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– Samuel Turcotte, President & CTO, Zukor Interactive

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– Allen Novian, PhD, LMFT, LPC, Novian Counseling & Neuroeducation Chief Clinical Advisor to Zukor Interactive

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Letter from ISNR President

Greetings to all of the ISNR members. I hope you were able to join us for the annual conference and that you went away from it with as much excitement and enthusiasm as I did. The conference committee once again did a wonderful job of bringing together presenters from a wide variety of brain-related disciplines, as well as some of the best research and leading edge practitioners in the world, to share with us the latest discoveries and affirmations of our work. If you were not able to be with us in Orlando, you may want to go to the ISNR store on the website and purchase some of the recordings to catch up on the best that the field has to offer. You may want to subscribe to the video streaming service where you can watch the conference in HD. The 20th Anniversary remembrance DVD will also be available and is a great memento to have and keep and a great way to contribute to the Society as well. Lastly, mark your September 2013 calendar now so that you can join us in Dallas for our 21st annual conference!

In my closing remarks at the conference I talked about the “State of the Field” as I see it. I remarked that we had learned about a significant and important body of research literature about neurofeedback that had been published around the world in some of the top peer reviewed and PubMed indexed journals in a variety of neuroscience-related fields. This is incredibly good news! Ten years ago, our researchers were begging for journals to publish their work. Today we are observing more and more of our research finding a receptive and appreciative audience. In fact, a recent announcement from one of our members informed us that PracticeWise, the proprietary company that creates the American Academy of Pediatrics Evidence-Based Child and Adolescent Psychosocial Interventions, has just elevated biofeedback to “Level I—Best Support” as an intervention for attention problems this morning. I wrote to them about whether or not neurofeedback was included in their definition of biofeedback, along with a list of studies that they considered in making this change. I was told that neurofeedback was part of their decision and they provided the following citations:


Past-president Richard E. Davis also talked about the project that he has headed up along with Henry Harbin and Ed Pigott, working with United Healthcare Insurance to try and get insurance reimbursement for neurofeedback. Ed has drafted an excellent white paper detailing the research demonstrating neurofeedback’s superior record of positive outcome in relation to ADHD over Cognitive Behavioral Therapy and Behavioral Therapy. With ISNR’s continued sponsorship, Ed will be expanding this paper to include other evidence-based categories of treatment. We will then make this paper available to members for their use with insurers or for evidence of effectiveness in their promotion of their neurofeedback practices.

All of this points to an incredible advance in the field of neurofeedback and applied neuroscience. As is always the case with growth, this brings both blessings and challenges. The blessings are hopefully obvious in increased referrals from medical practices and increased acceptance and knowledge of the field and the good things we can do. The challenges are perhaps a little more difficult to see. As with anything that is successful, there are those who would seek to benefit from the years of hard work and research that has gone before without necessarily fully understanding the risks and pitfalls of such a powerful modality of treatment. We see that there are people who will offer services without having adequate or appropriate training and that there are people who will provide the inadequate training and equipment that these people use. This is not new or unique to our field. Indeed, we see the same problem in medicine, law, and even entertainment. However, because we are new and growing, the prospective harm from these excesses is potentially great. One part of addressing these concerns is to provide members and consumers some description of what competent neurofeedback should look like. Therefore, a consortium of diverse practitioners has worked together for this.
The fossilized brain of an arthropod was recently identified in China by Nicholas Strausfeld of the University of Arizona. The specimen was dated at about 520M years old. This places it close to the Cambrian explosion, and yet the specimen largely resembles modern arthropods. What is evident here is similar across the animal and plant kingdoms. The basic forms of the biological organisms that dominate our planet largely took shape during a relatively brief period in our geological history, and from then on constrained the changes that could take place through evolutionary development. It strikes me that we have seen a similar kind of explosion in the field of neuromodulation, and that the basic framework of what will ultimately emerge with technological maturity is already quite recognizable to us now. Over the period of a few decades, the key approaches toward neuromodulation on the macro scale have become established well enough that their technological maturation is reasonably predictable.

We may still encounter a few surprises, such as the emergence of Infra-Low Frequency neurofeedback training over the last half-dozen years, but already, the available techniques really do have the clinical terrain covered. With a combination of stimulation and reinforcement techniques, the entire EEG spectrum has shown itself to be useful in brain-training strategies for various purposes. Increasingly, the limitations will shift from being instrumental in nature to being dominated by the rate at which the brain can learn new patterns of regulation. This is already apparent in the broad dispersion in learning rates that we observe among our clients. The observed trend correlates well with what one might call the client’s “dysregulation history.” If someone suffered from brain dysregulation in early childhood, remediation simply takes a lot longer, quite irrespective of the particular complaints. This is because the dysfunctional patterns got established so early that they laid the foundation for subsequent learning and were therefore consolidated.

There is very little doubt that neuromodulation technologies will end up assuming a primary role in the maintenance of mental health, and that pharmacology directed toward neuromodulation will end up playing only a supportive role. The pace of that development is only partly determined by what happens in research. Evidence for this is furnished not only by the development history of

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**LETTER FROM AAPB NFB Division President**

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neurofeedback, but also by what happened in biological psychiatry. It cannot be argued that the conversion to biological psychiatry was driven by the quality of the published evidence. It was the belief system that changed, and then "the intelligence was fixed around the policy," so to speak. The change in the belief system, in turn, was stage-managed by the DSM study committees. Research largely followed the change in official positions; it did not lead the change.

Of course, the whole development had to be kicked off by actual discoveries, such as the utility of Benzedrine for calming hyperactivity; the utility of lithium in calming bipolar excursions; the utility of iprazinaz in recovery from depression; and the utility of chlorpromazine as an antipsychotic agent. None of these drugs were developed for the purposes to which they were ultimately directed. The discoveries were therefore opportunistic, much as ours have been in neurofeedback.

The essential difference is that pharmacology encroached upon virgin terrain, whereas neurofeedback now has to contend with a terrain that has already been claimed for pharmacology. Meanwhile, we have learned to live with pharmacology, even if the converse has not yet occurred. In fact, the strength of neurofeedback has always been in application has not yet occurred. In fact, the strength of neurofeedback has always been in application never before claimed for pharmacology. Meanwhile, we have learned to live with pharmacology, even if the converse has not yet occurred. In fact, the strength of neurofeedback has always been in application never before claimed for pharmacology.

The terrain that has already been claimed for pharmacology needs. We get in trouble with the policy," so to speak. The change in the belief system, in turn, was stage-managed by the DSM study committees. Research largely followed the change in official positions; it did not lead the change.

A positive development is also in prospect with the insurance companies. We are beginning to see inquiries from insurance companies, and that is surely an indication that they are beginning to see us as a solution to their problem rather than as their problem. Hence, we do not so much pose a threat to pharmacology, as offer it an opportunity to play its proper role.

Siegfried Othmer, PhD

Letter from ISNR Co-Editor

Dear ISNR members,

Welcome to the winter edition of NeuroConnections!

The Sun, snow, and holidays are all around us and we continue with our everyday experiences of seeming-miracles happening in our offices. The work that happens with autistic and ADHD children is often looked at by parents, teachers and relatives as, "You have given me the son/daughter I knew was in there." There has been a large increase in the number of techniques for working with autistic and ADHD children and adults. Most recently, the ability to see the brain of the client in 3-D, as the client is training, has entered the field of neurofeedback. BrainAvatar is the name of this new technique, and it allows the client to turn the colors of the Region of Interest (ROI) into the desired color. I say to the client, "Make the colors disappear" if the aim is to reduce the amplitude of the Region of Interest or, "Turn everything red" if I want them to increase the amplitude, and they do it. The changes in the total cerebral cortex are very clear and happen in a short time. That is what surprised me the most. Recently, I had a client come in with depression and anxiety. I conducted a qEEG and examined the ROI. Then I conducted ROI Loreta and then BrainAvatar training. Two sessions later, she noted her depression had disappeared and she said it with a look of puzzlement. Her third session yielded a qEEG analysis that was essentially normal. Frankly, we are examining with talk therapy what needs to be done to help her adjust to the new functioning and feelings.

This edition has articles by a lot of very expert clinicians in the areas of Z-score and BrainAvatar training. I think you will find from your reading that you will be encouraged to use these techniques and that these articles will help you to implement the techniques.

To say this edition has really hit the ball out of the park is spot on.

Dick Genardi, PhD, has provided an almost step-by-step article on implementing the BrainAvatar protocols. These are advanced techniques and definitely call for you to have a good knowledge of the operation and functioning of the brain and the sync with the client’s symptoms. Read and then try the protocols. He also gives us studies to illustrate these techniques. Ronald J. Bonnstetter, PhD, Tom Collura, PhD, Dustin Hebets, and Bill Bonnstetter provide us with a technique for seeing what is actually happening in the brain —no matter what the client says. This is exciting and could lead to more enhanced ways to provide psychotherapy, with the ability to reduce the number of sessions to get to the core of problems. J. Lucas Koberda, MD, PhD, reviews the issues of autistic spectrum disorder as a potential target of Z-score training. The study and the procedures will give you more food for thought in your work with autistic children. Mark Llewellyn Smith, LCSW, has written up his work of using sLORETA and the Anterior Cingulate Gyrus with reducing pain. As always, Mark reports on well-thought-out procedures, and his thinking is worth reviewing. Penjicen Rutter-Gracefire, LMHC, and Gail S. Durbin, PhD, have written a report on using sLORETA and 19-channel Live Z-score training. The study is a review of targeting HiBeta in Brodmann areas to reduce symptoms of anxiety. The resolution of the symptoms, as well as other symptoms, in a short time, and the reduction of anxiety are worth your time to review. Christen Stahl, PhD, and Tom Collura, PhD, write on the effects of sub-threshold magnetic stimulation on brain activation using sLORETA. The use of magnetic stimulation has become more prevalent in the Neurofeedback world with the use of lasers, EMF, low level of stimulation, TDCs, rTMS and Alpha Stim. This article shines some light on what activation is taking place, via examination of the brain operation with sLORETA. Finally, Jeffrey Reich has written an article about the training of a child who had reading comprehension difficulties, and noted that dysfunction in finite Regions of Interest relating more specifically to the client’s symptoms and complaints can be singled out and specifically trained, revealing there may be much more to “inattention” than simple attention. Read and be challenged to try the same.

To say this edition has really hit the ball out of the park is spot on.

Have a wonderful winter, see you next edition.

Meryln Hard, PhD, BCN Senior Fellow
Welcome to the winter 2012 edition of NeuroConnections. I want to take this opportunity to offer one last reminder to mark your calendars for the AAPB Annual Meeting, March 14–16, 2013 in beautiful Portland Oregon. In our fast-moving field, increasingly, clinicians are exploring the potential of multimodal interventions to enhance the impact of their neurofeedback protocols and techniques. This is the focus of the 2013 conference, organized around the theme, “Creating Synergy, Integrating Methods and Modalities.” Conference organizers have planned a state-of-the-art update on innovations which are tightening the integration of bio/neurofeedback into traditional clinical intervention, and increasingly blurring the boundaries between peripheral and EEG biofeedback. At the time of this writing, keynote speakers included:

Speaking on High Performance Brain Training: Old Idea, New Reality, high-achiever Leslie Sherlin, PhD, is uniquely qualified to address this topic. A protégé of neurofeedback pioneer Joel Lubar, while still an undergraduate, Leslie joined a group of pioneering students who trained in Switzerland to bring Low Resolution Electromagnetic Tomography (LORETA) technology into the hands of neurofeedback clinicians. Following his early years of primarily research in qEEG and LORETA, he co-founded Nova Tech EEG, Inc., and has been involved in client care since 2002, while continuing to pursue research projects in the field of qEEG and psychophysiology. Dr. Sherlin currently serves as the Chief Science Officer and Executive Vice President of Research and Development for Neurotopia, Inc. and Chief Executive Officer of Nova Tech EEG, Inc., maintaining academic appointments with Southwest College of Naturopathic Medicine; University of Phoenix; Northern Arizona University; and at Southwest Naturopathic Medical Center.

