER FROM AAPB NEUROFEEDBACK DIVISION PRESIDENT CONTINUED FROM PAGE 5

### 3. MINDS CAN BE CHANGED INDIRECTLY.

Through scientific discoveries, scholarly breakthroughs, and artistic creations, minds can be changed. We must do good scientific studies of neurofeedback for various problems—not necessarily double blind/placebo controlled studies, though it is possible to do them. It is probably more appropriate (and persuasive) to do studies comparing neurofeedback with standard therapies, using high quality assessment techniques, which are as objective as possible. Long-term studies should be done to show the permanence of the effects. Then we need to seek publicists in the journals that are read by the appropriate providers. The Journal of Neurotherapy and The AAPB Journal are doing a good job, but those journals are not read by most neurologists, psychologists, LPC's, nurses, social workers, etc.—those who treat most of these clients. We need to publish in their specialty journals. We need also to present and do workshops at their meetings. In addition, we need to get the media (TV, radio,

the internet) to present neurofeedback to the public in a persuasive, appealing fashion.

### 4. MINDS CAN BE CHANGED UP CLOSE, IN INTIMATE SETTINGS.

Creating resonance is the key. One must look for ways to bond with the patient (listening carefully, a willingness to consider other approaches, keep the atmosphere open and upbeat). Avoid egocentrism. Figure out what motivates the other person and base your approach on what appeals to him/her. Case histories and testimonials are invaluable.

### 5. WE MUST FIRST CHANGE OUR OWN MINDS.

Perhaps our biggest obstacle in changing others' minds is changing our own minds. We must truly believe that neurofeedback represents the best way of remediating neurological and psychological problems and improving peak performance. It may be helpful to recall your own development—how you were originally taught how the brain

works, how your views changed over time, and why this new paradigm fits the facts better than any other. Every person in the field will have come down a different path. We need to tell our story, to ourselves, to each other, and to the world. Neurofeedback is our way of being “Good Workers,” i.e., technically excellent and seeking outcomes that are ethical, moral, and responsible. We need to recognize and confirm our mission. We need to look for and acknowledge models. Finally, we need to use the mirror test. We need to look in the mirror and ask how we can become a “Good Worker” and be proud of what we do. And, if Gardner is right, we will change minds by so doing.

I look forward to your comments and suggestions regarding the ideas presented here. Please let me know what ideas or plans you have to begin fleshing out these suggestions. I am proud to be part of the neurofeedback community and believe we can grow and do better and better.

*Jonathan Walker, MD*  
*President, AAPB*

LETTER FROM THE ISNR  
PRESIDENT  
CONTINUED FROM PAGE 5

since our founding and did not quite meet our present needs in that they did not address clearly enough some of the problems that had arisen over the years. To meet that need the board met, for the first time in its history, in a three day meeting in Houston and fleshed out the outline of the changes that we needed. We asked Hank Weeks to lend his extensive experience in organizational structuring to join and lead the discussion in Houston and we continued as a board to discuss and rewrite the By-Laws in bi-weekly meetings until we were able to finish the task last month. I would like to thank all for their dedication and willingness to take that much of their time and energy to serve this society. In the next few weeks you will receive the changes that we feel would enhance the functioning of the society and will ask you all to vote on these changes. Please take the time to do so. We will announce the result of this vote at the conference.

I am looking forward to seeing you in San Diego in September.

*Judith O. Lubar LCSW, BCD*  
*ISNR President*



## LETTER FROM ISNR EXECUTIVE DIRECTOR

ISNR is working hard to become the most important association in our field. Things are changing and this push is warranted. We continue to develop a policies and procedures manual for future boards to rely on. We have revised the By Laws to reflect current needs. I hope you take the time to review the changes, made available within the next month. One of the benefits of being a full member is the ability to vote on these important issues. We look forward to your vote which you will send along with your ballot for board members for the '07 – '08 year.

This, my first year with ISNR, has been busy. Judith Lubar has certainly kept us on task. There is little else that we as a board need to complete so we have a strong foundation and spring board into the future. Ann Marie Horvat has embraced her new role as Membership and Conference Coordinator, turning the membership drive and conference planning into a proactive

and highly functional system. I expect her conference planning efforts to be quite apparent in San Diego and tip my hat to her. This is Roger deBeus' last year on the board, having served for 7 years. His ideas and practical efforts during the time that we went from SNR to ISNR, from neuronal regulation to neurofeedback and research, and from a mom-and-pop operation to a full functioning association with well over 500 members will be legendary.

As to the future: we hope to formulate committees this next year that will execute a level of professionalism and integrity in the areas of public relations, research, education, acceptance and standards. If you have experience and/or a desire to be part of the process and devote some of your time and effort to ours, I invite you to speak to me or one of the board members. There will be a lot to do and your help is greatly needed. We will be well-guided in this important year with Nancy White on board as our president.

*Cynthia Kerson*  
*ISNR Executive Director*  
[office@isnr.org](mailto:office@isnr.org)

## LETTER FROM AAPB EXECUTIVE DIRECTOR



**AAPB  
LAUNCHES  
NEW  
STRATEGIC  
DIRECTION**

A new strategic plan for AAPB has been adopted that focuses on four primary themes: Professional Support, Education, Science, and Technology.

These themes are being used to guide the Board's decision-making in all that it does. To ensure that we stay on task, champions have come forward from the Board to work together in addressing each theme. As champions, Board members make sure that actions taken are consistent and theme focused. They are also responsible for identifying initiatives for AAPB that reflect the themes in all aspects of the organization.

Theme champions include:

- Professional Support – Karan Kverno, PhD, APRN and Aubrey Ewing, PhD
- Education – Aubrey Ewing, PhD and Thomas Collura, PhD
- Science – Barbara Peavey, PhD; Stuart Donaldson, PhD; and Richard Gevirtz, PhD
- Technology – Alan Glaros, PhD

Some examples of how these themes have enhanced AAPB's member focus include:

- The establishment of a new e-newsletter that has received rave reviews as an important device for communicating organizational, section and division, chapter, and professional news to AAPB's membership. In addition, it provides a mechanism to

share summaries of articles that illustrate the efficacy of psychophysiology and biofeedback.

- The development of a Clinician's Tool Kit, currently in progress, that will provide online resources to assist members with billing issues, communicating with insurance carriers, and a host of other resources. Anyone wishing to contribute ideas to the AAPB Clinician's Tool Kit is invited to submit them to me at [dstumph@resourcenter.com](mailto:dstumph@resourcenter.com).
- The 2008 Annual Meeting is shaping up to provide content that will address each theme.
- AAPB members will also see changes in their journal, Applied Psychophysiology and Biofeedback, and their newsmagazine, Biofeedback, that will better reflect these themes.

One key initiative under the Professional Support theme is to collaborate throughout the psychophysiology and biofeedback community. To that end, AAPB, the International Society for Neurofeedback and Research (ISNR) and the Biofeedback Certification Institute of America (BCIA) recently responded jointly to the Federal Food and Drug Administration (FDA) proposed guidelines to further define Complementary and Alternative Medicine (CAM). FDA recognized biofeedback within its standards under the heading of mind-body medicine. Our joint response thanked the FDA for its recognition and offered our collective services in addressing further related issues.

Another collaborative project currently underway is joint participation of the same groups in a task force charged with formally defining the term "biofeedback." We believe that our members and the general public will be better served through a consistent use of the term throughout the biofeedback community. For the same reasons, AAPB is also evaluating how the term "psychophysiology" in marketed it to the public.

The most important function of any Board is to set the direction for the organization it represents. This change in AAPB's culture is a bold statement on how AAPB is poised to address member needs.

*David L. Stumph, IOM, CAE  
AAPB Executive Director*

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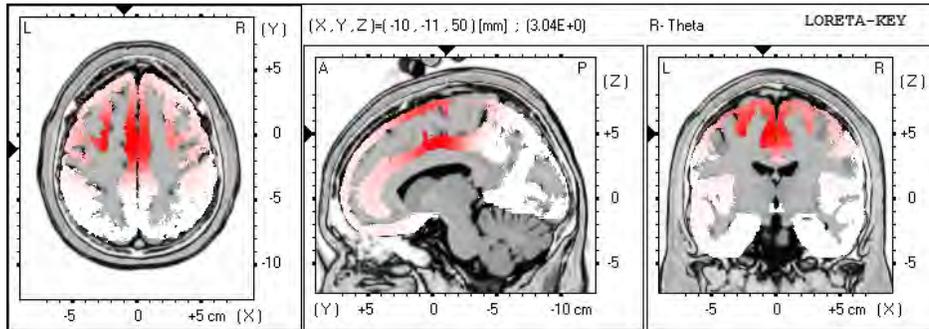
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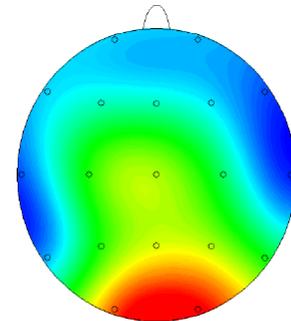
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Roger deBeus, Ph.D.  
William Decker, Ph.D.

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# REMEDIATION OF READING DISABILITY: CONTRIBUTIONS OF AN ACTIVATION DATABASE TO EFFECTIVE TREATMENT PLANNING

K. Thornton, PhD; C. Carroll, PhD; J. Cea, Jusun Cea-Aravena, MA, LMHC

Selection of clinically relevant treatment protocols has seemed, until recently, as much art as science. The skillful clinician has been called upon to carefully integrate information derived from symptom complaints, objective psychometric testing, previous experience with clients presenting with similar problems, and a knowledge of relevant clinical research. Information derived from eyes closed qEEG databases, while helpful, has also been problematic, providing only indirect information

about brain performance characteristics during relevant cognitive tasks. It was in response to these challenges that we set out, more than a decade ago, to develop a task-activation database to guide treatment planning for individuals presenting with specific cognitive deficits or learning disabilities. The following case histories illustrate the contributions of the task activation database approach in providing focus and clarity to the treatment planning process.

## CASE #1 – A CASE OF FAILURE TO COMMUNICATE AND COMMUNICATING WITH THE WRONG SIDE

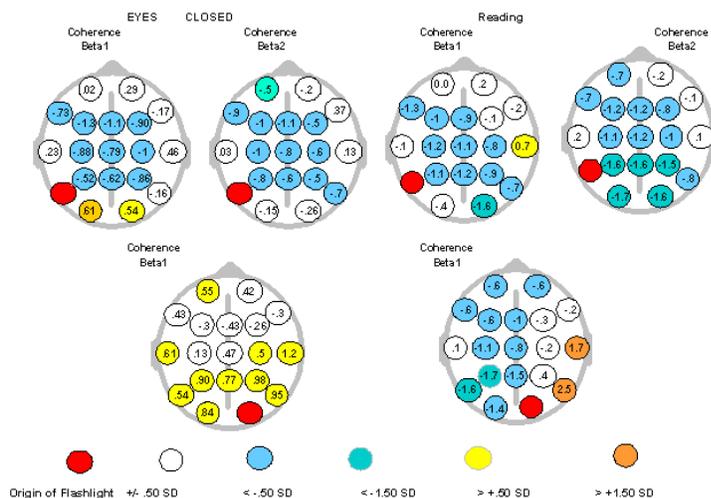
The individual is a 46 year old, right handed male with a long history of reading problems and minor head injuries. All previous attempts at remediation were unsuccessful, according to the client.

The client underwent a cognitive activation evaluation during 10 task conditions, including eyes closed baseline, simple visual and auditory attention tasks, auditory and reading comprehension and memory tasks, and a visuospatial reasoning task.

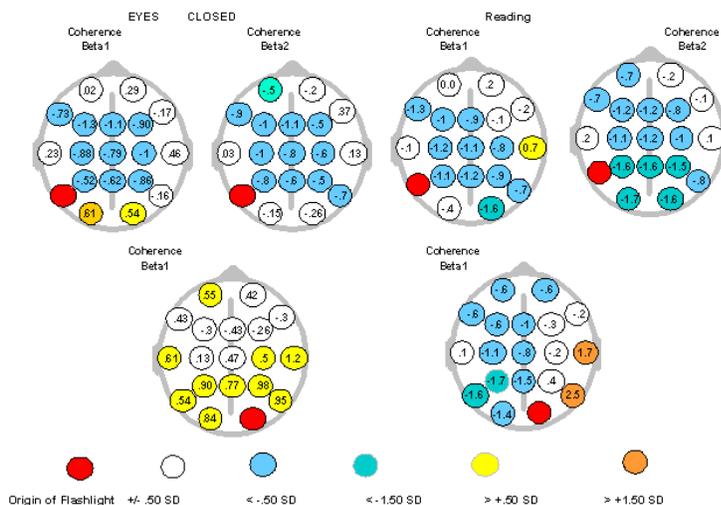
Eyes closed baseline data was of limited benefit in understanding the basis of his reading problem. The client was within acceptable limits for all the relative power measures of delta, theta, beta1 (13-32 Hz), and beta2 (32-64 Hz) frequencies as the delta and theta values were below normal and the beta values above normal during the reading task.

Employing the activation database to understand what was occurring when he read resulted in an interesting pattern of decreased activation (with reference to database) in beta1 and beta2 coherence patterns from the T5 location (Figure 1). The figure presents the data employing a flashlight concept which states that a specific location is sending out a “beam” to all other locations within a specific frequency. When the “beam” arrives at a location a number is generated and compared to the database and a standard deviation value is assigned.

Examination of the client’s qEEG activation pattern during task yielded three key findings. The first is the lowered (with respect to the database) coherence values during the reading task from critical locations related to reading comprehension (T5 and O2). As the information flow in the reading task moves from the occipital locations to the temporal and parietal areas, his low coherence values were judged to be a probable marker of inefficient information processing and integration associated with the client’s problems. The second finding is that the eyes closed standard deviation



**FIGURE 1**  
The values in the circles represent the standard deviation difference from the normative reference group (N=42).