Reflecting the current renaissance of interest in biofeedback-based technologies in rehabilitation medicine, Chet Moritz, PhD, will deliver a keynote address on Neural Devices and Biofeedback for Rehabilitation of the Damaged Central Nervous System. Dr. Moritz, who serves as assistant professor in the departments of Rehabilitation Medicine and Physiology & Biophysics with University of Washington, will discuss emerging rehabilitation strategies such as brain-computer interface (BCI)-triggered Functional Electrical Stimulation (FES), and intraspinal stimulation to improve quality of life after brain injury, stroke and cerebral palsy.

No patient group has more clearly demonstrated the wisdom and necessity of a multimodal approach to therapy than those suffering chronic intractable pain. This is the focus of keynote speaker, Dennis C. Turk, PhD in a presentation titled: Self-Management in Chronic Pain: When Pills & Procedures Are Inadequate. A recognized pioneer in his field, Dr. Turk was identified as one of the “top 10 leaders in pain research and treatment development” in an international survey of his peers. Professor of Anesthesiology & Pain Research and Director of the Center for Research in Pain Impact, Measurement, & Effectiveness (C-PRIME) at the University of Washington, Dr. Turk has over 500 publications in scientific journals and scholarly texts, and has written and edited 20 volumes on his topic. Dr. Turk provides practical information that clinicians and clinical investigators can use for an integrated, biopsychosocial patient-focused approach that emphasizes self-management of diverse chronic pain syndromes.

It’s not too late to make your travel plans. We look forward to seeing you in Portland!

Roger Riss, PsyD
The AAPB 44th Annual Scientific Meeting is shaping up to be an outstanding event, strong on content, networking opportunities, and held in a truly popular venue, Portland, Oregon. Known as the City of Roses, Portland offers a wealth of outstanding cultural, entertainment, and historical options to keep you engaged and entertained before, during, and after the conference. The meeting will be held at the Hilton Portland Executive Towers, March 13–16, 2013 with the preconference workshops on March 13–14, 2013 and the conference itself on March 15–16. The theme for this year’s meeting is “Creating Synergy: Integrating Methods and Modalities.”

Located at the convergence of the Willamette and Columbia rivers, Portland is known as one of the most eco-friendly cities in the world and is frequently awarded the designation of “Greenest City in America” by Popular Science and Grist magazines. It offers a temperate climate with an average daytime temperature of 50 degrees. As the third largest city in the Pacific Northwest, it offers some of the finest seafood in the region and a wide range of culturally rich cuisines to please any palate.

Some highlights that the city offers which should be on your must-see list while in town, include the Lan Su Chinese Gardens and the Portland Japanese Gardens. Other attractions include the Oregon Museum of Science and Industry and Pittock Mansion high atop the West Hills of Portland 1,000 feet above the city skyline. The city is also home to a rich history of music ranging from the classics to jazz and from folk to modern rock. Live-music lovers will not be disappointed enjoying the local music scene. Portland also has a strong theater community for off-Broadway performances throughout the year, and plays host to the unique annual H.P. Lovecraft Film Festival.

The “sins of Portland’s past” and the legend of the “Shanghai Tunnel” are revealed in the Portland Underground tours, providing a glimpse at the city’s colorful past. If you have a bent for history, you won’t want to miss the opportunity to experience Portland’s Underground.

If you have the opportunity to arrive early or stay a few extra days after the conference, you will not be sorry. Just minutes from the city, the majestic Multnomah Falls serves as a tributary to the Columbia River. Or, take a day trip a bit farther up the road to Mount Hood. Continuing up that road, you will find Mount St. Helen, the volcanic peak that erupted in 1980, permanently changing its surroundings.

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So, come to Portland to enjoy the outstanding educational content organized by the AAPB program planning committee, chaired by Dr. Fredric Shaffer, and while in the City of Roses, take time to enjoy the wide variety of attractions that the city has to offer.

We look forward to enjoying a great conference and an outstanding venue. See you in Portland!

David L. Stumph, IOM, CAE
3. Depression (65.4%)
4. qEEG (57.7%)

**Membership Services**

- 50.9% of respondents are satisfied with their membership in ISNR.
- 26.7% of respondents are extremely satisfied with their membership.
- 6% of respondents (a total of 10 people) are either dissatisfied or extremely dissatisfied with their membership. I am personally following up to address any concerns.
- 91.3% of respondents told us that receiving the *Journal of Neurotherapy* and *NeuroConnections* was the major factor in deciding to become an ISNR member.
- 44.2% of respondents said they joined ISNR because they received a discount to a Society conference.

**Journal of Neurotherapy**

- 74.3% of respondents read articles in the *Journal of Neurotherapy* once they have received a new issue.
- Only 12.2% of respondents have submitted a paper to the *Journal* within the last three years.

The top five reasons for publishing a paper in the *Journal of Neurotherapy* are:
1. Publisher
2. Frequency of publication
3. Low fees
4. Time from acceptance to publication
5. Favorable previous experience

The top five most popular topics for articles in the *Journal* include:
1. Social Work
2. Coma
3. AVE
4. Respiration
5. Personality Disorders

**Annual Conference**

- 52.7% respondents said they would not attend an ISNR conference in Portugal.
- 47.3% respondents said they would attend.
- Key factors in not attending a conference in Portugal included overall cost (too expensive) and that the Netherlands was a preferred European location.
- 58.9% of respondents support a collaborative conference with AAPB in the future.
- 50.4% of respondents endorse a joint conference with a mix of biofeedback and neurofeedback topics.
- 51.4% of respondents would be willing to pay a higher fee for a combined conference.

The top five factors disclosed by respondents for attending an ISNR Conference are:
1. Scientific content
2. Speakers
3. Location of meeting
4. Networking opportunities
5. Early registration discount offering

The most requested topics for an upcoming ISNR conference include:
- qEEG as a diagnostic tool
- EEG/qEEG data
- Brain stimulation therapies for rehab
- Head injury and neurofeedback training

**Preferred location ranked by respondents for a future U.S. ISNR Conference:**
1. Western region
2. The South
3. North region
4. The Midwest

**On the Horizon**

Once again, thank you to everyone that participated in our membership survey. We were overwhelmed with the thoughtful and insightful comments we received. It is precisely this collective voice that helps us make improvements for you. We are working to develop several action plans to follow from these results.

I value your input, your ideas, and your suggestions. This is your organization and your involvement is essential. So please feel free to contact me to discuss any issues. My email is cyablonski@isnr.org.

With best wishes,

*Cindy A. Yablonski, MBA, Executive Director*
Jonathan E. Walker, M.D.

- Board Certified Neurologist
- Board Certified Electroencephalographer
- President of the Neurofeedback Division of AAPB
- President of the American Board of QEEG Technology
- Pioneer in the field of neurotherapy research and treatment, he has used neurofeedback in his medical practice for over 20 years

EEG / QEEG interpretations, analyses and reports with protocols using the modular activation / coherence approach to allow practitioners to achieve superior results

Dr. Walker personally reads each QEEG Service includes phone consultation with Dr. Walker

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Visit our Web site: www.neurotherapydallas.com
BrainAvatar—Flexible Individualization for Treating Autism, a Complex Disorder

Dick Genardi, PhD

Abstract

Autism is a disorder that manifests itself in a complex and varying array of dysregulations in areas of behavior, cognition, and emotion. Multidisciplinary scientific investigation has informed us about the underpinnings of this disorder in genetic, metabolic, nutritional, environmental, neural structural, and neurophysiological domains. One hopeful and exciting area of assistance in diagnosis and treatment of autism available today is the application of neuroimaging-based assessment and neurofeedback methods. But, in order for the neurofeedback clinician to take advantage of the latest developments in neurometric and neurofeedback approaches to the treatment of autism, it is important that one has knowledge of the scientific literature on autism as it applies to EEG assessment and neurofeedback. Access to a select group of such articles is offered herein via a URL, along with resources on cognitive, behavioral, and emotional functions associated with specific brain areas—Brodmann areas, Regions of Interest, and the most common organization of those areas into functional networks. The article itself is devoted to describing for the clinician how to use the BrainAvatar software to target a neurofeedback intervention, individualized to the unique presentation of the patient before them, based on the network and autism literature resources accompanying this article.

Introduction

Autistic individuals present with several consistent patterns of behavior. The lack of communicative intent was initially used as one of the hallmark signs of identification. Some individuals never demonstrated language or gesturing with communicative intent, while others show normal development with regression and loss of language and communication functions in the first few years of life. As a consequence, autistic individuals have trouble relating to others, miss social cues, have minimal eye contact, and rarely initiate social behavior. They are isolated individuals preferring to be alone. Autism is now seen on a spectrum of degree and extent of impairment; in more severe cases, if there is speech or language it may be echolalic or of unusual syntax. Stereotypic movements are often seen, as is the idiosyncratic use of objects. Behavioral routines are dependent upon, and become rigid and inflexible. Deviation from the expected or shifting from one set or activity to another can result in behavioral tumult. Obsessive focus is not unusual, with some circumscribed area of interest being a primary focus, sometimes associated with a skill of savant proportions. Repetitive self-stimulatory behaviors may be present in some cases, occurring with such intensity that extreme injury is self-inflicted. Autistic individuals are often known to be easily overstimulated by environmental setting characteristics (sound level, number of items on walls, multiple objects in a room, room size, number of people present) and multiple choice options. Many of the difficulties in functioning seen in autism can be viewed from a neuropsychological systems perspective involving arousal, attentional, sensory integration and executive functions systems. Current diagnostic nosology defines autism as presenting along a continuum of severity of deficits in cognitive, social-behavioral, and emotional regulatory functioning. It is listed as one of several developmental disorders.

The link to the references on autism provided herein, the reader will find articles containing discussions on the causes of autism. Early studies show macrocephaly in autistic individuals with increased cerebral volume in posterior areas of the brain and decreased volume frontally. Findings of voxel-based magnetic resonance imaging studies, however, show significant reduction of total gray matter volume as well as frontal striatal and parietal network loss. Similarly, modern studies show reduced white matter in critical brain areas. Abnormal structural and functional findings in prefrontal cortex, temporal-parietal, and occipital-temporal cortices are expressed in connectivity aberrations in networks consistent with the varied impaired functions most frequently seen in autism.

Numerous studies employing fMRI Blood Oxygen Level Dependent (BOLD), Magneto-encephalographic, Positron Emission Tomographic, and Electroencephalographic measures of temporally coactivated but spatially distributed regions help identify distinct functional networks; these various measures are known as measures of connectivity. In order to appreciate the findings of studies on autism most relevant to neurofeedback practice wherein patterns of aberrant connectivity are identified, the reader at least should be familiar with EEG connectivity measures of asymmetry—comparative measures for homologous sites, phase- timing of waveforms across frequencies and sites, and coherence—the consistency of phase relationships across time. This information is most easily acquired via reading three pivotal articles:

3. Tom Collura’s detailed exposition Toward a Coherent View of Brain Connectivity at http://www.brainnm.com/software/pubs/WNEU_A_343495_O.pdf, is essential in discerning which connectivity measure to choose for training during a neurofeedback session. He illustrates how the values change for the various metrics for the same subject at the same 10-20 placement, as well as how the same connectivity measure can take on different values at a different electrode placement.

Connectivity Patterns in Autism—A Brief Overview

In their comprehensive overview of the connectivity patterns most often found in the quantitative EEGs of autistic individuals, Cohen and Myers (2008) identified the following patterns in the literature reviewed:

- Frontotemporal Hyperconnectivity: frequently found in posterior frontal to anterior temporal regions; associated improvements with treatment include improved attention self-regulatory functions, enhanced social behavior, and communication skills.
- Frontal (Orbitalfrontal) Hypoconnectivity: areas involved in social cognition and theory of mind.
- Mu Rhythm Complex over sensorimotor strip: biofeedback in this area results in improved mu rhythm suppression, believed to be an important index of the integrity of the mirror neuron system, essential in observing others as a basis for proper responding.
- Posterior (Occipital-Parietal-Temporal) Hyperconnectivity: associated with excess Theta activity with low conductivity in Delta and Theta and beta bands as well.
- Frontal-Posterior Hyperconnectivity: this pattern is consistent across studies produced in many research centers, representing the isolation frontal lobe input to numerous posterior processing centers; particularly significant as disconnection in the gamma frequency training primary visual cortex parietal integration areas and inferior frontal cortex containing mir-
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It Melts Away Anxiety, Lifts Depression
And Helps You Sleep Longer
And It Does All That Simultaneously And Safely

Where have you been all its life?