**FIGURE 2 COHERENCE BETA ACTIVITY DURING READING – CASE 1**

Red circle represents origin of flashlight. Numbers in circles represent standard deviation differences from normative group

Continued on page 11

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REMEDIATION OF READING DISABILITY: CONTINUED FROM PAGE 9

values for these flashlights (as presented in figure 1) are low for these relationships but become even lower during the reading task. In particular, the posterior interconnections drop considerably (in reference to the normative database reading sample). Thus, a key feature of this client's difficulties was a failure to activate task appropriate connectivity patterns during reading. The third finding is presented in Figure 2 and is an overactivation of right hemisphere connections, reflecting a possible compensatory response pattern to his brain injuries resulting in inefficient activation patterns within the left hemisphere during the reading task. This pattern is evident in Figure 1 with the O2 coherence beta1 head figure, where all right hemisphere connection patterns are either within normal limits or above while the connection pattern to the left hemisphere from O2 are all below normal. Figure 2 presents the pattern with the P4 and T6 flashlights. As further data to support the right hemisphere overactivation pattern his beta2 relative power value for right posterior locations (P4-T6-O2) averaged 1.9 SD above the norm while the left posterior locations (P3-T5-O1) averaged 1 SD above the norm. The corresponding average microvolt values were 14.7 (left posterior) and 24.4 (right posterior).

In conclusion and in reference to the database, this client fails to activate posterior beta coherences, fails to recruit task relevant beta coherence values when shifting from eyes closed baseline to the reading condition, and over activates right hemisphere coherence relationships and right posterior beta microvolts and relative power measures during the reading task. In short, his brain is doing all the wrong

things. Several studies in the fMRI, MEG research area have pointed to the importance of the left posterior region in the reading situation.

**CASE #2 - A CASE OF FAILURE TO SUPPRESS ALPHA DURING VISUAL TASKS**

The client is a 19 year old student with a long history of reading problems, presently functioning in the normal range of intelligence, but at the 4<sup>th</sup> grade level in reading. Numerous and continuous intervention programs have been attempted since the first grade, with noted failure to improve his ability to read. Figure 3 presents the relative power of alpha values during the eyes closed and reading conditions.

As in case #1, the eyes closed baseline data revealed very little in the significant deviations from the normative sample. However, during the reading task his standard deviation values for relative power of alpha increased dramatically into the 2 to 4 standard deviation above the norm range. Examination of the figure also reveals markedly elevated theta relative power values (compared to the database). The bottom two head figures present the raw score change in these values. Across the 19 locations there was a point value increase of .57 in theta relative power and a decrease of -1.7 in alpha relative power. Thus the client did decrease the absolute values of alpha, but remained in the highly elevated range in terms of standard deviations. This pattern was evident on all three visual tasks which included a non-cognitive visual attention task and a visual problem solving task (Ravens matrices). Whenever his eyes were closed (6 other tasks), his alpha rela-

tive power values were roughly within the normal range.

The examination of his testing scores revealed confirmation of this auditory vs visual task response problem. As one example, on the WAIS III, he scored in the 98<sup>th</sup> percentile on the comprehension subtest (a internal verbal reasoning task) and the 2<sup>nd</sup> percentile range on the coding task (a visual task requiring the subject to place numbers below symbols according to a translation coding system presented on the top of the page).

These two cases provide compelling evidence of 1) the need to consider each case individually; 2) the value of an activation database approach to the reading disabled population; 3) the value of the high frequency data range.

*Dr. Thornton has been publishing ground-breaking research in the understanding of the quantitative EEG and its application to the learning disabled, ADHD, and traumatic brain injured subject since the 1990s. He has developed the Neurocognitive approach to the improvement of brain functioning. The implementation of this approach has resulted in exponentially improved results over traditional approaches. He has published 14 articles and a chapter in the book Evidence Based Practice Interventions. He has been nominated for five different awards for his scientific work and awarded two patents by the U.S. patent office.*

*Dr. Carroll is a New York State licensed psychologist. He has also held New York State and New York City licenses as a special education teacher. He is currently full-time faculty in the Psychology Department at Farmingdale State College of the State University of New York. He also teaches psychology at Molloy College, and the graduate programs at the CW Post campus of Long Island University and Fordham University. He maintains a private practice in Glen Cove, NY and is a past president of The Biofeedback Society of New York and former vice president of the Biofeedback and Behavioral Health Practitioners Guild. He was a member of the graduate school faculty at Adelphi University for nine years, training teachers working towards their Masters Degree in Special Education. Dr. Carroll worked for five years as a counselor for students with disabilities at Farmingdale State College.*

*Juan Cea-Aravena is in private neurofeedback practice in New York. He has a background in experimental psychology and his interests on the area of applied psychophysiology included clinical application of neurofeedback and health promotion/disease prevention using neurofeedback and self-regulation modalities. He has conducted research at CUNY with college students applying quantitative EEG, CPT, neurofeedback and relaxation response. Board Member of Northeast Regional Biofeedback Society (NRBS), and member of AAPB.*

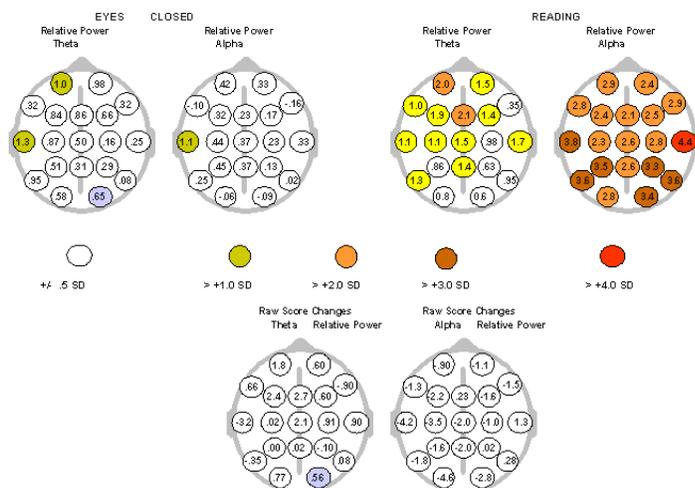


FIGURE 3

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## PRESENTING BRAIN TRAINING TO CHILDREN

Peter Van Deusen

From 1992 to 2001, when few families had heard of neurofeedback (NF), I operated 4 offices in metro Atlanta providing only fee-for-service neurofeedback. In our face-to-face contact with families, our goals were to show them how NF could help, motivate the client to ASK for more, get a commitment from the parents and create a dynamic for NF. This was the approach we used, and it is still effective today.

### THE SETUP

#### 1. DON'T START WITH AN ASSESSMENT.

The assessment is essentially boring. It is for the trainer—not the client. I start with a “sample session”. This is not a FREE sample. Families who get things free don’t have to make any decisions; those who have to pay have already said “yes” once. Charging our standard rate screened out many of the “tire-kickers,” kept professional time productive and improved our conversion ratio.

#### 2. DISRUPT EXPECTATIONS.

In my call to set up the sample session I told parents 2 things: *If you have a file of diagnostic workups, tests, etc., please do NOT bring that.* I knew they had committed a lot to getting those labels. I also knew my interest in labels distanced me from the client (and often one of the parents). *Please don't tell your child, “We're going to have you tested.”* Instead, tell him, “I heard about this place where you run a computer just with your brain. I'd love to see how that works, but you know how I am with computers. Would you come along and try it out for me?” Kids rarely refused this offer, and they usually arrived in a much more positive state.

#### 3. INCLUDE THE SUPPORT SYSTEM.

I asked the parents to schedule when both could come—even in split families—and asked them to bring grandparents and siblings (if they were not too disruptive). I included the doubters and negative voices, so the family dialogue had a common reference. More important, we reversed the usual dynamic: Instead of the siblings chanting, “Nyah, na, na, na-na! You have to do brain training,” I wanted them saying, “How come SHE gets to do it, and we DON'T?!”

### THE SESSION

#### 4. SPEAK TO THE CLIENT—NOT THE PARENTS:

I always warned parents before the session that I would do this. “We all know as soon as I start talking with you about your child, he'll be gone. Hopefully, if I explain things so the kids can understand, the adults will be able to follow along.” After greeting Mom and Dad, I'd shake hands with the client and ask what he knew about what was going to happen. The answer was generally “nothing”. I'd tell him, “don't tell your parents,” (who were standing right beside him), “but you are going to control a computer just with your brain.”

*A note here: I do NOT tell the client, “You are going to play video games with your brain.” All kids know what video games are, and for most of them the games we play in NF are NOT video games. The trainer sets a crucial expectation in the first contact. If I tell the client, “you'll play video games,” or “you'll watch a DVD”, then the promise is NF is entertainment. This is a blind alley, and I avoid starting into it. What NF offers that is unique is that the client can literally control the screen with his brain. As he gets better at doing that (assuming the trainer is training the right thing in the right place), his life will get better. I want the client to have that AHA moment in the very first session and to recognize what he's getting into and why. It's not as easy for the trainer: you can't just set the kid in front of the TV and go away (mentally or physically); you actually have to coach. But I believe the results repay the effort.*

#### 5. EXPLAIN NF IN SIMPLE TERMS:

I introduce the client to frequencies. I make a point of testing in a joking way, asking questions every sentence or two. I explain that her brain works with electricity—that it makes its own electric pulses, just like the heart. Hearts beat faster or slower depending on how hard we are working; so does the brain. I make the connection between brain speed and locus of attention and type of processing: Slow pulses mean you are inside your head. And slow pulses use images instead of words. Many clients can recognize their problems with tasks re-

quiring external attention and/or language processing. Keep this short and interactive, and show how brain speeds connect with what the client wants to improve.

#### 6. GET TO THE TRAINING CHAIR AS SOON AS POSSIBLE:

The younger/more hyperactive the client, the shorter the foreplay. After the orientation, I ask the client, “So when we look at your brain, do you think we'll find a lot of slow or a lot of fast pulses?” Whatever the answer, “Well, let's go see,” and into the training room we go. Parents and siblings are seated behind the client where they can see the screen.

#### 7. INVOLVE THE CLIENT IN THE HOOKUP:

Sticking wires on a person's head can be a bit dehumanizing—especially if you whip out a tape measure, marking pens, impedance meters and charts. I use a simple Cz/A1 or Cz/A2 hookup. If you tell the client, “sit very still,” you become a teacher or parent. Give the client an electrode and let him look it over, explaining that it is like a satellite TV antenna that picks up signals from the brain. Let the client feel the paste and rub the prep between finger and thumb while you set up the electrodes. Ask him to tell you what he is feeling. For example, when prepping, “is that cold?” “Do you feel the sandy stuff in the prep?” Deal with the concern of many clients and parents that you are putting electricity into the head.

#### 8. KEEP IT SIMPLE:

My first screen is a simple power spectrum with frequency across the bottom. I show the client where the slow pulses are, repeat what they are good for, and explain that the taller the bars, the stronger they are. Repeat for the fast pulses. If slow waves dominate, I tell her, “No wonder you have trouble doing your homework! Your brain doesn't make many fast pulses. You aren't dumb or lazy; your brain just doesn't help you as well as it could. If you could teach your brain to make more fast pulses, it would be a lot easier to show how smart you are in school!” When kids protest that they just aren't smart, I tell them “If your brain were a car, intelligence would be the horsepower of the engine. Here we work on the transmission. If you have a

*Continued on page 15*

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## PRESENTING BRAIN TRAINING TO CHILDREN: CONTINUED FROM PAGE 13

really powerful engine, but you can't drive in 4<sup>th</sup> or 5<sup>th</sup> gear, you can't USE that power on the highway!"

#### 9. DEMONSTRATE THE CLIENT'S CONTROL

This is the fulcrum point of the sample session. I switch screens and show a simple bar graph with a threshold and point counter. The goal is to inhibit 2-5 Hz activity. For the first 10-15 seconds, I watch the fluctuation of the bar and note its lower limit. When the bar is near its top, I put my finger beside the graph on the screen just above the normal lower limit and say, "Bring the bar down to my finger, just by paying attention." Literally everyone succeeds. "That's good!" I tell them, "Now keep it there." Of course the bar pops back up within a few seconds. "That's the problem." I tell them, "You can PAY attention; you just can't KEEP paying attention! Whenever that bar goes up like that, you fall inside your head, thinking in pictures and you miss what's happening around you."

#### 10. CREATE A PUBLIC SUCCESS

I use the bar graph with point counter or a simple game like PacMan (always with the bar graph visible.) The segment time is 1-2 minutes. The challenge is to keep the bar below the target by paying attention to it. Here again, the trainer can set expectations. Within 20 seconds of starting the first scoring session, I I look at the child and say, "this isn't the first time you've done this, is it. Nobody does THIS well the very first time!" It doesn't matter if she has been scoring 80% or 40%; now everyone knows she's doing really WELL! I prefer to start off with an auto threshold around 50% and, after 15-20 seconds, switch to Manual. This way, better performance results in higher scores. I want the client to score more points in a 2<sup>nd</sup> and 3<sup>rd</sup> segment. This usually happens without much help, but, since I control the thresholds (in the background), I can guarantee they will. I lead the family's cheers after each. Kids get up from the chair saying, "Hey mom, when can we come back?"

#### 11. ACCEPT THE MYSTERY

At the end of each segment, I congratulate the client on the number of points she scored and ask her how she did it. Some clients will tell you what they did; most repeat the child's mantra: "I don't know." If they have identified a strategy, I reinforce

it. If not, I nod and tell them, "Just like riding a bike. You can do it, but you can't tell another person HOW you are doing it."

#### THE CLOSE

#### 12. GIVE THE CLIENT AUTHORITY

After the session, I ask, "Who did all the work here today? Your family and I were just watching the screen. The computer was just being a computer. Who actually scored the points?" The client admits, "I did." "And so," I point out to her, "when you get better and better at controlling the computer, and you start seeing that your school work is getting done faster (whatever her goals are), who gets to take credit for it?" "I do," they say. This is a crucial benefit of NF. Brain training is empowering. "You are right," I agree. "No-one in the world can change the way your brain works—except you!"

#### 13. CREATE A COOL FRAME

In closing I tell him, "When you see your friends at school tomorrow, tell them, 'you know what I did yesterday? I practiced changing the speed of electrical pulses in my brain!' You know they are going to laugh and say, NO WAY! But you saw yourself doing it here today. Your family saw you and I saw you. The better you get at controlling the screen, the better you will be at doing something that most people don't even believe is possible! It will be like a *secret power* you have, and you'll have it for the rest of your life!"

#### 14. BUILD THE SHEER CLIFF ARGUMENT WITH PARENTS

After giving the child a reward and sending all the youngsters out to the waiting area to watch a DVD, I ask the adults: Did you understand about the slow and fast pulses? They did. Did you see how lots of slow pulses could connect with the problems you see him having? They did. Did you see on the screen how strong the slow pulses are in his brain? They did. Did you see how he was able to control them, but not for very long? They did. Did you see that he got better each time he tried? They did. That's all it is, I tell them. The more he trains—the better he gets at speeding up his brain for longer periods—the better he can pay attention. Do you see that? They do.

#### 15. ASK FOR A REASONABLE COMMITMENT

I finish by saying, then let's try 10 sessions.

We'll assess his brain and test some training approaches to see what works best and give him a chance to keep improving. He won't be DONE training in 10 sessions—any more than you are done dieting after you lose your first 10 pounds—but we should be seeing improvement. And in 35-45 sessions the change should be stable. Then we can stop training, and he'll keep improving for 6 months to a year even without training. I suggest a prepayment option with a discount, since this again demonstrates commitment and improves compliance with appointments.

Obviously each trainer has his or her own style. Parents often told me that their kids liked me because I acted like a kid and treated them like they were adults. Any trainer can adapt these ideas to his or her style and get results.

The keys, from my point of view, are

1. Never forget how strange brain training seemed the first time you saw it! Explain it briefly in terms that clients and their support systems can relate to. Link it to changes they want to see in ways they can understand. When I see trainers handing out research articles to baffled parents, I know they have forgotten this basic dictum.
2. Recognize that you will have to adjust a system, not just the client. Involve the support system as much as possible from the very beginning to avoid creating or reinforcing pockets of resistance.
3. Make them WANT to do it, even before you have fully defined what "it" might be. Especially make the child WANT to do it. Anyone who has a child knows the power of that persistent child voice asking for the cereal or the toy—or the training. Focus on the BENEFITS of training, rather than explaining the process or the basis for it.

*Peter Van Deusen has operated Attention Development Programs in Atlanta for 10 years, training several hundred clients and supervising training of more than 1,000. Since 2002, he has traveled the world teaching trainers a simple, practical brain-based system for working with a wide range of problems. He can be reached through his website ([www.brain-trainer.com](http://www.brain-trainer.com)) or his free listserve ([groups.yahoo.com/group/braintrainer](mailto:groups.yahoo.com/group/braintrainer)).*



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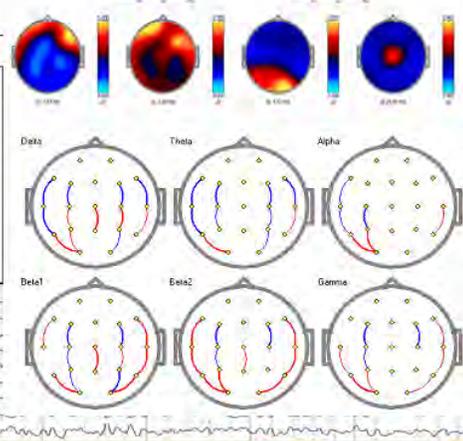
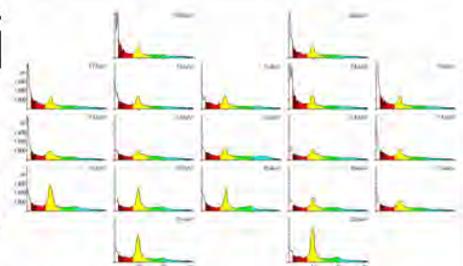
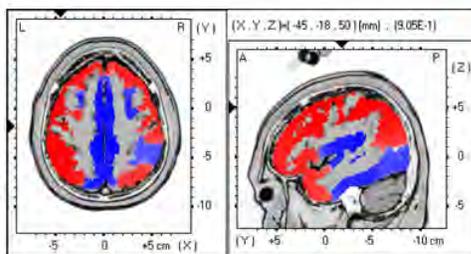


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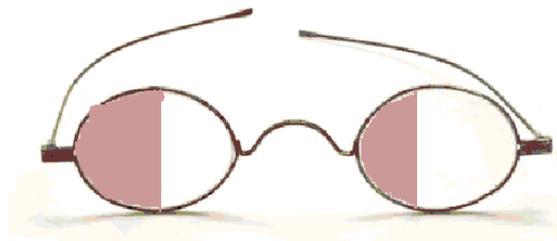
David Kaiser, PhD

*"If there is anyone who is in the sun/  
Will you help me to understand"*  
– lyrics by Joseph Arthur

My son has difficulty understanding. He suffers from autism, a communication and cognition disorder in which his world does not fully overlap with ours. Perhaps he orbits a sun we cannot see nor follow, as my wife believes, as he is often the embodiment of bliss, moving and giggling, swallowed in a light of his own making; but that is his problem:

He rarely drops from his heavenly world to receive the rules of this one.

Autistic children typically show deficits in sociability, communication, and imaginative play as well as exhibiting stereotypical motor behaviors. J.D., my son, is hyper-social, constantly seeking interaction



with everyone he finds. He makes few distinctions between people, calling girls boys and by names of babysitters they resemble. When I warn him not to "stranger talk" when we are out and about, he approaches everyone, taking the hands of strangers, because to him there are no such things as strangers. He is much like his father in this way.

Unlike my wife, I think my son orbits not a sun but a black hole. It is not a darkness built of evil but of loss, of separation, and he is being drawn deeper into its clutches every day. He is in his 9<sup>th</sup> orbit around our sun but spiraling ever faster away from it.

When J.D. was three, he underwent 20 sessions of SMR uptraining. I was fortunate to train J.D. incorrectly on the very first day so I knew almost immediately that

the training had impact—in the wrong direction. We trained 12-15 Hz up and he wet his bed that night for the first time in a year and was so aggressive in school the next day that he nearly was thrown out. SMR was his beta rhythm. So we lowered the frequency and some inhibition returned to his nature. Wrong-training is a useful lesson for anyone who thinks neurofeedback is a placebo. A session or two in the wrong direction, driving them into a neurochemical depression (e.g., downtrained alpha F4, uptrained alpha F3), should open their eyes to the power of rhythm training.

We discovered that's J.D.'s sensorimotor rhythm was most likely 10-12 Hz, which is another story, overlapping his alpha range (which may be common to autism). I trained him in a car seat, a helpful restraint, but after 20 sessions on the Neurocybernetics system, he stared at a filing cabinet instead of the computer monitor. He had burnt out on the same games over and over. I invented a set of "Infinite Content" games for him to resolve burn out (see example figures, below) and I had a student of mine (Justine Paoletti, who was involved in this research) train him again a few years later.

Autism involves severe disturbances of attention. Temporal lobe abnormalities also appear to be involved (Gendry et. al, 2005). My son showed elevated delta in his right temporal lobe, the infant rhythm, the one prior to subcortical connection. Apparently this part of his cortex never joined the thalamocortical confederacy that governed the rest of his cortex; it never matured past infancy. And it is this area of the temporal lobe which is important in the formation of episodic memories, so I suspect his sense of autobiographic self is infantile.

Neurofeedback training has been found to be beneficial for a number of symptoms that apply to individuals with this disorder including seizures, hyperactivity, attention problems, anxiety, and sleep disturbances (Egner & Serman, 2006; Monastra et al., 2005; Hammond, 2005; Hauri 1981). We evaluated the impact of operant conditioning of temporal lobe activity on behavioral, psychophys-

**Table 1.** Paoletti's Observation of J.D.'s response to neurofeedback training

Session Duration Comment

Session	Duration	Comment
1	20 min	C3-C.Ear
2	15	
3	15	Discovered breathing technique to produce SMR bursts
4	30	
5	40 min	T3-T4 Responded very positively to use of animal sounds
6	25	
7	20	Voices of family members introduced as reward. He responded very positively to sister's voice, jumping with excitement
8	40	Excessively talkative
9	20	
10	15	Frequency band widened; JD uncompliant
11	35	Very hyperactive but attuned to task when sounds changed from animals to people
12	30	
13	30	Very uncooperative
14	25	Cooperative, responded better to auditory stimulus
15	15	Inattentive & hyperactive; changed stimulus led to temporary compliance
16	30	Great session; very calm and attentive
17	25	Difficulty concentrating
18	20	
19	22	Washed own hair of electrode prep after session ended without prompting.
20	25 min	Showed awareness of own cognitive abilities: During memory span test he started to respond before longer spans were complete but waited for completion of 4- and 5-item spans. He cleaned himself up after session.

Continued on page 18

## MINDFULL CONTINUED FROM PAGE 17

ological, and neurocognitive function. The goal was to induce greater rhythmicity to his anterior temporal poles, especially on the right side.

## METHOD

J.D. was diagnosed at three years of age with autism and recent training used a 2-channel system (C2 from J&J Engineering, Inc.). Feedback images included animals, ocean life, children playing, and family members (see below). Audio feedback included statements by his mother such as “you can do it” or his brother exclaiming “Perfect!” and other comments and sounds. A Neuro-ABC (Autism Behavior Checklist), Autism Treatment Evaluation Checklist (ATEC), and WISC digit span were administered pre and post training.

J.D. underwent 20 half-hour neurotherapy sessions and was evaluated pre and post-training. Training montages were C3-to-contralateral ear for the first 4 sessions and T3-T4 bipolar training for the remaining 16 sessions to address emotional lability. As the subject’s SMR rhythm was atypically slow (cf. Kaiser, 2002), reward band was set at 9-14 Hz, with 2-7 Hz and 22-30 Hz inhibit bands to control artifact.

Jarusiewicz (2002) also began with a slower SMR reward band, 10-13 Hz or lower depending upon the child’s condition.

## RESULTS

**Cognitive & Behavioral Assessments:** J.D.’s forward digit span improved from 4 items to 5 items after training (i.e., 35th to 69th percentile improvement for his age). The Neuro-ABC and ATEC assessments were inconclusive.

**Behavioral Observations:** He was highly engaged by images and voices of family members. He became much calmer and less talkative during sessions when familial stimuli were used as rewards. In addition to images, the client screen presented filtered EEG signals and he apparently attended to these complex signals as he discovered how to alter his breathing to produce SMR bursts, with subsequent reward, by the 3rd session. After 19 sessions he showed signs of improved self-regulation by cleaning up and washing his hair on his own (see Table 1). Greater rhythmicity was evident across EEG sites after training.

Operant conditioning of temporal lobe activity produced signs of EEG and cognitive normalization: there was in-

creased EEG rhythmicity during baseline recordings and improvement in memory span performance. Social functioning was specifically targeted by temporal lobe training and the use of social and emotional rewards (e.g., pictures of children playing, faces, and emotional expressions) and some improvements were observed in this domain, although a quantitative assessment of sociality was not performed. That symptom changes were observed after only 20 sessions is remarkable and additional training sessions are recommended as most clinical studies for this population involve 30 or more sessions.

Autism may be a disorder of agency, too much agency, too little reception. I suspect it is due to an imbalanced neurohormonal system (testosterone >> estrogen), so it is an endocrine disorder with neurological consequences, much like schizophrenia. Inhibition training (along with connectivity training) ought to be very useful in addressing hyper-agency, especially if the area of the cortex disconnected from subcortical influence can be identified. After a modicum of training (40 sessions), and a thousand other interventions, J.D. was recently diagnosed with P.D.D. by one psychiatrist who worked with him briefly. But this is wishful thinking as my son still hovers near his black hole and can collapse into infinite auto-relation at any given moment. Only time will tell if he, with our help, can pull his way out to our world.

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## FIGURES: EXAMPLES OF INFINITE CONTENT FOR NEUROFEEDBACK:

*Game 1: “Where’s Wanda,” emotional development set. Find Wanda the butterfly, which is placed near facial features.*

*Game 2: Emotional Grids: Ekman-like faces for children. Identify the emotion, or match emotions between consecutive frames.*



## VIDEO GAMES CONTROLLED BY BRAINWAVES

Gail Dugrin PhD



*In response to an invitation for members to submit articles on consumer brain games or toys, we want to thank Gail Sanders Durgin for being the first to submit a review article. We are asking other*

*members who have knowledge about other consumer brain games or toys on the market or in development to submit a brief article reviewing these products, with particular focus on how they may relate to our field. – Editors.*

Over the past few years, two separate gaming companies have been in the process of developing headsets which the average gamer can use to control video games in a hands free way. These headsets are designed to harness brain wave activity as the control-

ling factor in the games. These headsets have from one to 18 sites of dry sensors.

One of these companies is known as NeuroSky. NeuroSky has developed a light savor that is controlled by a sensor that attaches to the players forehead. The sensor reads the brainwaves and sends them to a wireless receiver embedded in-it. When the player maintains his focus long enough the light savor turns itself on. If focus is lost, the savor turns off. In another games created by this company, a selected object can be moved on the video screen by focusing on summoning the object toward the player. The attention algorithm allows the user to push or pull objects, while the mediation state enables the ability to levitate objects.

One of NeuroSky founders, Koo Hyoung Lee is a South Korean scientist who studied how athletes concentrate. The software that interprets the brainwaves is based on brainwave interpretation algorithms

which were developed by the Moscow State University Human Physiology Department. Alexander Kaplan, formally head of the Brain Research Group in Moscow directs the R&D department. Dr. Lee said that the products were tested on two groups, a small sample of ADD children and a group of adults with Alzheimer's. Most ADD children showed improvement within three months but the group with Alzheimer's did not show significant improvement.

The company plans to add the technology to robots, video games, toys and cell phones. The first products should be available next year.

A second company named Emotiv uses a more complex sensor system with up to 18 sensors that can identify facial expressions, measure player's emotional states and

*Continued on page 20*



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VIDEO GAMES CONTROLLED BY BRAINWAVES  
CONTINUED FROM PAGE 19

direct conscious thought. A video on the company's site demonstrates a player using his brain waves to raise, rotate and lift large Stonehenge like stones on the video screen. The company plans to initially develop single player games for video game consoles. The characters in the games will be able to express the emotions of the player on screen. Nam Do, the CEO and cofounder of Emotiv Systems states, "Brain computer interfaces dramatically change the way players interact with a game and, as such, have a profound effect on the gaming experience. Developers are looking to this technology to take their games to another level, to differentiate their products and to retain their fan."

After reviewing this material, I have a number of concerns. The assumption of the developers seems to be that all users will fall within their algorithms and will be able to use the product without adverse effects. I think that assumption is incorrect. Overtraining particular frequency bands, especially in the frontal areas could have negative effects on the user's behavior. I am also concerned that toys and games using EEG will have a negative impact on the public's perception of the field of neurofeedback.

The information in this article was obtained from the companies' web sites: <http://www.emotiv.com/>, <http://www.neurosky.com/>, an article by Rachel Konrad, AP Press, and other press releases and news articles that are on the websites.