What is the Alpha-Stim® AID?
The Alpha-Stim® AID is a medical device used for the management of anxiety, insomnia and depression (AID). Alpha-Stim® AID provides a safe, effective and proven alternative to drugs. Use it during talk therapy, while working at your desk, or at home watching TV or meditating. After treatment, there are no physical limitations imposed so you can immediately resume your normal activities. The treatment is simple and easily administered at any time. People using the Alpha-Stim® AID usually report a pleasant, significantly relaxed feeling of well-being accompanied by an alert mind.

Try it Yourself.
You Will Be Amazed How Good You Can Feel.
Most People Experience a Significantly Better Mood, and Sleep Longer and Deeper.

✓ Simultaneously Treats Anxiety, Insomnia and Depression
✓ Proven Effective in Many Double-Blind Studies
✓ Most Research of Any Therapeutic Device
✓ Research Being Funded by DOD, VA, NIH, NCI
✓ Veterans Chose Alpha-Stim® 73% of the Time When Given a Choice of 5 Non Drug Therapies.
✓ Results are Long Lasting and Cumulative

What Makes Alpha-Stim® Unique?
It’s the waveform. Alpha-Stim® generates a unique and proprietary waveform that no other device can replicate. The waveform in a therapeutic device is analogous to the precise chemical compound that differentiates one drug from another.

Alpha-Stim’s waveform is distinctive in its proven safety and effectiveness. It uses such a low current that some people can’t even feel it. It is never turned up to where it is uncomfortable. After just one simple 20 to 60 minute treatment via ear clip electrodes your body can relax comfortably while your mind is more alert.

Special Offer for NeuroConnections Readers
Want to try an Alpha-Stim®?
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Scan to take the Alpha-Stim® AID for a test drive

In the USA, the FDA restricts this device to sale by, or on the order of a licensed practitioner. It is sold over-the-counter throughout the rest of the world. Side effects occur in less than 1% of people and they are mild and self-limiting consisting mainly of headaches and skin irritation on the ear lobe electrode site.

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Patient Self Reports: Alpha-Stim® vs. Drugs

Anxiety

Alprazolam (N=156)

Alpha-Stim® (N=156)

Insomnia

Zopiclone (N=156)

Alpha-Stim® (N=156)

Depression

Zoloft® (N=156)

Wellbutrin® (N=156)

Alpha-Stim® (N=156)

Percent of Patients Reporting Improvement

6% 12% 18% 24% 30% 36% 42% 48% 54% 60% 66% 72% 78% 84% 90% 96% 102%

Patients either reported a positive response according to WebMD Drug Surveys, and AlphaStim’s Service Member and civilian surveys. AlphaStim Data from S8i, WebMD Service Member Survey (N=156) and AlphaStim Patien Survey (N=156). Conducted by Larry Price, PhD, Associate Dean of Research and Professor of Psychology in the College of Behavioral Sciences and Public Policy, Florida State University. Pharmaceutical Survey Data (N=156) from WebMD. Design, Content, and Source of October 25, 2011.
ror neurons.

- Left Hemisphere Hypoconnectivity: decrease in connectivity throughout the legend in the language areas and for complex language processing tasks.

- Left Hemisphere Intrahemispheric Hyperconnectivity: increased connectivity in the Delta frequency band is seen in frontotemporal regions suggestive of abnormal lateralization language patterns in autistic individuals.

Even a casual review of the studies on autism made available through the URL provided herein reveals that in persons with this disorder, it is likely that there are aberrant measures associated in at least one of every commonly identified functional cortical network, such as those reviewed by Raichle, Hagmann, Laird, Van Den Heuvel, Sridharan, Ye and many others. Thus, there is no pathognomonic EEG/qEEG sign for autism.

One very illustrative finding, however, is seen in the work of Thatcher et al. (2009) concerning phase reset in autistic individuals against age-matched controls. They found that:

1. Autistic individuals have shorter phase shift durations across frequencies, particularly in alpha 8–10 Hz (alpha 1) when compared to age-matched controls. Phase shift duration is poised to be a period of neuronal recruitment; thus, autistic individuals are less likely to recruit sufficient neuronal assemblies to process information being passed from one functional unit to the next. Other studies have established that Alpha 1 (and theta) are involved in neuronal recruitment.

2. Autistic individuals have longer phase lock durations specifically in alpha at 10–12 Hz (alpha 2), which is involved in neuronal recruitment. But, the BrainAvatar software can be used entirely out of the realm of clinical face. Brain Avatar’s images are currently very applicable to training the Default Mode Network (DMN), attention networks, mirror neuron groupings, a-p-cingulate, insula, and other structures showing significant dysregulation in autism.

At the same time, all of BrainMaster’s 19-channel PZOK (UL) surface ANI EEG-derived Z-score measures, live sLORETA when reviewing or training, or both 19-channel surface BrainMaster with ANI Z-score and BrainMaster proprietary sLORETA software modalities simultaneously.

Those neurofeedback practitioners already familiar with the benefits of one to 19-channel surface Z-score training with the ability to target outlier metrics, can now train any ROI or any network at any combination of frequencies at the voxel level as well, with those frequencies defined by the user to 0.0001 Hz precision, and at the same time be viewing one or more 3-D real time head maps of the ROIs being trained, or the impact of that training on the whole brain, displaying 6239 voxels at 5 mm resolution, either 8 or 32 times per second. In addition, the patient can also view, in real time, their own brain activity at the voxel level for the ROIs of interest. Clinicians using live 3-D head map voxel displays as a feedback modality report this as a powerful reinforcer for their patients. (This is very applicable to training the Default Mode Network (DMN), attention networks, mirror neuron groupings, a-p-cingulate, insula, and other structures showing significant dysregulation in autism.)

At the same time, all of BrainMaster’s training software works with the BrainAvatar live Loretta Projector (LLP), including sound, CDs, DVDs, multimedia, etc. using the Event Wizard. Adding sound to the powerful visual 3-D head map is very compelling, as the visual and the sound together are a very rapid and accurate reflection of brain activity. Adding the DVD player is easy to do, and is a good feedback modality when using 19-channel surface ANI Z-score in conjunction with sLORETA training. Important in the treatment of the autistic patient, that is the composition of the feedback can easily be adjusted to the autistic patient’s sensitivity level for input.

The reader unfamiliar with this neurofeedback approach can get a fuller perspective of the BrainAvatar offering through the following resources:


For the psychotherapeutic clinician it is important to note that the BrainAvatar software can be used entirely out of the realm of the “normalizing EEG” neurofeedback perspective. That is, it can be used as a brain imaging/monitoring system, useful during typical therapeutic dialogue/interventions and interactive assessments. By simply watching the brain activity live, without Z-scores, it is possible for the clinician to image and “interact with” the client’s brain in real time. Especially in the case of mood issues, frontal asymmetry can be observed live, changing in real time by watching gamma in the frontal lobes and seeing the amount of asymmetry of the activity (akin to Davidson’s work), thereby actually witnessing whether the patient is having a positive or negative reaction independent of their self-report. Thus the therapist sees the patient’s reactions to information live, on top of the patient’s standing “trait” level of asymmetry.

Helpful in developing proficiency in viewing live current source density, LORETA spatial-temporal frequency distribution patterns is the recent chapter by Sherlin (2009).

Since BrainAvatar uses a proprietary method that is approximately 100 times faster than other implementations, it generates full 3-D images in which every voxel is turned into a real number quantity, in all of 16 frequency bands, up to 32 times per second. The produced image shows the CSD amplitude of one of the 6,239 voxels, represented with coloring indexed to CSD value, changing in real time at 8–32 frames/second (a new image every 125 to 31.25 milliseconds), thus providing true live animation of brain activity.

Also, the actual number of voxels that are maximum depend on the individual, and are in essence an individual signature. In a personal communication, Tom Collura likened this aspect of using the BrainAvatar software by saying that ordinarily, when using a Z-score normative approach, if one were trying to analyze a face for example, the assumption would be that everyone’s eyes are in the same place, and the Z-score obtained would be the deviation of the patient’s eyes from the normative average. But, the BrainAvatar method finds the actual location of the eyes of the specific individual in question, even more precisely, the center of the iris, rather than comparing everyone’s face with an average face. BrainAvatar’s images are currently showing the true current source density, which is like a functional image of what the brain is doing. Z-score images show deviations from normal, hence only show where the activity is different from normal, a population average.

With BrainAvatar you can specifically target brain locations with user-defined bands, and train each location in different directions. So if it makes sense for a particular patient, the practitioner could for instance “train down theta on the anterior cingulate” and “train up beta on the left insula.” This is equivalent to surface target training of a specific metric when doing 19-channel surface Z-score training.

Great flexibility is provided to the practitioner in that BrainAvatar also allows, through its Z-Builder option, defining one’s own reference database or “normative” EEG. For instance, the practitioner can currently image and train sLORETA Z-scores using the patient’s own EEG, sampled from a period when the patient is asymptomatic,
or when functioning at some peak or desired level. Thus, the therapist can capture the EEG of an autistic individual who, at the time of EEG acquisition, is reporting a more comfortable 1:1 social interaction, and use that EEG to create a reference database, to be used in neurofeedback training while the practitioner introduces more persons (shapes tolerance) into the room during an on-going session. In this way the practitioner has established individual-specific, yet clinically valid training criteria with increased likelihood of treatment generalization. In short, it is an alternatively valid way of comparing the sLORETA with a reference brain.

It is important to note the implications of the information given above. Training delivered using the BrainAvatar implementation adheres strictly to the principles of operant learning found essential to successful neurofeedback: 1) Relevance and Specificity, function directly mapped to the area(s) of training; 2) Contiguity-Immediacy (1 & 2 allowing for contingent reinforcement, not superstitious training); and 3) Providing a reinforcing event that is very powerful/engaging/motivating.

sLORETA

BrainAvatar offers true sLORETA neurofeedback, an advancement of LORETA. The reader unfamiliar with the differences between sLORETA and LORETA may find the following informative.

The differences between LORETA and sLORETA are basically as follows:
1. sLORETA has 6,239 voxels versus about 2,200.
2. sLORETA has a voxel size of 5mm versus 7mm.
3. sLORETA has guaranteed zero error in the presence of a single dipole, which LORETA does not.
4. sLORETA assumes maximum smoothness of the sources.
5. sLORETA takes a maximum likelihood approach which LORETA does not.
6. sLORETA does not include the amygdala, which is not possible to localize from the surface.

The basic approach for LORETA and sLORETA however, is the same; it is a linear transformation matrix applied to the surface field to generate an estimate of the underlying sources. sLORETA actually produces a probability of current-source density for every one of the 6239 voxels, using a maximum smoothness condition.

In addition, BrainMaster has announced an sLORETA live Z-score implementation in which every single voxel is converted into a Z-score eight times per second in ten bands, and it uses a published, FDA-registered normative database. This provides true live imaging of the full 6,239-voxel images using normative referenced Z-scores, and when used for training, would thus also provide live sLORETA Z-score training in addition to live raw sLORETA imaging and feedback.

As previously mentioned, in this system, the practitioner can have multiple sLORETA images running concomitantly, so it is possible to view a live Z-score sLORETA image, and also a raw amplitude sLORETA image simultaneously. This design also includes sLORETA connectivity graphs, and sLORETA dipole images, which are entirely unique to this implementation. All of these images are live, at eight frames per second in any (or all) of sixteen different user-defined frequency bands (onlyten frequencies are in the database).

So, in summary, one performs an analysis of the autistic patient’s presenting complaints, reviews known brain-behavior relationships based on extant neuroscience literature, and conducts an adequate neuroassess- ment; then, if a convergence is found amongst these information sources, a BA, ROI, or Network can be targeted and treated with great flexibility through the assistance of the BrainAvatar software.

**Setting Up a Network to Train**

Benefit from the following section requires that the reader have at least a trial version of the BrainAvatar software and be familiar with its basic use.

For the reader to easily implement the training of a Brodmann area or more complex Region of Interest grouping as discussed in this article, a template for BrainAvatar settings file may be found at the following URL: http://www.brainm.com/kb/entry/511/. It is called “TryIt-19ChanSurfZScore&sLORETA.”