## CONFERENCES AND CALLS FOR PAPERS

*Applied Neuroscience Society of Australasia*, 1<sup>st</sup> Annual Conference and Workshops, August 23-26<sup>th</sup>, 2007, Melbourne, Australia, CALL FOR PAPERS; Send a 100 word abstract to [secretary@ansa.au.com](mailto:secretary@ansa.au.com) before 15th of July for oral or poster presentations

*International Neuropsychological Society*; 36th Annual INS Meeting; February 6-9, 2008; Waikoloa, Hawaii, USA; Online submission deadline: Friday, August 31, 2007; <http://ins.abstractcentral.com>

*Biofeedback Foundation of Europe*, 12th International Biofeedback Conference, Holistic Approaches to Health, SALZBURG, AUSTRIA, February 19th - 23rd 2008; Deadline For Scientific Presentations: August, 31st 2007, contact: P.O. Box 555 3800 AN Amersfoort Netherlands, Tel/Fax: +31 (0) 84 83 84 696 [www.bfe.org](http://www.bfe.org)

*Society of Applied Neuroscience*, 2008 Annual conference; 7th-11th May 2008; University of Seville, Spain; Spain; Deadline for Symposia and Roundtables: December 1st 2007, Deadline for Papers, Posters, Workshops and Scholarships January 1st 2008; <http://www.applied-neuroscience.org>

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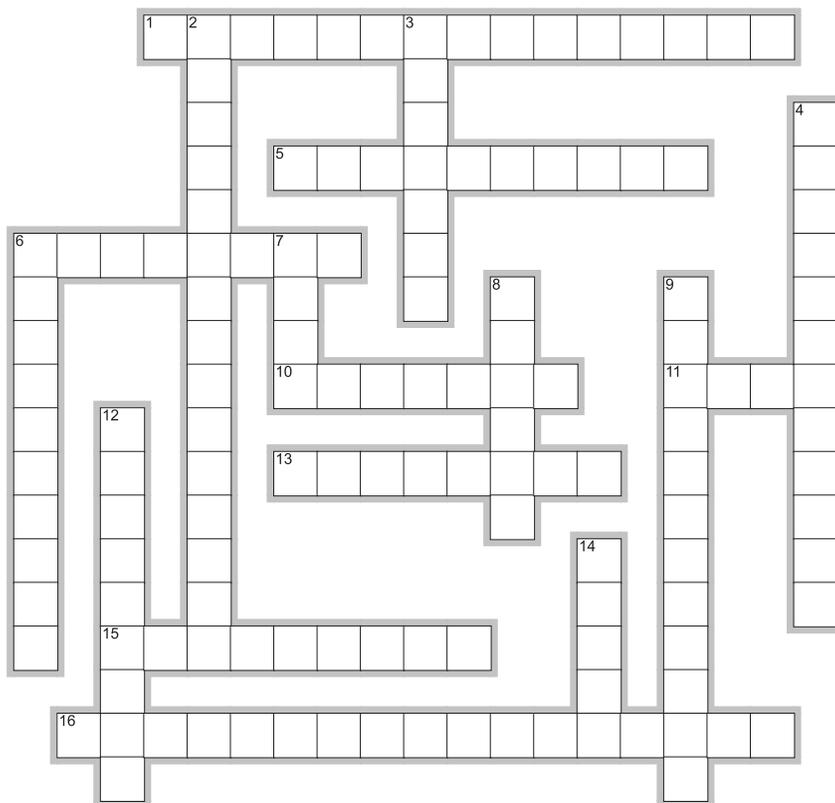
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### ACROSS

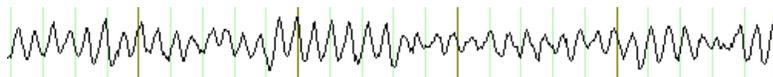
1. For Swingle, high alpha amplitude (two words)
5. Omni-harmonic designed to suppress the excess theta amplitude
6. Activation database developer
10. *Biofeedback of the Brain* author
11. Important frequency for reading
13. SNR meeting site (two words)
15. Australian neurofeedback meeting site
16. Neurologically based technique to resolve trauma (three wrds)

### DOWN

2. Dogris autism protocol (two words)
3. European neurofeedback meeting site
4. AAPB 2008 meeting site (two words)
6. Strategic Themes: Professional Support, Education, Science, and\_\_
7. LENS developer
8. Reading disability author
9. Viral infection, physical and emotional trauma cause this
12. Van Deusen says give client this in first session (two words)
14. Frequency suppressed in trauma survivors

*Crossword puzzle answer is on page 25.*

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### For additional information contact:

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## THE LENS & AUTISM: A CASE STUDY OF JJ

Nicholas Dogris, PhD

In April 2006, I received a telephone call from JJ's mother requesting information about neurotherapy. She had heard about me through her pediatric physician and was interested to learn more about non-medication approaches for the treatment of autism. Her son, JJ, was struggling and needed assistance because most everything he had tried had failed and she was desperate. I provided JJ's mother with information about traditional neurotherapy along with information about the Low Energy Neurofeedback System (LENS). JJ's mother was intrigued and decided to schedule a LENS mapping session for her son.

Up to this point in time my success rate with children who suffered from PDDs was variable. The ability to engage in the treatment required the client to focus enough attention on the screen in order to make the training worthwhile. For some PDD clients this worked very well, and with others it simply failed because they could not engage in the training process. How-

ever, the LENS system did not require the client to engage in a training process. They simply needed to sit there while I administered the treatment. For young children I would simply put on a DVD and let them watch a movie while I mapped the brain. While this technique has problems associated with EEG artifact, it was still effective in providing me with enough information in order to provide LENS treatment.

When JJ and his mother arrived at my office JJ was visibly anxious, made no eye contact, spoke in quick, pressured sentences, and was eager to leave the office as soon as possible. I instructed JJ to sit in a chair close to the computer while I explained the LENS mapping procedure to him and his mother. JJ rocked back and forth in the chair, head down, and asked how much longer this process would take. Since I'm a person who likes to joke around I asked him if he was waiting for his stock broker to call. No response. His mother laughed and I simply began placing the

sensors on his head and mapped his brain. I developed a 15 session treatment plan where JJ would come in once a week and receive LENS treatment at seven sites. He would also be asked to wear the blue/green pROSHI glasses for 15 minutes prior to each session.

JJ's first LENS map did not look as "bad" as I expected it to be. However, after speaking to his mother and therapist I learned that JJ was coping with the moderate to severe symptoms of autism that pervaded every aspect of his life. School was especially tough for JJ and he was known to walk down the hallway with his hands on the wall like a human spider. He had poor social skills and was unable to recognize social nuances. As a result he had few friends, if any, and would isolate himself at home. JJ described himself as a "monster."

After a month of treatment I did not see much change in JJ and decided to try using a protocol that I had developed while treating my son. It had been a particularly snowy year in Bishop, California, having had several storms that covered my home in snow. After one big storm my truck was immovable so I tried the old rock back and forth driving trick to get my it out of the snow. While I was shifting between reverse and drive I realized that I could apply the same concept to the LENS. In LENS theory the excursion of the dominant frequency is limited when a person has suffered from neurological injury. The LENS helps to broaden that excursion, which translates to improved overall functioning. With this thought I deviated from the standard feedback protocol that comes with the LENS system and wrote what is now called "Rocking the Brain."

I began by "rocking" JJ at T5, P3, Pz, P4, and T6. These sites were selected based on my belief that the motor cortex fails to integrate itself appropriately when the person is an infant. This causes, in my opinion, sensory integration issues that give rise to autistic symptoms if not the full blown disorder. I was concerned that I might overstimulate him and trigger a "wired" or "tired" response. However, JJ showed no sign of overstimulation and reported

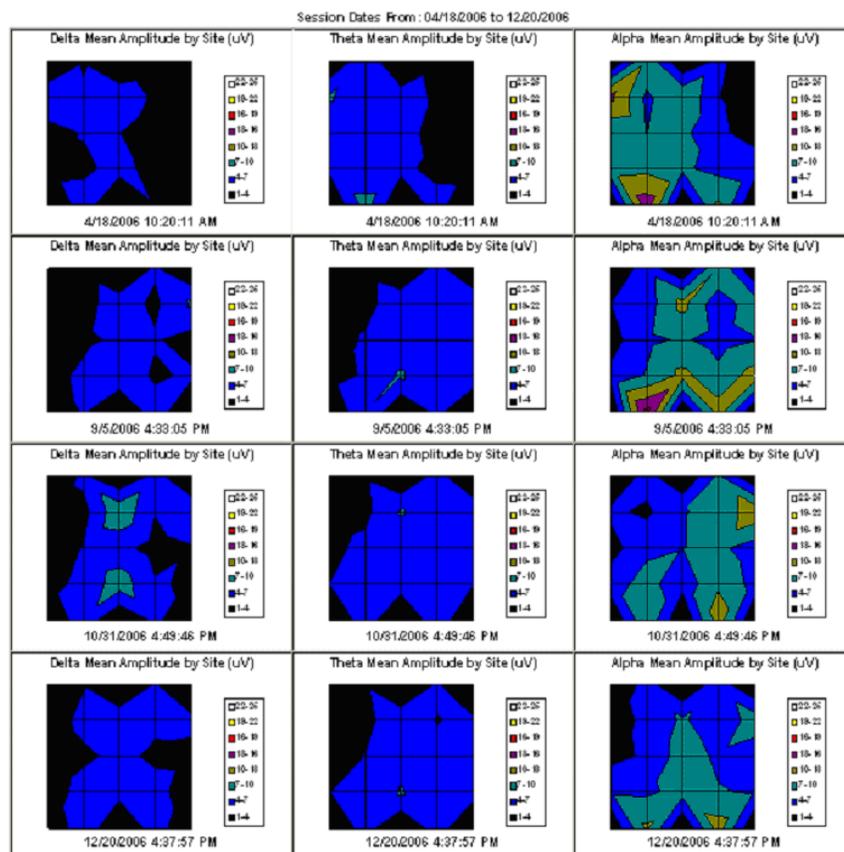


Figure 1. JJ's map sequences from the beginning to the end of treatment.

Continued on page 24

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| <b>Advanced LENS Training at ISNR &amp; BSC – San Diego, CA</b><br>by Len Ochs, Ph.D. Registration: www.isnr.org / www.biofeedbackcalifornia.org | <b>Sept 3 - 5, 2007</b>   |
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## THE LENS &amp; AUTISM: A CASE STUDY OF JJ CONTINUED FROM PAGE 22

that he felt OK. Within days of this treatment JJ began to emerge from his shell. His mother was amazed and began emailing me her observations. When he arrived for his next session he walked into my office, looked me in the eye and said, "Hello." He was calm and relaxed as he walked to the sofa looking for the pROSHI glasses. I was shocked because, I had never seen such a dramatic change in my history of doing neurotherapy. During this session I rocked JJ again and he looked at me after one of the stimulations saying that he felt like his brain was "evolving."

Over the next four months I observed JJ's symptoms of autism diminish to levels that allowed him to be a functional person. In total, he spent seven months in treatment. His maps (see Figure 1) show changes in the delta, theta, and alpha ranges that illustrate the notion of suppression and reactivity that is typically observed in LENS treatment. After one year JJ's treatment gains remain intact and he continues to improve.

JJ's progress (along with my son and many other clients) motivated me to develop other protocols for the LENS that would facilitate this 'rocking' process so that others like him could be helped.

JJ's progress was documented by his mother who is an active part of his life and has done everything that she can to help her son. The following is an account from her perspective. I feel that it is important to hear her story as it illustrates what I observe with the LENS on a consistent basis.

The following is an account from JJ's mother written three months after he began LENS therapy:

I didn't know what to do. It was hard for me to see JJ suffering. We had been attending a local church regularly for the past four months after taking a hiatus for about 12 years. It was a Saturday morning when I decided to get on my knees and pray for a miracle, miracle to cure JJ of his autism. I called his pediatrician to ask if I could meet with him. I expressed that I felt the medications he had been taking for 10 years might be causing negative side effects. I wanted JJ to be off all medications; I needed to see the real JJ. Were there other options besides medications? I wanted to see JJ without chemical dependency.

The pediatrician shared with me that he had heard of neurofeedback therapy, but really didn't know much about it. At the same time I was talking to the pediatrician, JJ's school counselor was talking to the

neurotherapist 45 minutes away. She had the same idea.

Is neurotherapy the miracle I prayed for? JJ has been medication-free for the past five months after receiving 10 sessions of neurofeedback therapy. This is the highest functioning my child has ever been, and he is without medication. He told me for the first time a few months ago, "Mom, I am loving my life." I asked him why. He expressed that he now has a brain. It feels like he has an open brain. JJ shared that he hopes he lives really, really long.

These are areas I have seen improvement:

- open mindedness
- thinks more logically
- processes information more quickly without confusion
- holds "on topic" conversations
- takes the perspective of others
- goes outside the box and breaks routines
- has more self control (not being so impulsive)
- being more comfortable with "who" he is
- has a higher self-esteem
- does not get irritated or frustrated as easily
- seems to problem solve better coming up with good solutions
- is making goals for himself
- has a positive attitude; has a "can do" attitude
- appears to have a lot more confidence
- is taking responsibility for his actions
- remembers information

Here are a few examples:

JJ has not participated in extra-curricular activities since 1<sup>st</sup> grade. He has not felt comfortable doing so. My thought is because it would upset his routine, that he wanted to isolate himself from the rest of the world hanging out in his room focused on drawing, or that he thought he should know all of the information before hand. After a few months of neurotherapy, JJ expressed interest in martial arts; he has been taking lessons for the past three months and thoroughly enjoys it. For the past few months, he has also expressed interest in becoming a police officer or detective as

he plans to go on to college. He has participated in four "ride-alongs" with the local police department and is seeking out a job after school with the PD, something he would have never done before (he just got the job!!!).

For months, JJ had a behavioral plan in place at school. This was to help him with self-control and not lash out at other students during conflict. In the heat of the moment, he could not think through this process and would get into trouble many times for his impulsive and reactive behaviors. A few months ago, JJ called me from school to share his excitement that he had followed the plan during a confrontation from another student. Bursting with excitement, he expressed, "I did it, I did it, I did it!!!"

Over the years, we have tried to teach JJ how to hold conversations. This has not clicked until recently. He stores "friend files" in his brain so that when he sees a friend, he can pull information out of his brain to start a conversation. Recently, I observed a conversation. A friend came up to JJ. He asked a very appropriate question. The friend responded, JJ then asked another question relating to the friend's answer because he was listening to the answer. He did this about three times building on the conversation. He listened and stayed "on topic." In the past, JJ would have entered a conversation with an off-topic joke and then couldn't understand why no one got it.