In this regard, also provided for the reader is a Word document with the Brodmann areas already written in Event Wizard equation format for all the Hagmann networks, Laird Interconnectivity Networks (ICNs) and Raichle networks. It is these equations which are used to implement the sLORETA trainings. This is accessible at http://www.brainm.com/documents/Publications/ROIInfo.pdf.

In addition, the reader will find a Region of Interest Table document at http://www.brainm.com/kb/entry/461 containing a listing of Lobe ROIs, Gyrus ROIs, and Brodmann ROIs which may then be used to write one’s own equations in Event Wizard format for training specific targets in sLORETA.

- Please note the format for specifying a Region(s) of Interest to be trained. It is $x=\text{LoretaROI}(###,\#).$ The four numbers before the comma reference the ROI as listed in the table with numbers that begin with 1 referencing Lobes, those beginning with 2 referencing Gyri, and numbers starting with 3 referencing Brodmann areas.

- The single number after the comma identifies the frequency being trained. That is, Delta =1, Theta=2, Alpha =3, Beta =4, Low Beta=5, High Beta=6, Gamma=7, User=8.

- Right- or left-sided ROI training is implemented by adding left-right designations as follows: $x=\text{LoretaROI}(###,\#)$ and $x=\text{LoretaROIAR}(###,\#)$.

A description of the settings file follows.

- Events 1 through 5, which can be viewed in the Events Wizard, are devoted to defining the parameters for the 19-channel surface Z-score normative database training.

- Events 6–9, and 9–11 are used for the training of sLORETA ROI(s) at a particular frequency, as specified by the Event Wizard equations listed in the “If” condition of Events 6 & 9. Using E6 & E9 together allow the training of the same network at two different frequencies at the same time. (Recall that BrainAvatar is infinitely flexible in that any ROI can be trained at any frequency in combination with any other ROI. Two separate
events are not required to do that. The author structured the settings file provided with this article for the purpose training a whole network using of cross frequency coupling. See Sauseng & Klimesh (references).

- Pre-written equations for the major networks provided in the Network Listings MS Word document mentioned above, can then simply be cut and pasted into Events 6 & 9. Entries for a single lobe, gyrus, or Brodmann area or combination are similarly written.

A screenshot of Event 1 is shown in Figure 1. Note that adjustments to sound and multimedia feedback can be made within this event. Also, the event may be disabled altogether by a simple click of the “Disable” button at the upper right portion of the screen portrayed in the image.

A screenshot of Event 6 is shown in Figure 2. The reader will observe in the “If Condition” of Event 6, the individual region of interest entries for the ICN Default Mode Network (DMN). Please note that for this particular network there are several Brodmann areas entered and each must be trained at a frequency, as indicated by the number following the comma according to the following syntax x=LoretaROIA(####,#). In this illustration, the reader will see that after the comma there are the letters “BD” which stand for (frequency) band; with the actual number assigned to that band at the beginning of the equation. So, in the screenshot the whole Default Mode Network is being trained at a frequency where BD=2; that is to say, at the frequency of Theta. If the reader wished to change the frequency for the whole network to Alpha, all that would be necessary would be to change the initial part of the equation to increase or decrease CSD activity within the ROI is chosen.

In the settings file provided, “TryIt-19 ChanSurfZScore&sLORETA,” this author is currently using at Event 9 the same region of interest being trained in Event 6, but at a different frequency. For example, the frequency used in Event 6 is theta coupled with gamma being trained in Event 9.

The reader may train to increase or decrease the CSD of the ROI by simply changing the selection of the rule after the “If” condition in E6/E9.

At the bottom of the screenshot images, the reader will note a series of tabs labeled Raw, Z-scores, PZOK, BrainMaps, Adjust E6E9, and others. By clicking on the Raw tab the acquired EEG is displayed. The Z-scores tab displays a screen containing all the normative database Z metrics for the channels acquired. The PZOK tab shows a screen where the upper and lower Z-score training limits and the percentage of Z-scores falling within that target are adjusted.

Clicking the BrainMaps tab allows viewing the CSD activity of two 3D head maps simultaneously. (More could be displayed if needed.) In the titled drop-down boxes, the ROI and the frequency of interest are selected for each map to display each voxel in color, mapped to the voxel’s CSD value. The side-by-side placement of two head maps can be used to study cross frequency coupling in real time. The in vivo impact of sLORETA training as defined in Events 6 & 9 can be observed in any region of interest, even all 6,239 voxels, at any frequency, showing the dynamic patterning from anterior to posterior, left to right, or more local processing. Many practitioners use the 3-D head maps as visual feedback for the patient.

The AdjustE6E9 tab allows one to adjust the threshold of those events. (Figure 3). The h key is used to adjust the threshold upward for Event 6, the b key is used for Event 9. Using the Shift key with either h or b lowers the threshold value. The threshold works by multiplying the damped average of the CSD value of the ROI being trained at the specified frequency by the value of the h or b key.

Once a functional network is selected for the patient, sLORETA training can easily be implemented. Assuming that the practitioner has already created a folder for the patient and read in the “TryIt-” settings file. Then the practitioner should perform the steps given below.

- Access Event 6 via the Event Wizard. Highlight the equation in the “If condition” and delete it.
- Go to the Network Listings MS Word document and copy the equation for the network selected for training.
- Paste that network equation into the equation box in the “If condition” of Event 6.
- Set the frequency by placing the appropriate band number in “BD = #” at the beginning of the equation.
- Click “Check Equation” button.

![Figure 2](image)

![Figure 3](image)
19 Channel NeuroGuide Neurofeedback
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Brief Case Illustration

Mr. XYZ is a 50-year-old Caucasian male, diagnosed with autism at age five, during his first hospitalization. He attended special schools through high school; earned a two-year degree in accounting, and a certificate as an electronics technician. He has worked for several years, part time, in a sheltered setting. He has been prescribed neuroleptics and other psychotropic medications for extremes in mood and behavior for many years.

He frequently is unkempt. Initially he would present at the office pacing in the waiting room instead of sitting. When he did sit in a chair he bounced his legs. His facial expression was tense, eyes nearly exophthalmic. Gaze aversion was prominent.

He is socially isolated due to deficits in social pragmatics but has some desire for social interaction. He has communicative intent, verbal and expressive language appear within normal limits. However, careful attention to the flow of conversation reveals that the content of his verbal responses are not directly related to what came before. He is close enough in his responses that those conversing with him often fill in the gaps or continue the conversation in the new direction it has taken. His understanding of the meaning or implication of what has been stated is often idiosyncratic. Interests are restricted, making his initiating and maintaining conversation more difficult. More recently, he has successfully taken on the care of a pet cat.

Cognitively, he has high average intelligence, with near savant-level episodic memory recall.

Learning through reading is onerous for him. He is obsessively focused on legacy electronic devices, with encyclopedic knowledge of serial numbers of obscure parts. He is perseverative, has difficulty switching sets, and lacks ability to place input from other sources and information from daily events in its proper context.

He was referred by his psychiatrist because of fear of the patient’s behavioral outbursts and boundary violations. Neurofeedback is one of the treatments provided to this patient.

An initial qEEG was performed which is shown in Figure 4.

Given the role of the Default Mode Network in a Theory of Mind and its impact on the regulation of other networks, the initial training selected for this patient was conducted with the Brain Avatar software using a protocol comprised of 19-channel Z-score, that is the PZOK (UL) version, in conjunction with sLORETA training of the ICN-13, the Default Mode Network as defined by Laird et al (2011). Frequency pairings used in training included Theta-Gamma, and Alpha2-Gamma.

A second qEEG was taken at the end of the eighth session. It is shown in Figure 5.

Subsequently, the patient received one session of training of the anterior cingulate and precuneus. A screenshot of the two 3-D headmaps used as the visual feedback given to the patient is shown. The 3-D headmaps display the CSD activity in theta at Brodmann area10 and in gamma at the precuneus. Auditory feedback was also given; it was based on CSD activity of additional Brodmann areas also included in the anterior cingulate—i.e. Brodmann areas 24, 25, 32, and 33. This feedback display can be seen in Figure 6.

Behavioral improvements to date include the patient being able to stop leg bouncing and maintain it when cued by the author. Gaze aversion is less. During conversation patient is more easily redirected to focus on the topic of discussion. Patient had one recent social visit with a workmate from the sheltered workshop where he is employed. He was accompanied by an aide. Ability to place information in proper context has shown no change.

References

Hagmann, P., Cammoun, L., et al. (July 2008), “Mapping the

References continued on page 33

From top left: Figures 4, 5, and 6
A local news release requesting volunteers with known wellness disorders was sent out and respondents were first administered a survey to expose their self-reported response to numerous wellness issues, including questions related to exercise, smoking, depression and general health. The survey also included a Likert-scaled set of words or phrases to which they were to provide their reaction from “strongly dislike” to “strongly like.” It should be noted that TTI has been in the business of creating and validating self-reporting ipsative surveys for over 30 years, with distribution to more than 90 countries and in more than 40 languages.

Once consent forms, medical history, and surveys were collected, each participant was asked to come to the lab for a one-hour EEG session. The protocol involved a stimulus/response data collection process in which key words or phrases from the previous survey were presented on a screen in front of the participant while event markers and EEG readings from 19 sensors were collected using BrainAvatar™. (Figure 1 depicts a sample EEG episode.)

Once data was collected, a patent-pending process allows TTI to not only validate and improve their existing assessments, but to create new approaches that expose the core beliefs behind our daily decision-making. This process documents both the intensity of human emotional response as well as the directionality of the response.

This emerging technology and the patent-pending process allows TTI to not only validate and improve their existing assessments, but to create new approaches that expose the core beliefs behind our daily decisions.

**The process in action**

The first step involves a person completing an online survey. Once that data has been analyzed, the client is connected to the BrainAvatar™ and shown a word or image from the previous online assessment. These stimuli are measuring brain activity and exposes the match to self-reported explanations. The process documents both the intensity of human emotional response as well as the directionality of the response.

This emerging technology and the patent-pending process allows TTI to not only validate and improve their existing assessments, but to create new approaches that expose the core beliefs behind our daily decisions.
Emotional Response to Stimuli

A relative balance in beta and gamma waves creating asymmetry in the activity in the frontal lobes is associated with normal mood and emotional state. Increased activity within the left prefrontal cortex can indicate an elevation in mood and positive feelings. De-activation in the left prefrontal cortex alone or in combination with an increase in activity within the right prefrontal cortex can suggest the opposite, being associated with depressive mood or negative thoughts. Instances in which only the right prefrontal cortex activates quickly with a strong increase in gamma waves suggest a strong dislike or avoidance of a particular exposure.

Example Images:
These example images depict the amount of gamma activity present in subjects’ frontal lobes as they are exposed to different stimuli invoking neutral, positive, and negative responses.

Raw EEG and Event Markers
The event stimuli being reviewed in this case is “A lover’s embrace.”

Acquired EEG:
An increase in both beta and gamma waves can be seen when also inspecting the acquired EEG of the event.

Figure 2
Explanation of Asymmetry in the Prefrontal Cortex

Figure 3 shows prefrontal cortex for gamma activity stimulus response. In this sample we see an extremely strong avoidance to the words “obese people” (increased activity in the right prefrontal cortex) and a similar but less intense reaction to “body fat.” Even “fresh fruit” showed a negative reaction. The participant also responded to the survey with similar responses, thus showing a correlation between her ipsative survey and her brain activity and, in this case, affirming the accuracy of the original survey.

But the most interesting finding occurred during the debriefing. Sally was shown her resulting brain images as well as her initial survey responses. When asked why she was not more positive about fresh fruit, she responded, “Any food in excess is bad.” When shown her brain reaction to “obese people,” she paused and then stated, “I used to have a problem with anorexia.”

We will come back to this debriefing comment, but it is important to note that this data followed by an effective debriefing has the power to open communication and ultimately reveal and confront core beliefs. In this case, Sally is still very much anorexic, at least according to her brain, even though she has found ways to control her urges.