Over the past few months, several people have expressed to me the difference they have seen in JJ. They have shared with me that his face looks so relaxed, that he has eye contact, he looks so happy, always smiling and laughing. He appears very confident and holds very intelligent conversations. They have witnessed him socializing very appropriately. They can't believe the difference and neither can I.

I have also witnessed JJ hanging with friends with his body language engaged participating in conversation. In the past, he would have been very anxious pacing outside of the circle wanting to get into the conversation wringing his hands appearing stiff-like.

During summer break, JJ was an assistant at the local day camp. He loved volunteering there. I asked what it was that he enjoyed so much. He said it was so much fun being around the other kids.

We visited my mother over the summer. She spent a day alone with JJ visiting an animal park. She had such a wonderful

time with him. She could not believe the difference in JJ, the very intelligent conversations she held with him and how he kissed her cheek thanking her for caring so much for our family. I shared with her how it was just recently that JJ had kissed me on the cheek, too, and told me that he loved me.

Over the past several months, JJ has attended a weekly local youth group. He participates in discussions, and recently brought a friend. I understand he did very well introducing his friend to the other kids. JJ appears more confident in social situations.

JJ doesn't hold a driver's license. With his new social schedule, I have driven him around or he has taken the town shuttle. Another parent said to me, "Too bad you have to drive him around." I said, "Are you kidding? I finally get to do it. For years, all those other parents got to and I never did."

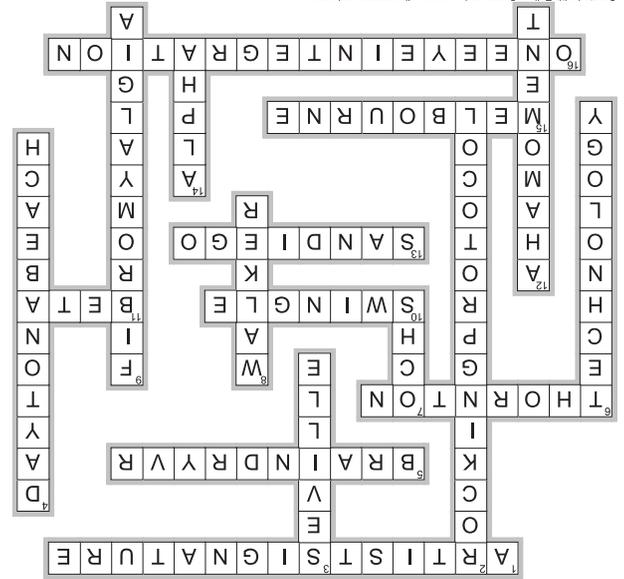
JJ is writing a graphic novel on tolerance and differences. He is a gifted artist and wants to help others. Autistic people are very highly intelligent. Can you imagine what lies ahead when we unlock the doors that have been holding them in bondage? **AN AWAKENING!!!** Is this a cure

for autism? Like the old saying goes, be careful what you wish (pray) for. I am now experiencing a huge adjustment in my life as JJ has become more independent, thinks more logically, seems more intuitive and is less impulsive. He just wants to be a teenager. I have to stop and let go because he is less dependant on me. When I seem a little overly protective, he'll say to me, "Mom, stop living in the past... you know what I mean." There is still a journey ahead of us, but I'm excited to see what the future holds; JJ's wonderful journey.

*Dr. Dogris is a psychologist who practices in the Eastern Sierra Mountains located in Bishop, California. He has been using neurofeedback for over seven years in his clinical practice treating children, adolescents and adults. Dr. Dogris has developed several innovations for the LENS and is committed to the research and development of the LENS technology. Dr. Dogris earned his Ph.D. from the California School of Professional Psychology in 1997. He earned a Master's Degree in research*

*psychology from Humboldt State University in 1990 and his BA from California State University, Long Beach in 1987. Dr. Dogris has 17 years of professional experience working with a wide variety of patient populations.*

Crossword Puzzle Answer



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# QEEG AS AN AID TO DIAGNOSING AND TREATING ADHD SUBTYPES AND COMORBIDITIES

Jonathan Walker, MD

Neurofeedback is increasingly recognized as an effective way of reducing attentional problems and hyperactivity in school children.<sup>1</sup> However, the studies have often not reported the *efficacy* of the neurofeedback (how *much* the ADHD is improved) and there has been no comprehensive report on how effective standard protocols are in reducing comorbidities such as learning disabilities, anxiety, and depression. QEEG studies have identified several subtypes of ADHD.<sup>2</sup> In our practice, we found that standard training for ADHD (*e.g.*, decrease theta, increase beta at C3; decrease theta, increase SMR at C4) improved ADHD about 80% of the time. Usually when neurofeedback was not successful, a QEEG would reveal another subtype (for example, excessive beta in the frontal or central areas). When we then addressed the specific abnormalities for that individual, our success rate approached 100% (judged by normalization of the T.O.V.A.). Wright and Gunkelman<sup>3</sup> did a controlled study of standard neurofeedback training *vs.* QEEG-guided neurofeedback training with 80 subjects. Using a soft criterion for success (client satisfaction), 80% of the subjects treated with the standard protocol reported satisfaction. If a harder criterion was used (total elimination of the complaint plus normalization of the T.O.V.A., no longer diagnosable by the DSM-IV), only 30% of those treated with the standard protocol reached criterion. The QEEG-driven protocol group reached the harder criterion 60% of the time, a doubling of the success rate by this criterion. Only 10% of the QEEG group reported no success *vs.* 20% for the standard group. The most common ADHD subtypes (in our experience) are noted in Table 1.

QEEG is also helpful in diagnosing and treating comorbidities in ADHD clients. In our experience, the majority of ADHD clients have one or more comorbidities. Standard theta/beta protocols usually do not address or remediate those comorbidities which include anxiety, depression, oppositional defiant disorder, epilepsy, specific learning disabilities, Tourette's syndrome, and bipolar disorder. There are reliable QEEG markers for those comorbidities,<sup>4,5,6</sup> and when neurofeedback is used to normalize the QEEG,

**TABLE 1**  
Subtypes of ADD/ADHD

CLINICAL PRESENTATION	QEEG	BEST NFB PROTOCOL (QEEG-BASED)
1) Hypoaroused (classic type)	Excess 1-9 Hz F <sub>1</sub> /F <sub>2</sub> /F <sub>3</sub> /F <sub>4</sub> /F <sub>Z</sub> (1 or more)	↓1-9 Hz F <sub>1</sub> /F <sub>2</sub> /F <sub>3</sub> /F <sub>4</sub> ↑16-18 Hz
2) Hyperaroused (over-focused type)	Excess 21-30 Hz F <sub>1</sub> /F <sub>2</sub> /F <sub>3</sub> /F <sub>4</sub> /F <sub>Z</sub> (1 or more)	↓21-30 Hz/↑10HZ F <sub>1</sub> /F <sub>2</sub> /F <sub>3</sub> /F <sub>4</sub>
3) Normal arousal; learning disabilities (Normal T.O.V.A./I.V.A.)	Focal excess 1-9 Hz in areas other than frontal areas	↓1-9 Hz in affected areas plus normalize coherence abnormalities

**TABLE 2**  
Usual QEEG Values for Various Abnormalities and Appropriate Training Protocols to Remediate Them

Comorbidity	QEEG Values	Effective Neurofeedback Protocols
1) Anxiety	Excess high frequency beta (any cortical area)	↓21-30 Hz/↑10 Hz of affected area
2) Depression	State value = Frontal alpha asymmetry (must use C <sub>2</sub> reference)	Alpha symmetry training
3) Dysgraphia	Excess 1-7 Hz at C <sub>3</sub>	↓1-7 Hz/↑15-18 Hz at C <sub>3</sub>
4) Dyscalculia	Excess 1-7 Hz at P <sub>4</sub>	↓1-7 Hz/↑15-18 Hz at P <sub>4</sub>
5) Auditory Processing Difficulty	Excess 1-7 Hz at T <sub>5</sub> and/or T <sub>6</sub>	↓1-7 Hz/↑15-18 Hz at P <sub>4</sub>
6) Visual Processing Problems	Excess 1-7 Hz at O <sub>1</sub> and/or O <sub>2</sub>	↓1-7 Hz/↑15-18 Hz at Fz at O <sub>1</sub> + O <sub>2</sub>
7) Verbal Fluency Problems	Excess 1-7 Hz at F <sub>7</sub>	↓1-7 Hz/↑15-18 Hz at F <sub>7</sub>
8) Working Memory Difficulty	Excess 1-7 Hz at Fz	↓1-7 Hz/↑15-18 Hz at Fz
9) Declarative Memory Difficulty	Excess 1-7 Hz at T <sub>3</sub> and/or T <sub>4</sub>	↓1-7 Hz/↑15-18 Hz at T <sub>3</sub> + T <sub>4</sub>
10) Verbal Understanding Difficulty	Excess 1-7 Hz at T <sub>5</sub>	↓1-7 Hz/↑15-18 Hz at T <sub>5</sub>
11) Verbal Comprehension Problem	Excess 1-7 Hz at P <sub>3</sub>	↓1-7 Hz/↑15-18 Hz at P <sub>3</sub>
12) Tourette's Syndrome	Excess high-frequency beta (21-30 Hz) at C <sub>3</sub> , C <sub>4</sub> , and/or Cz	↓21-30 Hz/↑10 Hz at C <sub>3</sub> , C <sub>4</sub> , Cz
13) Oppositional Defiant Disorder	Excess high-frequency beta (21-30 Hz) at T <sub>5</sub> and/or T <sub>6</sub>	↓21-30 Hz/↑10 Hz at T <sub>5</sub> + T <sub>6</sub>
14) Bipolar Disorder	Excess high-frequency beta (21-30 Hz) at F <sub>3</sub> and/or F <sub>4</sub> (mania)	↓21-30 Hz/↑10 Hz at F <sub>3</sub> + F <sub>4</sub> (mania) ↓1-7 Hz/↑15-18 Hz (depression)
15) Dyslexia	1) Excess 1-7 Hz at F <sub>1</sub> or F <sub>2</sub> or F <sub>7</sub> or T <sub>3</sub> or T <sub>4</sub> or T <sub>5</sub> or T <sub>6</sub> or O <sub>1</sub> or O <sub>2</sub> or C <sub>3</sub> or C <sub>4</sub> 2) Decreased coherence in 1 or more pairs of electrodes	↓1-7 Hz/↑15-18 Hz in affected areas and Normalize affected coherences

the comorbidities are usually effectively remediated. (Table 2).

Learning difficulties may also be caused by disconnections (decreased coherence) between different areas (modules) important in learning. The classic disconnection syndromes described by Geschwind and colleagues<sup>7</sup> can be determined easily using the QEEG, and coherence training is usually effective in normalizing the disrupted connections and improving learning abilities. Less commonly, hyperconnections (increased coherence between critical areas for learning) may decrease flexibility and creativity<sup>4, 7</sup> in the learning process. These may also be remediated with coherence training.

*Note on Table 1:*

*If a client has slow processing, it may appear to others that they have an attention problem. They probably are not paying attention because of the slow processing problem rather than an inability to pay attention.*

*For example, excess slow activity (1-9 Hz) in the temporal areas can impair short-term memory. The client may appear not to be paying attention. He/she may actually be paying attention, but cannot remember the information to which he was paying attention.*

*Likewise, clients with visual processing, auditory processing, verbal understanding, or comprehension difficulty have difficulty paying attention because of the processing difficulty rather than an inability to pay attention. Their T.O.V.A. or I.V.A. is likely to be normal in such cases. I consider these clients to have learning difficulties masquerading as ADD.*

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4. **Tato Sokhadze.** "Neurofeedback and Motivation Enhancement Therapy Based Bio-Behavioral Treatment in Psychoactive Substance Use Disorder (PSUD)" \$12,000
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6. **Jonathan Walker and Joe Horvat.** "QEEG-Guided Neurofeedback in Traumatic Brain Injury TBI): A Multi-Site Study" \$10,000 in the first year

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## STUDENT RESEARCH SPOTLIGHT

Kimberly Weeks



This is a new section in *NeuroConnections* to spotlight the research work of student members. In this month's pediatric-themed issue, we're featuring the abstract from a pilot study that evaluated the efficacy of using QEEG and neurofeedback with children with abuse and neglect histories, by Lark Huang-Storms & Janice Dunn, from the University of North Texas (UNT). A description of research that Janice is continuing, based on the initial pilot study is also included.

Lark is a fourth-year doctoral candidate in the Clinical Health Psychology/Behavioral Medicine program, starting an internship this fall. She has a masters' degree in School Psychology, and has completed her BCIA-EEG certification. Janice also has her M.A. in School Psychology and is working toward her Ph.D. in Behavioral Medicine/Health Psychology at UNT.

For students who would like to see your research spotlighted here, please contact the Student Editor, Kimberly Weeks at [breezheasy@earthlink.net](mailto:breezheasy@earthlink.net).

Huang-Storms, L., Bodenhamer-Davis, G., Davis, R., & Dunn, J. (2007). *QEEG-guided neurofeedback for children with histories of abuse and neglect: Neurodevelopmental rationale and pilot study*. *Journal of Neurotherapy*, 10(4), 3-16.

### ABSTRACT

Abuse and neglect occurring in childhood has been associated with a number of functional and physiological effects on the brain. The purpose of this study is to determine what QEEG patterns are apparent in children with histories of relational trauma. Files of 21 children who had been removed from their homes by Texas Child Protective Services due to physical or sexual abuse or neglect were selected for analysis. The EEG records of the participants were compared to NXLink and Neuroguide database normal controls. The abused children exhibited significantly less delta relative power in the frontal region and negative maturation

lag scores. Though not significant, these children also tended to have greater theta relative power frontally and hypocoherence in the right hemisphere. Fifteen of the twenty-one children were taking prescription medications, which unavoidably affected the results.

### BACKGROUND

Poor self-regulation of arousal is central to the behavioral difficulties experienced by children with traumatic caretaker attachment histories. EEG biofeedback teaches children to self-regulate brain rhythmicity, which may in turn affect global improvements in the areas of attention, aggression, impulse control, and trust formation. Research literature reports successful use of neurofeedback for children with ADHD, autism, asthma, stroke, and migraine. This study extends current research by investigating the effectiveness of neurofeedback in reducing behavioral problems commonly observed in abused / neglected children.

### METHODS

Treatment records of twenty adopted children with histories of removal from their biological home by Child Protective Services were obtained from a private neurofeedback practice. All of the children were assessed prior to treatment using the Child Behavior Checklist (CBCL) and the Test of Variables of Attention (TOVA) and again after 30 sessions of individualized, qEEG-guided neurofeedback.

*Results:* T-test analysis of pre- and post-scores on the CBCL showed significant changes in the areas of externalizing problems, internalizing problems, social problems, aggressive behavior, thought problems, delinquent behavior, anxiety / depression, and attention problems ( $p < .05$ ). TOVA omission error, commission error, and variability scores also improved significantly following neurofeedback training ( $p < .05$ ). Some pre-treatment qEEG patterns common to this group of children were identified.

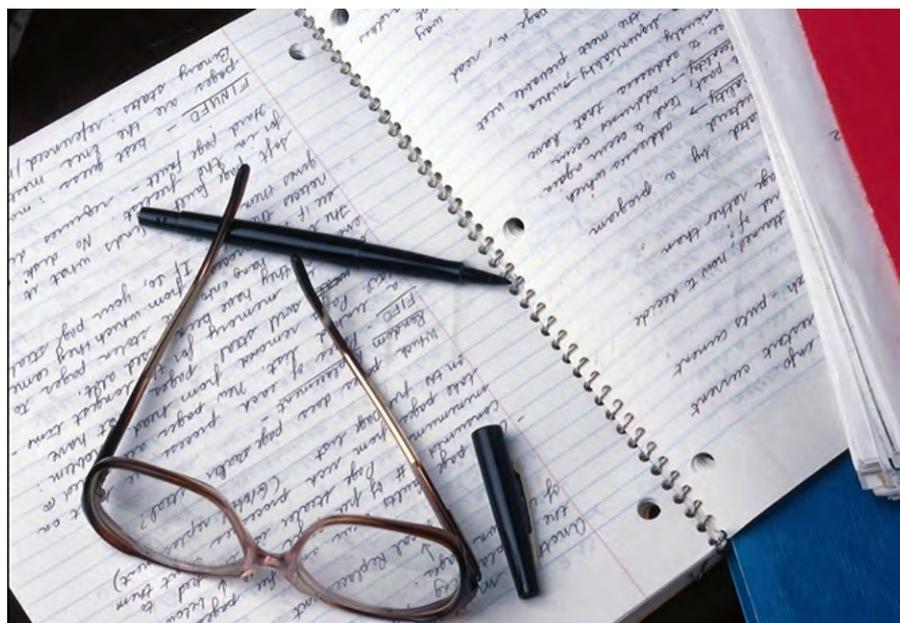
### CONCLUSIONS

The CBCL and TOVA score improvements observed in this study indicate that neurofeedback is effective in reducing behavioral, emotional, social, and cognitive problems in children with histories of neglect and / or abuse.

Janice's current research involves adding more participants to the study reported above, and concentrates on the following areas:

1. Reporting coherence findings.
2. Testing to see if there are qEEG differences between males and females in this population

Correlating Child Behavior Checklist (CBCL) and Tests of Variables of Attention (TOVA) data with LORETA results.



## WHEN ATTENTION DEFICIT ISN'T ADHD— THE EEG TRAUMA SIGNATURE

Paul Swingle PhD

Interviewed by Roger Riss, PsyD

**Q:** *Dr. Swingle, tell us about your current practice.*

I left McClean Hospital and Harvard Medical School and University of Ottawa just about 10 years ago. I was supposed to be retiring in Vancouver, and I had visualized myself as having 8 or 10 clients a week, casually maintaining myself in private practice. However, neurotherapy in this province has just exploded, and we see about 8,000 visits a year and we have a staff of ten here.

**Q:** *Who were the early influences that drew you to the field?*

I think the most influential was Neil Miller. I didn't personally know him but the work that he did on animals' controlling autonomic function had an enormous impact on me.

**Q:** *Tell us about your early work in bio-feedback.*

I received my degree from the University of Massachusetts, and my original area of interest was conflict resolution. I started to look at some of the physiological correlates of conflict between individuals. We found, as you might expect, that you could track a conflict in terms of autonomic arousal, so that when an individual was involved in a severe conflict physiological indicators of stress increased and as they moved toward conflict resolution, we would observe a decline in physiological arousal.

And we gave some thought to incorporating the use of physiological indicators into conflict resolution and negotiation processes. When we were working with couples, for example, we might monitor their physiology, so that when a couple's autonomic arousal was high we had them stay with a topic until the topic was resolved and so forth. That goes back almost 40 years ago, so, it's not surprising now when you look back on it. In any event that gives you a background of how I got interested in physiological correlates of human behavior.

**Q:** *When did you first begin working with EEG?*

While I was at McClean Hospital, we were introducing—now this goes back a num-

ber of years – introducing electroencephalographic assessments of individuals who were admitted to the hospital for all kinds of psychiatric disorders: eating disorders, traumatic stress, depression, OCD and so forth.

**Q:** *Did you identify a recurrent EEG pattern in PTSD survivors?*

Yes. That's where I first stumbled upon a relationship of brain activity to post-traumatic stress disorder. We saw a number of Vietnam combat veterans at the hospital with post-traumatic stress disorder. And when we did the brain assessment on them, part of my assessment was to look at the difference between eyes open and eyes closed alpha at both PZ and O1. As everybody knows, one expects to see a nice robust alpha amplitude increase jumping out at both of those locations when eyes close. Now, as we get older, our alpha efficiency starts to decrease, and we may begin to see a decline in the amplitude of alpha increase with eye closing. But what we observed of particular interest in individuals with post-traumatic stress disorder was that when they closed their eyes, their alpha didn't increase, and in some cases even went negative, decreasing further in amplitude.

Now if you reflect on that for a few moments it makes infinitely good sense, because the big issues in post-traumatic stress disorder are visual flashbacks, emotional flashbacks, and so forth. And if the brain is not responding with a strong alpha visual response, then of course there's some depression of the potential for flashback. Now that's the way I kind of make sense of that anomaly. I interpret it as emotional suppression of brain activity.

**Q:** *Was this pattern evident in other kinds of patients?*

Well, I started looking for this in other situations, for example, in individuals who were hospitalized with severe depression or OCD; and occasionally we would run into situations in which we would see a suppression of that alpha response. Inevitably, when I would query the person about their emotional traumatic history. I found that if I had a marked suppression of alpha that the person admitted to a history of emotional trauma.

**Q:** *Will you tell us more about your assessment procedure?*

One reason why neurotherapy is so popular in our clinic is our rapid assessment procedure, The Quick Q, I call it, and that procedure takes 6 ½ minutes of recording time. We do not ask the people why they've come to see us. That 6 ½ minutes of data provides us with enough information to tell the person why they've come for treatment.

Part of that assessment is to have a look at the potential for trauma and here's where I would like to emphasize that it's very important that you do an evaluation of the raw EEG signal; that the clinician is watching raw signal while collecting information for the Quick Q. I strongly advise individuals doing rapid intake that they actually sit down with the client and watch the raw signals because there are qualitative differences associated with the trauma pattern that you'll only see if you're watching the raw signals. If you simply rely on a statistical report and a topographical map and so forth, you will miss things.

Now, if you have full-blown post-traumatic stress disorder most of the time it's going to be flat-lined and you would be able to see that in an eyes-open vs. eyes-closed topographic map, but if you're looking at some of the less severe traumatic conditions, a child being bullied, for example or a child who has experienced a frightening hospital emergency room procedure, that sort of thing, then you are going to see some peculiarities that are most easily seen in the raw signal.

For example, what you see often is that the signal is not robust. For example at PZ you want to see a jump in alpha when the eyes close of at least 30%. If it's less than that a trauma flag goes up. Now we also look at the back of the brain, at O1, in the Peniston area, and if that jump in alpha is not 50% or more, then again the trauma flag goes up.

Now it's further complicated if a child has artistic interests or skill. The artist signature is exactly the reverse of the trauma signature. The artist signature is a very robust and strong alpha response when the

*Continued on page 30*

## WHEN ATTENTION DEFICIT ISN'T ADHD—THE EEG TRAUMA SIGNATURE CONTINUED FROM PAGE 29

eyes are closed. It jumps to 200 to 400% at O1 and 150% or so at PZ. Now what happens if you couple the trauma signature with the artist signature since they're exact opposite, it has a very unique pattern on screen if you are watching the raw signal. It looks like the alpha jumps up and it looks like somebody's pushing it back down - a very, very unique display.

Now, in my practice, I treat a lot of artists who have artist's block and inevitably it's some trauma that's emerged; and when I describe what the signal looks like for the artist, they say that's exactly what it feels like. It feels like somebody's sitting on my creativity. It's just an interesting anecdote in terms of what you get when you have an artist who has a trauma background.

**Q:** *You've suggested that trauma responses in children may often be mislabeled.*

A lot of kids come in with diagnoses of ADD, ADHD, oppositional defiant disorder, learning disorder, and so on, and when you do the intake assessment you can easily pick out one of the various forms of ADD or ADHD, or you can pick out the ODD. But very often you won't see strong signatures for ADHD or strong signatures for ODD; instead what you see is a trauma signature.

Now one of the effects of trauma is that a depression of the alpha affects short-term memory so that you're not getting an efficient transfer of information to the short-term memory register. These are the kids that study or try to read something and their retention of that material is not good. So that is the first symptom associated with trauma. The second is that the child is traumatized; let's take bullying as an example. If the child is frightened in school, obviously sustained attention is going to be affected by that. If the child feels in a constant state of disquiet, obviously that's going to influence their ability to sustain attention, to block out interfering thought processes and so forth. Finally, you may be getting an individual whose response to the trauma is anger and oppositional types of behavior; so that can also be associated with the trauma signature.

**Q:** *Once a trauma pattern is identified, how do you address the issue with the child's parents?*

Whenever I see the trauma signature in a child, not only does a flag go up but it's kind of like a hot potato. The parents are sitting in the room, you see the trauma signature;

you don't see any signatures for things like ADHD or any of the other things. How do you handle that? Over the years, I've come to the conclusion the best way to deal with it is head on, so I ask the parents straight away if the child has had any experience that may have felt severely frightening to them.

Sometimes I'll have the child leave the room—we have a treasure chest here and after we've collected the data, the child goes out and digs around in the treasure chest. We've got coins from all over the world, fossils, and semiprecious stones and so forth, all educational material – they dig around in that while I'm chatting with the parents about what the potential is here for the child having experienced a trauma. The first thing that we consider is bullying. And you know the parent is more likely to be aware of that if the child being bullied is a male rather than a female. A male child that's been beaten up may come home crying because he's been hit or so forth. Bullying among females is a different kind of situation which tends to take the form of exclusion from groups, ridiculing in terms of looks, things of that nature, which can have the same traumatic impact on a child; but they're less likely to tell parents and teachers about it. In this respect bullying is not unlike ADHD, which also tends to go undiagnosed more often in females. So we review all of those things with the parents. Now let me give you a couple of examples:

In one example a child fell while running with a pencil in her mouth and the tip of the pencil went through the roof of her mouth. Now she was brought to the emergency room and she had all of the procedures done, they were painful and frightening and so forth, but nonetheless the parent was surprised and curious about why there was a trauma signature associated with that. We couldn't find any other trauma in the child's history. We were chatting with the child about it and it turned out that the day before she had that accident she had been watching television and somebody had died in an accident exactly like the accident that she had, that is they had something in their mouth, fell and it went up through the roof of their mouth, but they died from it.

Now, in another situation, a male child had genital surgery at a very young age, at three years or so, and he was handled very badly by the hospital. The child was brought in very fearful and the hospital, in their infinite wisdom, told the parents to leave, because they were distressing the

child and so forth. In any event, the surgery was unsuccessful and had to be repeated a year or so later and they brought the child to the same hospital. The child had a panic attack associated with being brought to that same place. The hospital, in its infinite wisdom did exactly the same thing. They removed the parents and strapped the child down in the operating suite.

Parents can often be very poor judges of trauma in children. I have one extreme example. I saw the trauma signature in the EEG of a young child of 10 or 12 years of age and I queried the parent about it. And their response was "He seems to be dealing with things okay." As soon as I heard that, the flag went up. What is he dealing with OK? And it turned out that the child had a relative that had committed suicide three weeks earlier. And the parent didn't identify that as an emotional trauma. Now that's unusual, of course, but the point that I'm getting at is to trust the data. When you see the trauma pattern in an EEG record something's going on somewhere.

**Q:** *Tell us about your treatment approach.*

Now the treatment of this is very straight forward. What we want to do is normalize brain function. That's what we do. Now, I make it clear to anybody with a trauma signature that when we release the alpha that they are going to experience an emotional reaction to that. Because all the traumatic material that's kind of wrapped up in that suppressed alpha is going to be released. I point out to the individual that you're not going to melt down, although you may not be used to this kind of reaction. I tell them "You're going to engage in the most efficient psychotherapy on the planet, you're going to engage the body's normal psychotherapeutic mechanisms." Basically, the child's going to dream more about the event; the events are going to be more on the front burner. The process occurs over a 48 hour period or so and the parents are going to be more mindful of it because the parent's going to be aware of it.

Very often we'll have emotional abreaction right on the spot. If the child, or the adult for that matter, starts abreacting, we have a number of different options. We can either do some counseling with them or more often than not, we just allow them to experience a release, as the emotionality starts to emerge and they start to process. Very often what I'll do, is if they're starting

to have an emotional abreaction, I'll switch over to brain driving and just start driving the alpha out even further so that we really allow the emotionality to emerge. And we often get some resolution in one session – it can be that efficient.

**Q:** *You'll switch to brain driving?*

Brain driving is a technique that was developed in my clinic and Brainmaster actually is the US Agent for the Braindryvr. Now basically the brain driving is a closed loop conditioning model, so for example, if we begin with a common ADD problem of excessive slow frequency, excessive theta measured at CZ, we set it up so that when theta exceeds a threshold, lights come on, light emitting diodes around eyeglasses, and my omni-harmonic sounds kick in, to suppress the excess theta amplitude. The child can be tasking while that's going on – they can be reading, they can be doing written output. If the child is having some speech problems, like an autistic child for example; they can be engaged in speech processes, while the area in the brain responsible for that activity is actually receiving the treatment with the brain driver. The nice thing about the brain driver is they're non-volitional so severe autistic kids can be treated prior to their being able to participate in neurofeedback.

In the case of trauma work, a different harmonic can be utilized to drive the alpha amplitude up. Now with trauma, very often, if the alpha doesn't respond, the neurofeedback with the brain driving technique will drive the alpha up, to facilitate the emotional release.