Figure 4 comes from a participant who had recently been diagnosed with severe depression by her family doctor, but was not on medication at the time of the wellness assessment. The follow-up debrief opened a number of “talking points,” including sleep deprivation, healthy food conflicts and her love of chocolate chip cookies. Her intense reaction to smoking was of particular interest. When quizzed she hesitated before explaining that the week before the assessment, she had been told that she had two dark spots on her lungs. She had not even told her family, but when confronted with this image, she opened up and started the process of reflecting on the implications of her physical and mental state.
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Conclusion

BrainAvatar™ and the protocols discovered by TTI’s patent-pending VIDE process are opening the doors to the very core beliefs behind our behaviors and emotions. As William Moulton Marston, the inventor and patent holder of the lie detector wrote in the 1920s, “Society would be better served by using this tool to modify behavior than to incarcerate people.”

The implications for clinicians are far-reaching and very exciting. BrainAvatar™ provides real-time noise-reduced images that expose the thoughts behind the action. Armed with this tool, psychotherapists can provide their client feedback without fighting the perceptions of top-down professional judgments. The data are coming from the client. No professional assumptions, no push-back or arguing over source or accuracy.

In addition, once baseline data are gathered, periodic monitoring can be used to visually document goal progress. The client is no longer a passive recipient of therapy but an active participant in their own recovery.

Another important affirmation coming from this research is the now-documented role of avoidance in decision-making. While several TTI assessments incorporate both avoidance and acceptance in the analysis, we now have scientific explanations for our assessment design assumptions. Our ERP experiments document that we simply are better at determining what we dislike than like. Our findings are consistent with the idea that people run their lives more to avoid certain things than they do to pursue them. This has implications for not only assessment design, but for debriefing protocols. Working with the dislikes allows us to expose the real drivers of behavior.

TTI believes that self-awareness is power; power to unveil our hidden beliefs that are holding each of us hostage in some way. When a person sees these images of their brain, they are confronted with the results of their mindsets in ways that allow them to begin the process of life changes.

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Dr. Bonnstetter also has served as editor of Science Education International, been invited as a visiting Professor to Venezuela, Indonesia, Cyprus, Brazil, Nigeria and Japan, hosted the 60 Second Scientist TV series, participated in the European Gordon Conference as a Featured Lecturer, and has served as a Board of Directors member for 9 regional, national and international organizations. In addition, Dr. Bonnstetter has served twice as a Delegate to the World Council of Science Education and was the first recipient of the National Senior Science Educator award. His teacher preparation program was the recipient of the National Search for Excellence in Science Education (SESE) Award for the outstanding Secondary Science Teacher Preparation Program.

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Dustin Hebets is coordinator for TTI’s Applied Cognitive Research Laboratory, Target Training International & the TTI Center for Applied Cognitive Research.

Figure 3
Three examples of ERP reactions. We see a progression of right prefrontal activation from a slight avoidance to fresh fruit to a rather major reaction to obese people, with body fat falling in the mid-range.

Target Training International Wellness Study Results

Figure 4
Figure 4 shows several images taken from the depression section of the Wellness Assessment. While right prefrontal cortex avoidance can be seen in each of the images, the intensity varies greatly. It is this variation that leads to follow-up dialogue.
**Autistic Spectrum Disorder as a Potential Target of Z-Score LORETA Neurofeedback**

*J. Lucas Koberda, MD, PhD*

**Autism** is a neurodevelopmental disorder characterized by impaired social interaction and communication, and by restricted and repetitive behavior. It is one of three recognized disorders in the autism spectrum disorders (ASDs), the other two being Asperger Syndrome (AS), which lacks delays in cognitive development and language, and Pervasive Developmental Disorder, not otherwise specified (PDD-NOS), which is diagnosed when the full set of criteria for autism or Asperger syndrome are not met.

The prevalence of autism is about 1–2 per 1,000 people worldwide, and the Centers for Disease Control and Prevention (CDC) report 11 per 1,000 children in the United States are diagnosed with ASD as of 2008. Parents usually notice signs in the first two years of their child’s life. Early behavioral or cognitive intervention can help autistic children gain self-care, social, and communication skills.

Asperger Syndrome (AS), frequently considered as mild form of ASD is characterized by significant difficulties in social interaction, alongside restricted and repetitive patterns of behavior and interests. It differs from other autism spectrum disorders by its relative preservation of linguistic and cognitive development. Although not required for diagnosis, physical clumsiness and atypical use of language are frequently reported. The syndrome was named after the Austrian pediatrician Hans Asperger who, in 1944, studied and described children in his practice who lacked nonverbal communication skills, demonstrated limited empathy with their peers, and were physically clumsy. There is doubt about whether it is distinct from High-Functioning Autism (HFA) partly because of this; its prevalence is not firmly established. Although research suggests the likelihood of a genetic basis, there is no known definite genetic etiology. The lack of demonstrated empathy is possibly the most dysfunctional aspect of Asperger syndrome. Individuals with AS experience difficulties in basic elements of social interaction, which may include a failure to develop friendships or to seek shared enjoyment or achievements with others. Stereotyped and repetitive motor behaviors are a core part of the diagnosis of AS and other ASDs. They include hand movements such as flapping or twisting, and complex whole-body movements. Although individuals with Asperger syndrome acquire language skills without significant general delay and their speech typically lacks significant abnormalities, language acquisition and use is often atypical. Abnormalities include verbosity, abrupt transitions, literal interpretations, and miscomprehension of nuance, use of metaphor meaningful only to the speaker, auditory perception deficits (unusually pedantic), formal or idiosyncratic speech, and oddities in loudness, pitch, intonation, prosody, and rhythm. Echolalia has also been observed in individuals with AS. There is no single treatment, and the effectiveness of particular interventions is supported by only limited data. Intervention is aimed at improving symptoms and function. The mainstay of management is behavioral therapy, focusing on specific deficits to address poor communication skills, obsessive or repetitive routines, and physical clumsiness. Most children improve as they mature to adulthood, but social and communication difficulties may persist. More recently, neurofeedback (NFB) has been reported as a potential treatment modality which could benefit ASD individuals. Therefore, the following case of Z-score Low Resolution Electro-magnetic Tomography Analysis (LORETA) NFB treatment, which is one of the newest forms of neurotherapy, is presented as an example of successful outcome.

**A case study**

Victor is an 18-year-old male student who presented for an initial evaluation with his mother. The mother reported that he had problems with focusing, concentration, and speech expressive functions. In addition, social interaction problems were reported including a difficulty in making friends and generalized clumsiness. Victor was not taking any medications. He was a freshman at a local university with very good performance in mathematics and physics (A) however poorer performance in English and philosophy (B, C). His examination showed monotone type of speech with decreased speech output and reduced facial expression. Some reduction of fine motor movements was also noted during the exam.

Initial workup was unremarkable except for the quantitative electroencephalogram (qEEG) (Neuroguide, Inc. St. Petersburg, FL) which showed increased theta activity in the fronto-temporal (see Fig. 1) region.

Victor and his mother were not interested in medication therapy.

Victor was diagnosed with possible Asperger syndrome and was initially treated with 1-electrode basic type of NFB guided...
by prior qEEG findings. Approximately 30 sessions of 1-electrode NFB were completed with some subjective improvement in concentration and executive functions. However, expressive speech problems were still of major concern for Victor and his mother. Follow up qEEG showed some changes in delta and theta expression (see Fig. 2). Subsequent computerized neuropsychological testing (Neotrax, Inc. Bellaire, TX) showed evidence of major verbal deficiency (see Fig. 3). The global cognitive score was below expected (93.2) and most deficient for verbal function (35.5).

Since Z-score LORETA NFB became available in our office, the decision was made to initiate this treatment modality in order to see whether his speech expressive dysfunction could be corrected. A total of 10 sessions of combined surface and LORETA NFB (Applied Neuroscience, Inc.) was completed and then another computerized neuropsychological testing was conducted (see Fig. 3). A major improvement of verbal function was noted (104.1) with an increase in global cognitive score (103.1).

At the same time, after Z-score LORETA NFB therapy completion, another follow up qEEG was also recorded (see Fig. 4) which showed a marked reduction of delta and theta activity.

Subsequently, Victor also reported a marked improvement in university performance, receiving an “A” score in both English and philosophy.

This case illustrates the potential of Z-score LORETA NFB for verbal enhancement in autistic spectrum disorder patients.
A recent market research report indicates that more than 1.5 billion people worldwide suffer from chronic pain (Global Industries Analysts 2011). Epidemiology studies vary, but one put the prevalence of chronic pain, as defined by the WHO World Mental Health Surveys, at 37% in developed countries (Tsang, Von Korff et al. 2008). Another study found a 33% prevalence in the United States with back pain being the number one complaint followed closely by osteo-arthritic pain (Croft, Blyth et al. 2010).

Allopathic medicine utilizes drug treatment for most chronic pain conditions. Chronic pain patients treated with medication are vulnerable to addiction, very often the direct result of opioid analgesia. While most pain patients use their medication responsibly, according to one study, as many as 18% develop an addiction (Fishbain, Rosomoff et al. 1992). Many will suffer from decreasing functionality and affective disorders. The sheer magnitude of the problem presents an opportunity for alternative treatments.

Pain experts often refer to the "perception of pain" making distinctions between chronic and acute pain that acknowledge that chronic pain may not have well-defined underlying pathological causes. The brain regions involved in the processing of pain cited in the majority of studies include: primary and secondary somatosensory cortex, anterior cingulate cortex, insula, thalamus, basil ganglia, and the cerebellum. One meta-analysis concluded that the brain network for acute pain perception in normal subjects is moderately distinct from that seen in chronic pain conditions. The study revealed that chronic pain preferentially engages brain regions important for cognitive/emotional assessments. The involvement of these limbic brain regions implies that the emotional and cognitive component of pain may be a distinctive feature between chronic and acute pain (Apkarian, Bushnell et al. 2005).

The anterior cingulate gyrus and the insular cortices, structures of the limbic system, have been implicated in the affective processing of pain (Price 2000; Morrison, Lloyd et al. 2004; Singer, Seymour et al. 2004; Apkarian, Bushnell et al. 2005). Apkarian indentified the anterior cingulate cortex (ACC), as cited across many studies, for having a particularly robust activation pattern in both chronic and acute pain. Those studies have divided the ACC into as few as four and as many as six components with affective reactions to pain localized to perigenual (rostral) ACC and cognitive processes to mid-cingulate activations.

The alpha band is a particularly useful one in neurofeedback training for a variety of clinical presentations. It has been hypothesized to direct the flow of information to task-relevant brain structures while inhibiting regions that are task irrelevant (Knyazev 2007; Klimesch, Fellinger et al. 2011). More generally, it may have a preventive inhibitory role in sparing brain regions from continuous excitatory impulses (Simonov 1968). This quieting function of the alpha band may have been helpful with a recent chronic pain client when the anterior cingulate cortex was trained with sLORETA neurofeedback, substantially reducing the intensity of pain.

The Client
The client was a 72-year-old male who suffered a "stroke-like event" that resulted in reduced functionality of his right forearm and hand. The MRI analysis was normal. The MRI made clear that the insult to the client’s brain did not result in tissue damage. The client was not naive to neurofeedback, hav-
ing been trained in several modalities before the introduction of sLORETA training. The qEEG analysis revealed insufficient power in the central, bilateral posterior temporal, and parietal areas from 1–3 hertz, and some mildly insufficient power at various areas at 4 and 5 hertz. Mildly insufficient power was evident in posterior regions from 21 to 30 hertz. Neuroguide Z-scored LORETA analysis revealed reduced current sources in the superior frontal and anterior cingulate gyri (See figure 1). Additionally, hypo-coherence was discovered in all bands, with the most deviance in the high beta band between frontal and posterior regions of the cortex. The client’s reduced functionality in the right arm and hand hindered his ability to play the piano, a much prized avocation.

sLORETA Training

Training was executed with BrainMaster Inc.’s Discovery amplifier and the BrainAvatar sLORETA software. The trained regions of interest (ROI) were imaged with BrainMaster’s Live sLORETA Projector. Z-score training was employed using Neuroguide’s Normative Database with BrainMaster BrainAvatar software.

A simultaneous combination of sLORETA and surface four-channel Z-score training was implemented targeting the deeper structures that included the superior frontal gyrus, post central gyrus, anterior cingulate gyrus, sensory, and motor areas in posterior regions. Bilateral central and parietal ten/twenty sites were trained with Z-scores while simultaneously training to increase either 1–3 or 1–5 hertz in the aforementioned structures with sLORETA.