**Q:** *Do you make use of other psychotherapy modalities?*

Yes, in resolving the trauma we may also make use of synergistic psychotherapeutic treatments. In addition to neurotherapy, we may offer emotional release procedures such as EMDR, hypnosis, one eye integration, and SomatoEmotional ReleaseTherapy. The latter is a CranioSacral Therapy technique to release emotionality. The nice thing is that the psychological procedures that we use are very synergistic with neurofeedback, because when you release the emotion in one fashion, you get a corresponding change in the EEG. And if you're able to release the alpha with neurofeedback you get a change in the function of emotionality.

Let me give you an example of an adult. This is a woman who was raped by her father at 12 or 13 years of age. She had always carried around huge amounts of

guilt associated with this, and the reason was, she had experienced a sexual reaction – she had an orgasm - and the woman felt responsible for having experienced pleasure associated with this event.

Now, we did the alpha release neuro-feedback, and we couldn't get the alpha to release in response to neurotherapy alone, so we offered her an additional emotional release procedure. In this case we used the SomatoEmotional ReleaseTherapy. She did experience a release and the next day when we did a Quick-Q re-assessment, the brain map indicated that her alpha response had been restored. Now I asked her about the trauma and she said what happened was that she finally redefined the meaning of the situation - and she redefined the situation as rape. Now while rape isn't pleasant, it changed the meaning of the event for her. She no longer felt responsible for what had happened to her as a child when she was raped. So that's what I mean by processing the emotional content associated with the alpha release. .

**Q:** *Are clients in your clinic typically treated by a single therapist, or by a therapy team?*

We have them working with several people. We cover a lot of the bases. We do acupuncture, we do electrical stimulation, CranioSacral Therapy, one-eye integration, EMDR, hypnosis and so forth. All of my technical staff is trained to at least level 1 CranioSacral Therapy. I've been trained in hypnosis, as is one other individual, several of our staff are at least level 2 EMDR and so forth. We also have a person who works primarily with educational remediation.

**Q:** *What is a typical course of treatment to resolve this pattern?*

If trauma is the only issue, probably 10 or 12 sessions, but usually you have some other complication above and beyond the trauma. It's unusual to have trauma only, although we have had some. Assuming there's nothing else going on, what we would do is neuro-feedback eyes-open, eyes-closed, alpha up, PZ and O1. What we're looking for is to achieve at least a 30 % jump in alpha at PZ when eyes close and at O1, at least a 50% jump in comparison to eyes open. If we're doing trauma therapy, we usually train in three-minute epochs, alternating three-minute eyes open, three-minutes eyes closed, three-minute eyes open, three-minute eyes closed.

**Q:** *Do you include parents in the treatment session?*

Yes. Parents are always included. If it looks

as though the parent is going to be intrusive in some sense, then we have the parent outside the room but we have glass doors and glass windows so the parent is always in eye contact with the child. But if it looks like the parent is interfering or might be too stressed out by it, then we ask them to sit outside in the other room observing the session through the window. But generally speaking, the children are with the parents at all times.

**Q:** *What percentage of patients in your practice demonstrate the trauma pattern?*

It's pretty high actually. And in adults, particularly adult females who come in with stress-related symptoms we find it very high.

**Q:** *Do you find that the trauma pattern is common in pain patients?*

Yes. Interesting you mentioned that. For example, fibromyalgia clients. You know there are three causes of fibromyalgia: viral infection, head injury or severe body injury, and emotional trauma; and in at least 50-60% of the fibromyalgia folks we see the trauma signature.

When a child reports pain symptoms, very often we find that it is to avoid a threatening situation at school. For example, if the child is traumatized because of a school situation then they may develop stomach aches and nausea and all kinds of things, as a method of avoiding going to school. So I think the dynamic there is a little different.

**Q:** *I understand that we can read more about your work in an upcoming book?*

Yeah, there are two, actually. The first is Bio-feedback of the Brain and that's written for the general population. It's being published by Rutgers University Press and should be out early next year. The second one is Neurotherapy for the Primary Care Practitioner, and it describes a method for integrating neurotherapy into medical practice for, as I say, primary care folks; so for example, rather than pop a pill for depression there is a method of assessing and treating it with neurotherapy. That's also due to be released by Rutgers University Press.

**Q:** *Dr. Swingle, thank you for your time today. We certainly look forward to speaking with you again when your books are released.*

*Dr. Swingle maintains a private practice in Vancouver, British Columbia. For 25 years he served as Chairman of the Faculty of Child Psychology at University of Ottawa, and as Coordinator of Clinical Psychophysiology at McClean Hospital in the Section of Psychiatry at Harvard Medical School.*



## IC FEEDBACK: A “SOURCE” OF INNOVATION

Leslie Sherlin, MS, QEEG-D, BCIA-EEG

Based on the principles of EEG biofeedback and brain computer interface a new and revolutionary approach to regulating the brain's electrical potential called independent components (IC) feedback has been developed. My colleague Dr. Marco Congedo and I at Nova Tech EEG have been working on the implementation of this technique for some time and we will be presenting real clinical and theoretical data at this year's ISNR conference. Dr. Congedo has been developing and testing various algorithms and writing a program to effectively implement the technique for well over a year. I have been fortunate enough to be able to begin utilizing these techniques for both analysis and intervention in my clinical setting with volunteer subjects.

Although this discussion will be very practical and clinically oriented a brief and basic background of the technique is required. Blind source separation (BSS) is the function of separating independent signals from a set of mixed signals. Blind source separation depends upon the idea that the source signals are independent and recorded from multiple locations. Independent component analysis (ICA) is a single implementation of BSS that we are focusing on. As a practical example, imagine you are in the center of a room at a cocktail party hearing many voices at the same time. If someone across the room says something particularly interesting such as your name you can focus in on that single voice and ignore the other vocal contributions. This cocktail party problem is a very simple and common way of imagining the BSS technique. The human brain can deal with the unmixing of the various auditory sources, but it can be very tricky in the electroencephalogram (EEG).

All of the sources within the brain contribute to a sum mixed signal recorded at each site, which is the EEG as we see it. The difficult step is creating and executing an algorithm that can accurately decompose the mixed signal and correctly identify and localize the sources independently. However through testing of both models and real EEG we have achieved a highly successful process for extraction of independent sources. Because my expertise is in the clinical domain of this procedure I will leave the technical details to Dr. Congedo's presentation at ISNR 2007.

You might recall that several years ago we were focusing on an implementation of this process for cleaning artifacts from the recorded EEG in a software named “6S – Supervised Software for Source Separation, Selection and Suppression”. The process worked well but wasn't for the faint at heart. It required that the individual have specialized software and training in how to understand

what it was they were even looking at since the EEG didn't look like EEG any longer but instead was sources. Learning to artifact sources took some getting used to. Although there were some inherent difficulties with using this method such as comparing edited data to normative populations that didn't have the same procedures performed when it was compiled. It wasn't long before the focus shifted away from only using the techniques for editing and on to the possibility for real time computations and even feedback.

This concept began to take shape for me with clinical relevance as one day I was sitting in a neurofeedback session with a client. I looked at the screen and saw the EEG scrolling across and the bars moving up and down just as I had for hundreds of sessions previously. On this occasion it occurred to me as I glared at the theta label and the SMR (sensorimotor rhythm) label, that I was asking the client to decrease theta amplitude but I didn't really want the SMR amplitude to increase. I had known that when doing traditional theta/SMR neurofeedback training that in reality the SMR amplitude doesn't increase but instead the frequency of occurrence increases. This is why it is so important to recognize the wave form and be present in the session to point this out to the client and help them recognize when they are producing the SMR.

I started to have a flash back to performing QEEG analysis which were compared to “normative” databases and noticing how some individuals had elevated 13-18 Hz activity and yet were classic ADHD with hy-

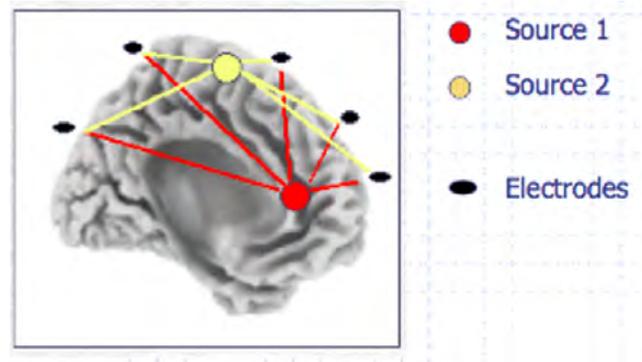


Image: In this diagram, which is from an ISNR workshop dating 2004 presented by Dr. Congedo, you can see how different electrodes are recording a combination of different sources.

peractivity. It was at that time I had wished there was a more effective way to teach the client to increase SMR occurrence but not the surrounding beta frequencies amplitude. I had wished that I could just teach the computer to recognize the wave form and to reward the client when the SMR appeared. Fast forward to the session I am sitting in and it all comes together as IC feedback. Following this session I began to go through all the charts of the clients I was to see later that day. There is the lady diagnosed with anxiety who has minimal occipital alpha. Could I isolate the alpha source in the precuneus and have her train to increase the occurrence and amplitude of that single source? Would this be more effective than training up alpha amplitude in the occipital cortex? There were 2 more cases coming that day alone that could use this method, the seizure disorder and another ADHD diagnosis.

Through the testing of new software that Nova Tech EEG was developing for ICA, I evaluated the effectiveness of the decomposition for several cases. I was amazed at the insight I gained into the cases. I had chosen a few complicated cases with known problems. I'll share the story of a single case to illustrate how this technique allowed me to gain additional insight. The client is a 16 year old female who presented with difficulties in school and complaints of attention problems. Following a thorough clinical interview, selected rating scales and an IVA+ the team at our clinic came to the conclusion that she did meet criteria for ADHD inattentive type. She had also lesser complaints and symptoms of de-

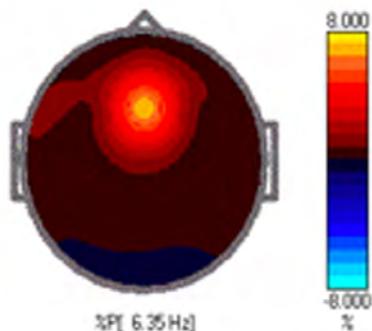


Image: Database comparison of theta illustrating significant elevations

pression although we determined it wasn't diagnosable at this time. She was a shy girl and didn't have much presence in the session with minimal input or discussion ever occurring (hint). Since we are trying to address the entire individual rather than just the diagnosis we completed an EEG recording and performed quantitative analysis. The results suggested just what we might expect, an elevated theta/beta ratio and a slight alpha asymmetry in the frontal lobes. It was as if she were a textbook image so we made the protocol. We completed several sessions of theta/beta ratio neurofeedback and then moved on to the inhibition of left frontal alpha. She was doing great and her family reported her making some significant improvements at school and socially at home (hint).

After completing about 18 sessions I had the ability to use this case for testing. While evaluating the output of the ICA a particular source stands out to me. I recognize a source that is maximal in the right parietal cortex.

Having dropped several hints you may have put together by now that after further investigation this young lady was confirmed to have some Asperger's characteristics. The literature has clearly demonstrated the involvement of the fusiform gyrus in the Asperger's and Autistic Spectrum disorders. This new information gave me additional insight into the case. The training protocol was modified to address this alpha localization in the parietal cortex allowing the sources in the primary visual cortex (lower alpha) and the precuneus (higher alpha) to become the dominant alpha peaks respectively. The social engagement along with participation in learning activities has increased and following a few additional sessions to address the attention complaints, she is well on her way to making honor roll.

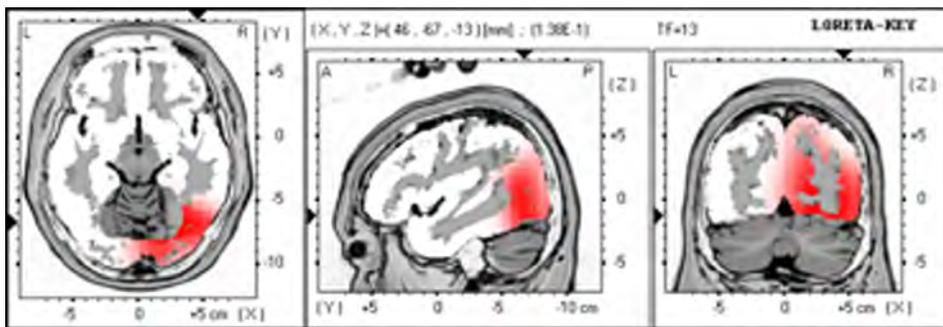


Image: LORETA image showing a source (source 13) localized to the right fusiform gyrus.

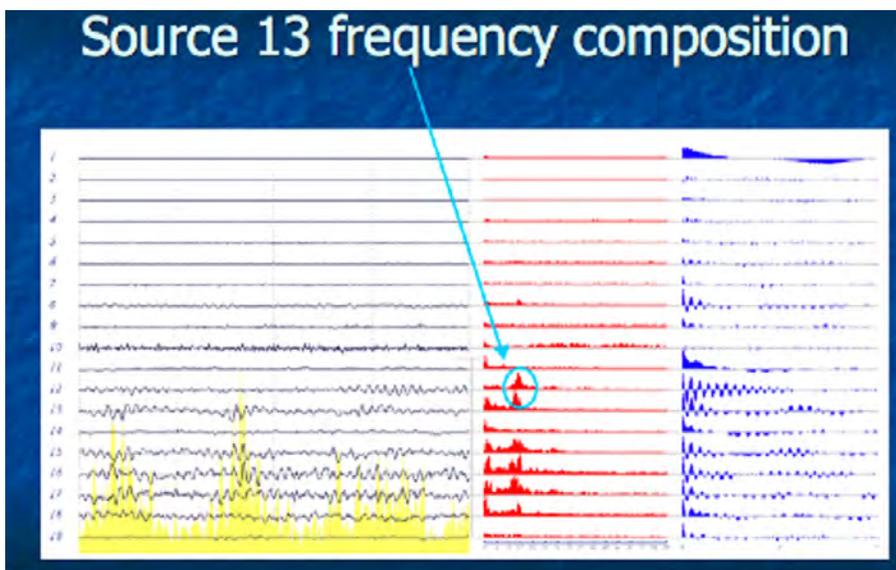


Image: Source 13 frequency distribution illustrating the alpha peak.

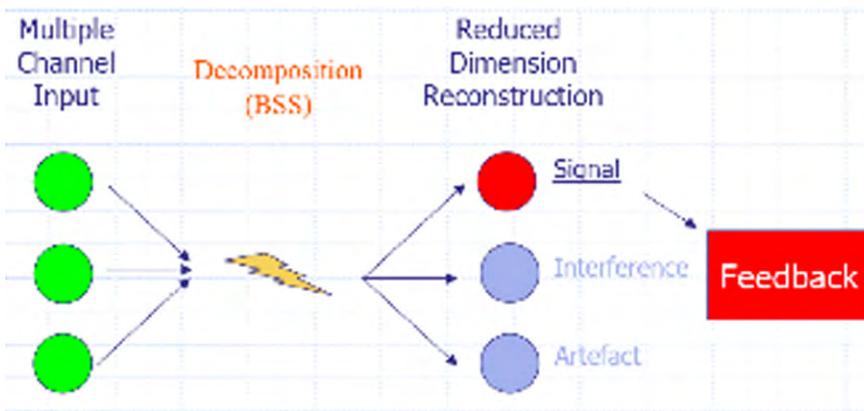


Image: IC feedback is illustrated by Dr. Congedo in the following image from his panel presentation in Nijmegen, Holland this past May.

This is a great example of how using ICA for understanding the presentation and developing a neurofeedback protocol can be beneficial. The next logical question is if it would have been faster or more effective if I could have simply addressed source 13 rather than site T6. From this question comes the

need for the application of IC feedback.

We are now testing this process of IC feedback with several volunteer subjects. We have had to overcome the usual obstacles of new product development, but I am actually conducting 2 sessions

Continued on page 34

IC FEEDBACK: A "SOURCE" OF INNOVATION CONTINUED FROM PAGE 33

per week with 2 different subjects. I won't reveal the study details at this time, but will say it is designed to directly compare the IC feedback with traditional amplitude scalp feedback. If no catastrophes prevail I will be presenting some preliminary data at ISNR.

The practical implementation of the IC feedback is rather straight forward. Our current strategy appears to be effective with as few as 7 active channels placed strategically on the scalp depending upon the source we are trying to isolate.

We have developed software that will create a file that contains all of the source information and will be implemented in the feedback system to accurately identify and train the source predetermined by the clinician. This software will be released at ISNR in two versions. We will keep our dedication and commitment to advancing the field through non-commercial activities and like our other in house software we will release a version as freeware. There will be a second version that is economically

priced that will contain enhanced features for those interested.

So I conclude in rather vagueness to hopefully wet your appetite and encourage you to be sure and attend the ISNR conference where Dr. Congedo and I both will be discussing this in more detail.

*Leslie Sherlin is President of Nova Tech EEG; Rapid Report Director, Q-Metrx; Adjunct Associate Professor, Northern Arizona University; Neurofeedback Practitioner, Southwest Naturopathic Medical Center; Adjunct Faculty, Southwest College of Naturopathic Medicine & Health Sciences; Adjunct Research Associate, Southwest College Research Institute.*

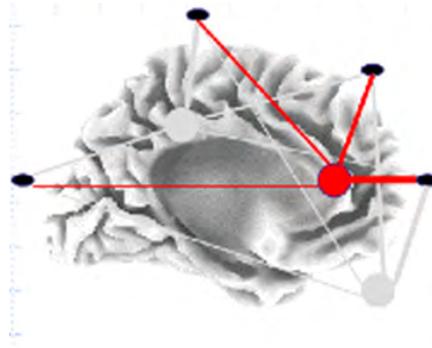


Image: IC feedback isolates the source of interest and electrodes are strategically placed for implementation of the feedback.

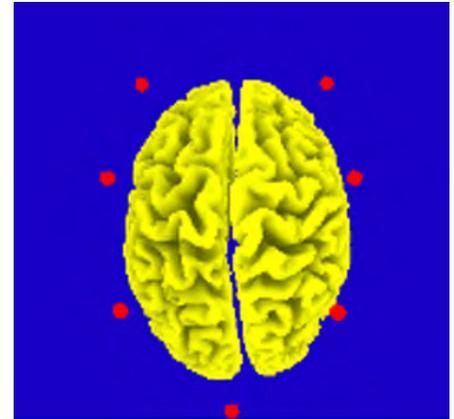
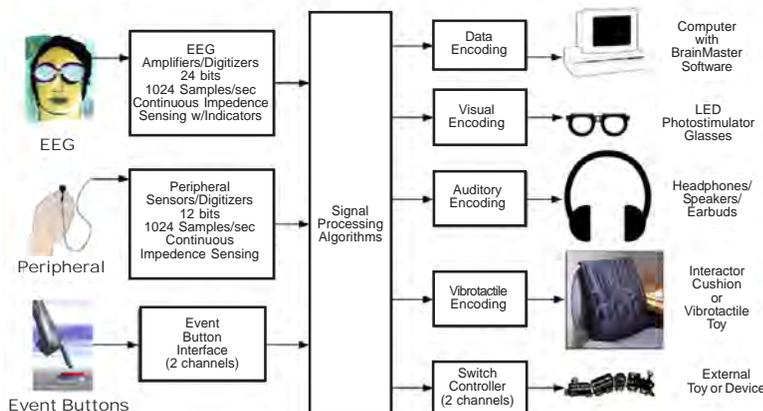


Image: a current subject's active electrode placement (F3, F4, C3, C4, P3, P4 and OZ)

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## HEADACHE SUBTYPES

*Jeffrey A. Carmen, Ph.D.*

Headaches have been one of my main interests for over 20 years. Most practitioners and researchers in the headache field have personal experience with them and typically suffer from migraines, cluster headaches, or other debilitating paroxysmal forms of head pain. I don't, which actually places me at a bit of a disadvantage. All of my personal experiences with headaches are observational.

Even though I don't get headaches, I have collected a huge amount of clinical data. I will be sharing some of that data here (albeit from the perspective of a non-headache sufferer). The reason I am making such a strong point about personal experience is that many headaches are really difficult to describe accurately, especially in terms of intensity. Some headaches such as cluster headaches are so painful that people actually attempt suicide—not from depression but seeking pain relief. On the other end of the spectrum, milder headaches can be so mild that they may defy the assignment of any pain level. Not all headaches hurt very much. Some don't hurt at all, which of course begs the question of whether or not to actually call them "headaches." Migraines (generally considered headaches) come in a wide variety of subtle presentations, some presenting as transient brain malfunctions only occasionally followed by head pain. There are even categories for migraine without pain, for example: 1.21.2.3 (Typical aura without headache)

### FORMAL HEADACHE CLASSIFICATION

In 1988 the International Headache Society (IHS) produced a supplement to the journal, *Cephalalgia*. This supplement served to define the precision with which headache professionals communicated with each other. The distinctions between headache subtypes were very detailed, although not necessarily correct. In many cases the classification system represented a best guess regarding the pathophysiology of various types of head pain. Further research has refined the understanding of headache pathophysiology, requiring subsequent restructuring of headache classification. The second edition of this classification system was revised in 2003 and published in 2004 as Volume 24, supplement 1 of *Cephalalgia*. This edition is more in line with current research and theory related to headache pathophysiology. Sadly, although much

knowledge has been gained, we are still very far from a comprehensive understanding of headaches.

Whereas the first edition was 96 pages long, the second edition doubled in size to 160 (larger) pages. Both editions represented a monumental effort by the world's leading headache experts. The second edition is called International Classification of Headache Disorders (ICHD-II), and is often referred to by just by those initials. This is the new authoritative reference for headache classification. I recommend it as a reference work, not as bedtime reading, although it may make a reasonable substitute for a chemical sleep aid. It should be used for formal headache research, partially because that is the classification format that journals now require.

### REAL WORLD HEADACHE CLASSIFICATION

For practitioners dealing with headache sufferers in a non-research oriented setting, the ICHD-II can be used to get a rough idea as to how the headache experienced by a specific individual headache sufferer compares to the headaches described in the headache research literature. However, for the most part, by the time a headache sufferer walks into an office for assistance, the headaches have become "messy" and defy a clean diagnosis. This is where good behavioral data collection is important.

### MY SIMPLIFIED VERSION OF HEADACHE CLASSIFICATION

1. Have the person keep a diary. This is helpful in terms of establishing a baseline. If you are going to help someone reduce headache activity, it is a good idea to know how often head pain is present, how much it hurts, significant patterns, etc. It is surprisingly difficult to get people to actually keep a diary. Perhaps less surprisingly, diary recordings are very subjective and frequently not very precise. Still, you need some sort of baseline and a headache diary is better than no data at all.
2. Diary components:
  - 2.1 Day and time of onset. Individual headaches tend to have a repeating pattern. The pattern may be deceptive. Time of day may reflect rise in fall of stress patterns, but it may also reflect the length of time since the person last took pain medication.

- 2.2 Duration.
  - 2.3 Day and time that the headache ends.
  - 2.4 Pain levels before during and after the headache. Although the ability to discriminate an 11 point scale is not consistent with psychological research, most pain scales currently use a 0 to 10 (11 points total) point scale.
  - 2.5 Mechanisms for headache relief. It is probable that the single most common headache is a kind of drug withdrawal from the drug(s) used to relieve the headache in the first place. Acetaminophen is a major offender. Since it is available over-the-counter, many people don't consider it a drug.
3. Important other variables:
    - 3.1 Correlation with the menstrual cycle. Most migraine and tension headache sufferers are women of child bearing age. The probability of a experiencing a headache tends to rise and fall in relation to sex hormone shifts. A woman's hormonal status is affected by natural hormone production, birth control hormones, and dietary hormones such as those obtained from soy products.
    - 3.2 Psychological variables. These are important in making distinctions between major headache categories. The headache portion of a migraine tends to hit on release from chronic psychological tension. Tension-type headaches tend to rise in response to psychological tension and subside when the psychological tension subsides. Cluster headaches tend to have no particular connection with emotions.
    - 3.3 Pathophysiology of Primary Headaches
      - 3.3.1 Migraine headaches represent a paroxysmal neurological event. The involve a complex inter-relationship between the trigeminal nerve, the brainstem, and psychological stress responses. Also involved in the process are complex responses to external variables such as barometric pressure, and internal variables such as changing hormone states.
      - 3.3.2 Tension-type headaches represent mechanisms that are unclear. It was once thought that they were caused by muscle tension. It is now known that muscle tension is not the cause, although there may be some increase in muscle tension in response to the pain.

*Continued on page 36*

## HEADACHE SUBTYPES CONTINUED FROM PAGE 35

3.3.3 Cluster headaches represent a largely unknown pathophysiology.

3.3.4 "Other primary headaches."

These do not clearly represent unique entities but don't fall nicely into the first three groups.

Migraine activity is very common, and may be responsible for the origins of most of the headache patients seen in clinical practice. By the time people seek treatment the headaches tend to be complicated by medication use/overuse. It is unusual to see true cluster headaches in a clinical practice because typically the person only gets them very occasionally. Somewhat less frequently people present with tension-type headaches, but these are often misdiagnosed. They tend to be migraine headaches that have taken on a level of constancy because the person has become addicted to OTC or prescription painkillers. A "true" tension-type headache will tend to increase in intensity under stress and decrease as stress is reduced.

Based on time-of-day and psychological variables, if a headache rises slowly throughout the day and subsides at the end of the day, it is likely a tension-type headache. If the head pain doesn't start until the end of the day when the person comes home from work or school, it is likely migraine.

Headaches that rise somewhat and fall somewhat in terms of pain, but never quite go away are very common and are very difficult to diagnose. Often they represent drug effects or drug withdrawal effects, even from medications that are being taken for reasons entirely unrelated to headaches. They may also represent a purely physiological response to an abnormal mechanism such as excessive cerebrospinal fluid pressure or chronic vascular inflammation.

Behavioral treatments such as biofeedback (peripheral thermal, EEG neurofeedback, and HEG neurofeedback) are quite effective for migraine headaches. They may be less effective for tension-type headaches unless combined with some sort of psychotherapy such as Cognitive Behavioral Therapy. Even then, they tend to be very difficult to remediate. Note: failure of a headache to respond to behavioral intervention raises suspicion that the etiology may be a secondary response to a more primary physical disorder.

#### EXAMPLES OF INFRARED IMAGES OF HEAD PAIN

It is nice to be able to actually see a visual correlate of the head pain. Infrared imaging allows that, at least to some extent.

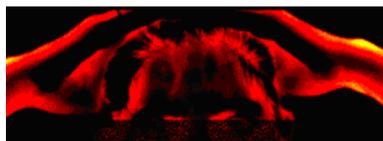
There are only two types of primary headaches that I have been able to capture through infrared imaging. One is migraine, the other is sinusitis. Both types have pain that correlates with portions of the infrared image with higher head output. Note: the increased heat output may or may not reflect the actual origin of pain. The images presented here have high intensity pain located at the regions of high heat output. However this is not always the case. Some migraine headaches don't present with a heat signature, and the infrared images of tension-type headaches look the same as for people who are not having headaches. Sinusitis images are a direct result of inflammation and hyper-perfusion, but sometimes even then, the pain is referred to other locations.

#### COLOR CODE FOR INFRARED IMAGES:

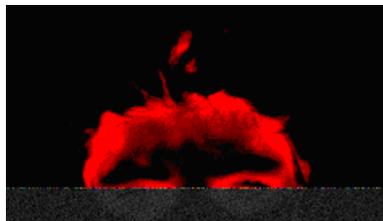


#### MIGRAINE HEADACHES IN PROGRESS:

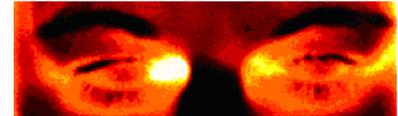
*Migraine headache, pain localized to the right temporal region. Pain level reported as "10" on a 0 to 10 point scale. Pain is reported as "pounding."*  
*Note: migraine headaches are often reported with a "pounding" description. This raises an interesting question about pain levels. If the pain level is 10 when the headache pounds, what is the pain level between those points? Usually the person cannot differentiate between the two levels, although there is clearly a difference.*



*Migraine headache, pain is bilateral in the temporal regions. Pain level reported as "8 or 9" on a 0 to 10 point scale. Pain is reported as "steady."*



*Migraine headache, left posterior. 15 year old male. Pain level reported as "10" on a 0 to 10 point scale. Pain is reported as "steady."*



#### SINUS HEADACHE:

*Pain localized behind right eye. 55 year old female. Pain level reported as "10" on a 0 to 10 point scale. The pain is reported as "pounding." The pain is caused by a bad right ethmoidal sinus infection, making this a "secondary" rather than "primary" headache.*

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