Nine sessions were completed with minor improvement in the mobility and dexterity of the right arm and hand. However, the client did report an unusually vivid “clean windshield” effect after the first session:

Wanted to report back to you on the treatment of this morning, as you had requested. What took place holds ENORMOUS promise for healing the weaknesses in the brain we discussed today, as of this moment, 9 pm. When I left your office and walked down the hall toward the elevator, I could tell that something significant had taken place. I felt wider and larger and clearer in some unknown way. I felt, and still feel, that my right side was working better than when I woke up this morning. All this is talk but something did happen. My right foot landed cleaner on the ground at least for a time. It may have regressed later in the day somewhat. Is that possible? That’s how it felt.

That the client was not naive to neurofeedback argues that the report may reflect a genuine treatment effect rather than placebo. Additionally, this kind first response, reflecting a profound sensorial clarity, has been the reaction of several of my patients trained with sLORETA.

After the initial training session, the client began to complain of increased pain in both knees, a chronic arthritic condition, which he attributed to an additional intervention related to his presenting problem. As the training proceeded, the pain steadily increased to the point where the patient’s mobility was severely limited.

A review of the pain literature suggested several brain structures on which to focus treatment while the client’s qEEGs, undergone every training session, continually revealed the anterior cingulate gyrus as dysregulated. This structure is involved in pain and motor processes and became the focus of training with very little improvement in either complaint. Training in the ACC had been focused on the delta and theta bands. A fresh look at the Neuroguide Z-scored LORETA analysis revealed that the alpha band was deficient in the ACC (see Figure 2). It was not the two standard deviations generally accepted in the field as a marker for pathology, but the thought was that the lack of alpha could have been contributing to an overactive ACC, producing a sensitivity to the painful condition.

At the eleventh session, the client was trained with a combination of surface Z-score training and sLORETA to increase 8 to 12 hertz in the ACC. The training was 17 minutes in duration. The next day via email the client stated:

Felt blissful yesterday afternoon. Was walking extremely well. Felt on top of the world. A profound clarity. A seldom-felt calmness of the emotional system. Very “in the moment,” if that makes sense. I had a wonderful full feeling in my chest and back, way out of the ordinary. Would not mind feeling like that again (oh, for the rest of my life).

1. Right hand. Two things mixed in. The soreness in my middle finger which runs up into my right forearm and into my right elbow. On top of this, the lack of dexterity and strength in the right hand, especially the pointing finger and the middle finger. Not sure if I’ve mentioned this to you before, but I often drop things from my right hand, silverware, tablets, pens and the like. Sometimes dishes. Strength is way down from normal. Am reluctant to shake hands often because of a weak grip and soreness in the middle finger.

2. Dexterity in the right hand is still compromised.

3. Knees felt very good yesterday afternoon. Was able to go up and down stairs close to normally.

This report is striking for several reasons. The euthymic response is clear. The training produced a significant reduction in pain and an emotional response that is consonant with the literature. At the same time, there was no improvement in the right arm and hand. The mixed response argues against placebo and for a training response. Moreover, at the next session to address the client’s concern with his chief complaint, the right hand and arm, the training moved away from the ACC to train other brain regions. After that session the client complained that the knee pain had returned and via email stated:

Still experiencing profound clarity pretty much continuously. Knees still sore.

At the next session we returned to training an alpha increase in the ACC in combination with Z-score training of bilateral central parietal 10/20 sites. The training session was 20 minutes in length. The next day via email the client stated:

Figure 3

Pre/post qEEGs. Note the increase in delta absolute power and the complete resolution of coherence abnormalities in the delta, theta, and alpha bands.
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I experienced immediate relief in the knees after the session yesterday. Up and down stairs was significantly better. Remains so today. 50% better. Mathematically though, 50% still remains.

The increase in pain after moving away from Anterior Cingulate training and the reduction in pain following the return to ACC alpha training are strongly suggestive of a treatment effect.

I would argue that the client’s training is a de facto A-B-A research design. Observe the reduction in pain with the initial sLORETA training of the ACC with alpha, the A condition. Then the return of painful stimuli when the training is focused on other brain structures, the B condition. Then the reduction in pain with the reimplemention of the A condition, sLORETA training of the ACC with alpha.

Three more sessions of sLORETA training of an alpha increase in the ACC were performed. The level of pain continued to improve, although more slowly, without the dramatic reductions of the earlier sessions.

At the next session:

I am experiencing a slow but steady improvement in my knees and ankles and hips and right elbow.

And after the last session:

Am experiencing incremental but perceptible lessening of the knee and other joint pain. I just walked up the stairs in our house and could feel the improvement in my steps. Have experienced this pretty much since the session yesterday. The elbow pain has improved. The forearm pain has improved. The ankle and hip pain has improved. If this is a placebo effect, then that would be fine also. I understand the placebo effect is a VERY powerful healing phenomenon.

There are several factors that may have contributed to the client’s positive response to placebo effect, then that would be fine also. I understand the placebo effect is a VERY powerful healing phenomenon.

Finally, the client was not made aware of the changes in cortical location and frequency during the course of training. The increase in pain after moving away from Anterior Cingulate training and the reduction in pain following the return to ACC alpha training are strongly suggestive of a treatment effect.

Mark Llewellyn Smith, LCSW, BCN, is a licensed clinical social worker whose early career was established in the world of work as the Director of clinical services to nurses, doctors, and staff of NYU Medical Center and Downtown Hospital as part of the Mount Sinai Medical Centers Employee Assistance Program. In private practice since 2001, Mark is a leading developer, teacher, and clinician of neurofeedback interventions for a variety of disorders. He was an early adopter and developer of Z-score and Infra-slow Fluctuation training, both now primary interventions in EEG-Biofeedback therapy. Mark has taught neurofeedback on four continents and continues to educate and train neurofeedback providers in international workshops and conferences. Mark is currently the Clinical Supervisor of The Child School’s Neurofeedback Program. He is the founder and Clinical Director of Neurofeedback Services of New York, PC.

References


Combining sLORETA and 19-Channel Live Z-Score Training:
Targeting HiBeta in Brodmann Areas to Reduce Symptoms of Anxiety

Penijean Gracefire, LMHC, CRC, BCN
Gail S. Durgin, PhD, BCN, qEEG-T

Nineteen-channel Live Z-score training uses information from surface recordings to generate 5700 quantitative metrics that include absolute power, relative power, power ratios, amplitude asymmetry, coherence, and phase at and between all 19 sites from which EEG is being acquired. These metrics are compared instantaneously to a normative database, and feedback is provided when a clinician-determined percentage of these metrics fall simultaneously within a range of activation that is considered optimally efficient based on previous statistical analysis.

This concept of “range training” or training a multitude of variables to coordinate within a complex system of networks that require different resource allocation patterns depending on the perceived task, is an innovative approach that has only existed for the last five or six years. Referred to as PZOK (or, the percentage of Z-scores within the optimal training range has been achieved, essentially: percent of $Z$ is OK), this training approach uses EEG activity as recorded at the surface of the scalp to create visual or auditory feedback patterns for the client, and instead of a unilateral directionality of feedback (rewarding the brain to increase, “make go up,” or decrease, “make go down,” particular frequency bandwidths in specified locations), PZOK establishes a range of approved activity and then works with each individual brain to design the most efficient way to use the currently available neural resources to meet changes in processing and network demands.

The unique strengths of 19-channel PZOK training are the direct interaction with connectivity measures as a core element of the feedback, which encourages greater integration and resource sharing between brain regions, while simultaneously providing the brain with an operational paradigm on a global scale, regarding the most efficient ways to allocate resources under a task demand state. Using 19-channel PZOK as a stand-alone treatment has yielded promising clinical data indicating its potential applicability to alleviate symptoms associated with a number of conditions characterized by hyper arousal. Due to the mechanism of encouraging reallocation of present energy resources, it is possible that range training may be particularly effective for assisting in the diffusion of symptoms of anxiety, post traumatic stress disorder, traumatic brain injury, obsessive compulsive disorder, insomnia and any syndromes where excess frequency activity is observed.

While favorable clinical improvement has been consistently observed by the practitioners using 19-channel PZOK, the motivation to construct protocol designs incorporating the newest available technology is still driven by the desire to provide the most efficient and cost-effective treatments possible. In this spirit, when the BrainAvatar software debuted the use of the sLORETA inverse solution, utilizing surface EEG recorded at the 19 channels of traditional 10-20 sites to accurately localize specific regions in the brain, clinicians were excited. For the first time, practitioners and researchers could observe a three-dimensional display of the current source density in specified areas of the brain in particular frequency ranges in real-time. Not only is the activity observable, but it can be utilized as the basis of a feedback paradigm that provides information to the brain, effecting responses in the targeted area. In essence, the BrainAvatar software is rewarding the client when targeted regions of the brain increase or decrease activity in chosen frequency bands.

Following are three cases in which the client reported symptoms of chronic anxiety and difficulty with social interaction, and then experienced a noticeable reduction in anxiety within two sessions or less. The first case was contributed by Dr. Gail D. Sanders, who practices neurofeedback in Greensboro, NC, and the second and third cases were shared by Penijean Rutter-Gracefire, a licensed mental health counselor in Tampa, FL.

Each of the contributed cases began with a qEEG analysis that indicated excess beta activity in regions of the brain associated with regulating arousal and emotional state, and each client was treated with a protocol that combined the global integration of BrainAvatar19-channel PZOK, with a specific region of interest chosen by matching the reported symptoms with observed focal dysregulations.

In the first case, the client is a 30-year-old female with a history of severe generalized anxiety, and currently taking 0.5 Mg of Clonazepam twice a day. She had been under Dr. Durgin’s care for some time and had previously received some sessions of 19-channel LORETA neurofeedback from an alternate training software. These sessions targeted diurnal metrics associated with obsessive-compulsive disorder and depression, indicated by the other training software. In an effort to maximize efficacy of treatment planning, after a number of sessions Dr. Durgin reviewed the client’s most recent qEEG data, paying particular attention to the LORETA analysis. This revealed excess activity in Brodmann area 20 that spanned from 13–30 Hz and ranged between 1.8 and 3.3 standard deviations above the norm. The image in Figure 1.
exhibits excess activity at 3.32 standard deviations located in Brodmann area 20.

The “attribution of intentions toward others” is a function associated with this particular region of interest, and also was a particularly problematic area for Dr. Durgin’s client, who has spent years in discussing her difficulties with social interaction. Dr. Durgin then trained her client with the BrainAvatar software 19-channel PZOK approach, combined with inhibiting hibeta in Brodmann area 20 using the sLORETA localization and feedback paradigm. The image in Figure 2 was taken immediately after one training session of less than thirty minutes, and when compared to the before-BrainAvatar training image, her 21Hz activity in BA 20 went from 3.32 standard deviations to 2.31.

The client reported, “I felt different after the session, more calm and confident. But the biggest change I noticed was in how I felt in social situations, specifically around people I didn’t know, later that evening. Upon walking into a store—something that always makes me self-conscious to some degree—I felt like the fullest, most authentic and powerful version of myself. It was like I “owned the room.” I was not afraid to ask for help with finding items, and I joked around with the salesperson a bit. The interaction was easy and light—completely free of my usual worries about others’ perceptions of me. I also noticed my senses felt enhanced. It was like the difference between surround sound and high-definition TV versus “regular.” The thought that kept coming to mind was, “If I could feel like this all the time, what couldn’t I accomplish? My limitations would be almost non-existent!” I want to be very clear this was not a state of euphoria; it was a feeling of being fully present and comfortable in my own body, just being myself.”

In the second case, the client is a 29-year-old female with severe social anxiety and generalized paranoia that other people are thinking badly of her, that they dislike her, or that they will dislike her as soon as they get to know her a little better, and consistently projecting worst-case scenarios over her social interactions. While not currently on medication, she has taken a number of anxiolytics in the past and had numerous talk therapy sessions, with minimal improvement of her symptoms. A pre-treatment qEEG and LORETA analysis (seen in Figure 3) revealed excess activity from 21–28 Hz in Brodmann area 23. This region is located in the limbic lobe, particularly the cingulate gyrus, and is associated with evaluative judgment, precautionary reasoning, fear conditioning, self/other distinction and response to classical conditioning, among other functions.

After two 20-minute training sessions, consisting of BrainAvatar 19-channel PZOK and inhibiting hibeta at BA 23, Figure 4 demonstrates that her excess activity decreased from 2.96 standard deviations to 1.67. She reported that the paralyzing fear she was experiencing in groups of people and unfamiliar social situations had “gone from a 9 ½ to 2” on a scale of 10, with 10 being the worst. She also said that she felt she was able to relax and enjoy talking to other people for the first time she could remember since third grade without “constantly being on red alert, waiting for the Klingons to attack” (direct client quote). Three weeks after her two sessions, she feels that she is still experiencing benefits; however, she would like to continue training to see what additional progress she can make.

The third case is a 36-year-old male with obsessive-compulsive disorder, who ruminates constantly on whether or not women find him attractive, is prone to emotional outbursts and instability, trends toward behavior that people in his family and social circle describe as “needy, suffocating, and creepy.” He has gone to classes, therapy, “dating school,” and read countless books trying to learn how to relax and interact with people in a less off-putting and stressful manner.

His qEEG and LORETA analysis (Figure 5) indicated excess beta activity from 24–29 Hz up to 3.12 standard deviations in Brodmann area 23 when compared to the normative database. After one 20-minute session of BrainAvatar using 19-channel PZOK and inhibiting hibeta at Brodmann area 23, his hibeta at 25 Hz decreased from 3.12 to 2.27 standard deviations (see Figure 6). He reported that the week after his initial session, he
QEEG / TOPOGRAPHIC BRAIN MAPS:
Generalized Anxiety Disorder Subtypes

**High Beta Subtype**: Anxiety, Insomnia, Alcohol / Drug Abuse

**High Alpha Subtype**: Anxiety, Depression, ADD

**Low Alpha Subtype**: Anxiety, Insomnia, Alcohol / Drug Abuse

**Cingulate Dysfunction**: Anxiety, Rumination, Obsessive Compulsive Disorder

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**SINGLE-BAND MAGNITUDE TOPOGRAPHIES**

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  - **03) Neuroguide - R. Thatcher Normative Database**
    - A: Eyes Closed Linked Ears Z-scores // Eyes Closed LaPlacian Z-scores
    - B: Eyes Open Linked Ears Z-scores // Eyes Open LaPlacian Z-scores

  - **04) Neurorep - W. Hudspeth QEEG Analysis System**
    - A: Eyes Closed - Weighted Average, Z-scores, Magnitude, % Power, LaPlacian, Average Spectrum, coherence, connectivity
    - B: Eyes Open - Weighted Average, Z-scores, Magnitude, % Power, LaPlacian, Average Spectrum, coherence, connectivity

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Raichle, M E, (2011) “The Restless Brain,” Brain Connectivity, 14, 4

Penijean Gracefire, LMHC, BCN, has eight years’ experience working with both low-functioning and high-risk populations, including profoundly disturbed adolescents and adults with severe traumatic brain injury. She contracted for two years with the Center for Rational Living as a cognitive behavioral therapist, rehabilitating DUI and drug offenders on probation, and training new therapists. She served for five years as the Clinical Services Director at CNS Wellness of Tampa Bay, using neurofeedback, biofeedback, and cognitive behavioral interventions on populations with autistic spectrum disorder, chronic anxiety and depression, aging and cognitive decline, traumatic brain injury, substance abuse, ADHD and OCD. Penijean believes in therapeutic interventions that incorporate cognitive, biological, social, and neurophysiological factors into an integrated approach that addresses each individual as a complete person functioning within a complex system. Her recent clinical research has focused on methods to improve neural connectivity in individuals with compromised function. She currently works with StressTherapy Solutions, Inc. as a clinical consultant and educational coordinator, helping to create and teach training programs and materials, and to develop clinical applications for groundbreaking training methodologies and brain imaging software.

Gail Sanders Durgin, PhD, BCN-Fellow, QEEG, worked in mental health and developmental disabilities for 18 years before beginning her career in neurofeedback in 2000. She has studied with a number of leaders in the field and has presented at several international conferences. She uses a variety of neurofeedback techniques and systems in order to better personalize the treatment for each individual client. She is the owner of Neurofeedback Associates Inc. in Greensboro, NC.
Assessing the Effects of Subthreshold Magnetic Stimulation on Brain Activation using sLORETA

Christen Stahl, Tom Collura

**INTRODUCTION**

There has been a recent increase of interest in the use of feedback stimulation that consists of very low levels of magnetic activity produced by a small coil or similar device (Dogris, 2011; Larsen, 2012). While lying well below the levels of conventional transcranial magnetic stimulation which can overtly alter brain activity, microstimulation provides the opportunity to modulate excitability in a subthreshold way, thus affecting local and global dynamics. In this study, a small electromagnetic device was constructed using a custom-designed circuit, and guided by conventional LED driving hardware and software under computer control. The intent was to deliver pulsed magnetic stimulation at set frequencies, while looking for systematic changes in EEG activity associated with the feedback stimulation. The availability of standardized Low Resolution Electromagnetic Tomography (sLORETA) provided the opportunity to assess changes in brain function at the level of regions of interest (ROI’s) rather than simply as surface EEG changes.

**PURPOSE**

The purpose of this case study was to determine whether deviations in power could be observed in association with the application of a subthreshold magnetic feedback stimulator. The objective was to assess the possibility of recognizing systematic changes in brain activation associated with the application of the stimulation. Specifically, by comparing time periods during various (or no) stimulation, we looked for trends that suggested functional changes. It was expected that there would be a differential effect on the EEG depending on the site of stimulation, as well as the site being monitored. For example, 3 Hz and 14 Hz stimulation would be expected to have different effects on activation, possibly in different directions. Additionally, when stimulation is applied to a particular area, the effects on that, as well as other areas, would be expected to change, as a function of frequency, and the locations both stimulated and being monitored.

Additionally, a corresponding and negative correlation might be seen between the stimulation and the amount of power on the site of a particular electrode. Simply, a larger decrease in power would occur with the 14Hz MicroTesla, than when using the 3Hz stimulation; yet, both conditions might be expected to produce a decrease in power, specific to site placement. On the other hand, certain Brodmann areas (BA) may experience power differentials, where one BA, has a greater change than another.

**PROCEDURE**

The description below incorporated the use of a BrainMaster Discovery and a BrainMaster Atlantis with 4.0 (“BrainAvatar”) software, the sLORETA Projector (Collura, 2012), an ElectroCap, and a subthreshold magnetic stimulator (MicroTesla), while analyses were completed on BrainAvatar and Excel. The MicroTesla is a custom-designed spirally configured electromagnetic device that produces an electromagnetic field. The device is controllable from a BrainMaster Atlantis using the standard photic or auditory stimulation output controls. The MicroTesla emits a magnetic field ranging from 1 to 10 microTesla, of the pulsed activity peaked in the range of 10 to 100 milliGauss, or 1 to 10 microTesla, and were verified using a TriField (Model 100XE) magnetic field meter. This is approximately one tenth the strength of the earth’s magnetic field standing on the surface, and is less than that produced by small earphones. It may thus be regarded as “subthreshold auditory/magnetic” stimulation.

The process and methods used to examine power deviations in EEG involved multiple steps beginning with the capping of a male participant in his late twenties on two separate occasions, while using a Checktrode to verify a clean signal with impedances below 10 kilohms. The participant reported overall good health and no mental or emotional concerns.

Using sLORETA, we examined changes in brain activity using the subthreshold magnetic brain stimulation described above. The procedure consisted of acquiring EEG for a total of six minutes, in order to utilize three discrete tests, where the first 30 seconds and the last 60 seconds were baseline recordings, or involved no stimulation. Beginning with the second block of 30 seconds, and alternating between the stim on the electrode and no stim, the stim was placed on a particular electrode for 30 seconds. This process was repeated every 30 seconds for a total EEG acquiring duration of 6 minutes. (See Table 1).

The first EEG acquisition involved using MicroTesla at 14Hz, but it did not have a large enough magnetic field to move the TriField meter. The second EEG acquisition used a 14Hz MicroTesla while the third and final EEG acquisition which was immediately following test two, utilized a 3Hz MicroTesla which had a magnetic field ranging from 1 to 10 MicroTesla.

The brain locations evaluated in this study were Brodmann areas 4, 10, and 24. These are shown in the corresponding sLORETA images in Figures 1, 2, and 3.

**RESULTS**

Test 2, which involved stimulation at 14Hz, created a dramatic change in BA4 and BA24 of around a 6-11-point difference in C7 (9.3, 6.9) and F7 (-6.5, -6.3) between pre-stimulation and stimulation; yet, in BA10 all sites saw little change, with the difference ranging around two (-1.8 to 1.8) (See Graph 1).

In comparing Test 2 and Test 3, BA4 and BA24 had greater changes in average power in both conditions (14 Hz and 3 Hz) than in BA10. More specifically, the average difference in power between the pre-stimulation period and the stimulation period was a less than 2-point (1.6) difference in BA10, whereas on average, a 6-point difference was seen in BA4 and BA24. On the other hand, when solely measuring the change in F7 between pre-stimulation and during stimulation, BA10 recorded the largest change in power at 2.3 points compared to the less than 1-point change (0.3 and 0.1) in BA4 and BA24. Notably, across Brodmann Areas F7, the change unexpectedly contrary to higher
stimulation, where less change was revealed with a higher frequency and more change was seen at a lower frequency. In other words, the power appears to contain greater variability in Fz with no stimulation than when stimulation is applied, especially when conditions were recorded at BA10 (See Graph 1).

When looking at tests 2 and 3, at the power in all Brodmann areas for Cz, pre and post-stimulation of the sites reveal that average power usually returns to the pre-stimulation state (See Graph 2). In particular, post-stimulation in BA4 encompasses Cz movement beyond, but in the same direction as the pre-stimulation state (See Graph 3). Generally, the same pre and post phenomena occur in Fz (see Graph 4), F7 (see Graph 5), and F8 (see Graph 6) in tests 2 and 3.

Furthermore, 14 Hz stimulation applied at F7 or F8 was associated with an increase in alpha in BA4. However, the same stimulation applied at Cz caused a reduction in alpha, more pronounced in Cz2. At 3 Hz, stimulation at F8 reduced BA4 alpha activity, while stimulation at Cz was seen to be associated with an increase in left BA4 alpha. This points to possible mechanisms of differential effects, such that Cz stimulation may directly affect the motor strip, while frontal stimulation reflects as an indirect, hence possibly reversed, influence (see Graph 7).

**Limitations**

Inherent in a pilot study are multiple limitations, namely, the diminutive sample size (n=1). Additionally, other confounding variables include that the first acquisition occurred midday, whereas the subsequent two tests transpired in the morning hours, and test 1, currently used as a baseline, was the initial attempt in using MicroTesla, but was later found to produce an insignificant magnetic field. Furthermore, since the hypotheses stated that more effect would occur with a greater magnetic field, it remains inconclusive whether test 3 at 3Hz was a factor of residual activity from test 2 at 14Hz or a mutually exclusive result.

Thus, replications of this study while using a larger sample size and controlling for other variables would be beneficial. For example, it is recommended that all conditions occur during the same period of the day, that tests begin with baseline and increase with frequency (i.e. test 1: Baseline/no stimulation, test 2: stimulation at 3Hz, test 3: stimulation at 14Hz, test 4: Baseline/No stimulation). In addition, it is recommended that tests begin with at least one minute of recording without stimulation in order to gather a more stable and verifiable measure of change once a stimulation is initialized.

**Conclusion**

It was possible to recognize systematic changes in brain activation that could be associated with the application of the stimulation. It was possible to use sLORETA to identify quantitative changes, which could be associated with the stimulation parameters. Differences were
evident in the effects of 3 Hz versus 14 Hz stimulation, and different brain regions responded differently to the experimental conditions. Specifically, BA4 and BA24 were more responsive than BA10. Cz stimulation at 14 Hz tended to decrease alpha activity, while Cz stimulation at 3 Hz tended to increase alpha. Fz stimulation, in contrast, did not produce noticeable differences. In the A-B-A conditions, effects of stimulation were observed to partially reverse during the non-stimulation periods. These findings provide support and a general rationale for the use of subthreshold feedback as an additional nonvolitional component of neurofeedback protocols.

References

For more information about ASET or to join
www.aset.org | 816.931.1120 | info@aset.org
Using recently available technologies such as BrainMaster Avatar, qEEG, and LORETA Z-score training, the scope of investigating and training clients complaining of what has loosely been defined as Attention Deficit Disorder has broadened immensely.

To review, according to the DSM IV, in order to meet the criteria of an ADD Inattention diagnosis, a client must meet 6 out of 9 of the following criteria:

1. Often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities.
2. Often has difficulty sustaining attention in tasks or play activities.
3. Often does not seem to listen when spoken to directly.
4. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not if oppositional behavior or doesn’t understand instructions).
5. Often has difficulty organizing tasks and activities.
6. Often avoids, dislikes, or is reluctant to engage in tasks or activities that require sustained mental effort (such as schoolwork or homework).
7. Often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools).
8. Often easily distracted by extraneous stimuli.
9. Often forgetful in daily activities.

Often, clients enter for neurofeedback with this diagnosis or complaining of these symptoms and a qEEG or Assessment of some type would be administered. In a majority of these cases, findings typically show elevated theta to beta ratios in the frontal/central region. Training might commence with a Cz, beta/SMR training and an estimate of 40 sessions to complete or 4- or 19-channel live Z-score training with improvement in somewhat less sessions. Results have typically been good with resolution of symptoms acceptable.

However, using Brainmaster Avatar and ANI Neuroguide with LORETA capability, dysfunction in finite Regions of Interest relating more specifically to the client’s symptoms and complaints can be singled out and specifically trained, revealing there may be much more to “Inattention” than those 6 of 9 criteria.

Case Study

Case in point involves a 10-year-old male who was diagnosed as ADD Inattentive by virtue of the DSM IV. The intake interview revealed teachers and peers finding him “spaced out” often having to raise their voices in order to gain his attention. He seemed to go through life lackadaisically. He was having difficulty with reading comprehension (his reading ability was 4th grade appropriate but was tested at pre-K due to poor comprehension. His math skills are grade appropriate. He suffers from low self-esteem because he feels his peers are leaving him behind. All of these symptoms and complaints were blamed on his diagnosis of ADD, Inattentive Type.

The qEEG EO Z-score 1Hz Bins (Fig. 1) revealed elevated 2–6 Hz and 10–23 Hz around F7 and elevated 19–30 Hz at CzPz. The theta/beta ratio at Cz was 3.23, which is elevated, but not terribly high. LORETA (Fig. 2) revealed Brodmann Area 22 as a Region of Interest. These findings are not typical of what is seen in clients who come in with an ADD, Inattentive Diagnosis. In fact, when researching issues reflected by brain dysfunctions at Brodmann 22 one finds a greater comparisons...
to the clients’ symptoms and complaints involved with language processing and comprehension. These issues seemed more consistent with a sort of Wernicke’s Aphasia rather than ADD, Inattention.

Training

Training commenced with just a few basic Cz beta/SMR sessions using Brainmaster Avatar to indoctrinate the client to the neurofeedback process, check arousal, and confirm consistency of brain wave activity to the qEEG. Interestingly enough the client’s parents reported an increase in attention.

Commencing with Session 4, a Brainmaster Avatar protocol was set up to directly train the Region of Interest (Brodmann Area 22 Left), a capability unavailable until this new technology. Using a 19-channel Electrocap, we were also able to concurrently perform live Z-score training (PZOK + PZMO). Feedback tones were provided when the client reduced theta in Brodmann 22 Left below a set threshold, and for increasing the number of Z-scores within target, while increasing the speed of a blimp across a screen, with more success in both. The client also could watch Brodmann 22 Left on the Live sLORETA Projector (LLP) and turn the elevated theta, red to green as the theta in this region reduced below threshold.

Avatar has the ability of displaying multiple tabs on two displays in order to monitor numbers of different screens according to the clinician’s desire. These screens are highly customizable. In this example, on the clinician side we set up 4 tabs. Each tab is highlighted at the bottom of each figure:

1. The “Acquisition” tab is to monitor the raw waveforms (Fig. 3A). The setup of this window is pretty straightforward and is used to view artifact, electrode stability, and general integrity of the EEG.

2. The “ROI Training” tab is to monitor and train at the Region of Interest, Brodmann 22 (Fig. 3B), as well as perform live Z-score training. In order to fully understand the setup of this screen it is important to review the Event Wizard associated with this screen. BrainMaster had created and instituted what is called the Event Wizard to expand the capability of their software beyond the basic functions since version 3.0. The evolution of the Event Wizard into Avatar is seamless and has been upgraded to include all the formulas necessary to perform sLORETA and Region of Interest Training on both left and right sides separately or together.
EVENT 6 IS CURRENTLY: ENABLED
IF: EQN: x=PercentZOKUL(UTHR, - GTHR); IS GREATER THAN EQN: X=CT;
THEN: Play MIDI Sound MODE: 2 NOTE: 61 INST: 96 Ice Rain
STYLE: Sustained MODULATION: Ampl. and Pitch LOWNESS: Level: 70
LOUDNESS CHANGE RATE: 3 PITCH CHANGE RATE: 1
KEY: A MODE: Major (Ionian) CHORD: 1 Note

Summary for Event 2: (This determines the percent reward with regards to Z-score training)
EVENT 2 IS CURRENTLY: ENABLED
IF: EQN: x= EI P; // percent reward IS GREATER THAN EQN: x= EI P;
THEN: Do Nothing

Summary for Event 3: (This determines the lower Z-score window parameter)
EVENT 3 IS CURRENTLY: ENABLED
IF: Channel 1 Gamma Threshold IS GREATER THAN EQN: x= GTHR;
THEN: Do Nothing

Summary for Event 4: (This controls the upper Z-score window parameter)
EVENT 4 IS CURRENTLY: ENABLED
IF: Channel 1 User Threshold IS GREATER THAN EQN: x= UTHR;
THEN: Do Nothing

Summary for Event 5: (This controls the movement of the blimp in the Flash Player)
EVENT 5 IS CURRENTLY: ENABLED
IF: EQN: x=EI F; IS GREATER THAN Value: 0.5
THEN: Do Nothing

Summary for Event 6: (This gives an additional reward tone for PZMO)
EVENT 6 IS CURRENTLY: ENABLED
IF: EQN: x=PZMO(l) IS GREATER THAN Value: 5.0
THEN: Play WAV Sound

Below the text stats a thermometer and long-term trend graph are visible. The thermometer is set to reveal theta in Brodman 22 Left in microvolts. In this cast a threshold is set at 50 microvolts and when the client can drop the theta below this level a tone will sound. Tracking of the theta over and threshold in a ten-second interval is viewed on the graph. The event script for these two functions is below.

Summary for Event 7: (This controls the region of interest thermometer, tones and graph)
EVENT 7 IS CURRENTLY: ENABLED
IF: EQN: x= LoretaROI(58,2); IS LESS THAN EQN: x= TTHR;
THEN: Play MIDI Sound MODE: 2 NOTE: 44 INST: 14 Tubular bell
STYLE: Sustained MODULATION: Ampl. and Pitch LOWNESS: Level: 126
LOUDNESS CHANGE RATE: 3 PITCH CHANGE RATE: 1
KEY: A MODE: Chromatic CHORD: 1 Note

In conclusion, this child came in with a diagnosis of ADD, Inattentive Type. He had a reading interest and Z-score training the client showed marked improvement in both attention and reading comprehension. The child participated in Little League. Before neurofeedback training, he was stuck out in right field, where the team would have to yell at him just to get his attention to come back to the dugout. After the sessions, he boasted about winning as a pitcher and batting in winning runs.

Throughout the training, the client’s reading interest, speed, and comprehension improved session to session. It is fortunate that our center, Providence Foundation, in Orlando, Florida, has multidisciplinary training for learning-disabled and special needs children. After neurofeedback sessions, this child participated with Megan Hunt of our center in tutoring involving the Lindamood-Bell for Reading Comprehension program. The program involves turning the read word into pictures so that they may be more easily committed to memory as a comprehension tool. She reported that at the beginning this child was unable to picture words that he had read let alone commit them to memory. As an entering fifth-grader, he was comprehending at a pre-K level. Again, what Megan described more fit a description of Wernicke’s Aphasia, a dysregulation pattern found in Brodmann Area 22 Left than ADD, Inattentive Type. Megan has continued working with this child and now has him reading and comprehending at nearly a third-grade level prior to the beginning of the school year.

Inattentive Type. Megan has continued working with this child and now has him reading and comprehending at nearly a third-grade level prior to the beginning of the school year. A real bonus is that the child’s self-esteem has grown. He feels really good about himself and is proud that he is overcoming his problems.

In conclusion, this child came in with a diagnosis of ADD, Inattentive Type. If treated using conventional neurofeedback related to this diagnosis, much time and money may have been wasted without complete remediation of the problem. With the aid of ANI Neuroguide pinpointing the Region of Interest relating to the symptoms and complaints, and using BrainMaster Avatar to train this child with web-based tools that are effective, accurate, and efficient, he has made significant progress.

I would like to thank Penijean Rutter and Robert Malicia of BrainMaster for their help and collaboration.
Who Is BCIA Really?

Fred Shaffer, PhD, BCB, BCIA Chair and Judy Crawford, BCIA Director of Certification

What Is BCIA’s Role?

BCIA serves as the certification body for the clinical practice of Biofeedback, Neurofeedback, and Biofeedback specifically for Pelvic Muscle Dysfunction. BCIA serves as the standard-bearer for our field. Our mission statement is quite simple: “BCIA certifies individuals who meet education and training standards in biofeedback and progressively recertifies those who advance their knowledge through continuing education.” It is apparent from this mission statement that education and training should be our main focus—and it is. Where does that start?

It all starts with the blueprints of knowledge. Any good architect or builder starts with a plan. The strength and integrity of the plan is what determines the quality of the finished product. BCIA’s Board of Directors has spent countless hours reviewing the science and the literature to ensure that our blueprints carefully outline the fundamental science, history, and theory of the modalities and thus sets a template for what every beginning clinician needs to know. As the science and clinical efficacy literature have evolved, we have revised the blueprints to keep pace and to truly represent current best practice.

Many people are surprised when they read these documents to see that something they like to use may be missing. While there are many new clinical modalities and promising treatment protocols, BCIA cannot add them to our blueprints until their efficacy has been scientifically established. We recommend that you read LaQua and colleagues’ (2002) informative “Template for developing guidelines for the evaluation of the clinical efficacy of psychophysiological evaluations.” Additionally, our blueprints must be free of commercial bias and must stay true to the currently accepted fundamental science. BCIA recognizes that in science there are often competing perspectives. To ensure that our certificants develop a comprehensive understanding of our field, our blueprints cover all viewpoints that have been supported by scientific research. We will never tie our blueprints to a specific theory, however popular. Our goal is to have each professional learn the same fundamentals. Once beginners can understand that science, the same science as others who are certified, they are better able to review the field and make a good decision about different theories or equipment choices.

Medical school education is based on a similar structure of taking a prescribed curriculum, so that both top- and bottom-ranked schools will offer the same courses. This pattern of study defines a field and ensures that consumers are not treated by a medical doctor who did not learn the fundamentals of biochemistry and just skipped over pharmacology since it was too hard to get into that course.

Our field is no different. If we want equal respect and acceptance, these fundamental educational standards are very important. Many new people wander into the field not sure exactly what biofeedback is and how it can be added to their practice. Then, they find www.bcia.org. At least they will find an outline of basic science and not an untested theory linked to the latest fad or information full of commercial bias. This will help lead them to an informed choice.

The universities and BCIA-accredited didactic training providers who teach to our blueprint train thousands of professionals each year. Unfortunately, a very small percentage of those people complete their certification. At first glance, this seems very disheartening. Compare those figures with all the millions of college freshman who entered their first year with no firm career goals, no real idea about which courses would suit their aptitude, not enough maturity to complete these courses, and poor information about employment opportunities. Our students take the didactic training course without realizing the depth and the amount of science they will need to master and how difficult it can be for many of them to become proficient with the technology. Just as with a huge percentage of college freshmen who want to enter our field may also wash out. Isn’t that just a part of the educational process?

There is no easy way to introduce a person to our field. Most of us have learned what it means to be a dentist, a lawyer, or a teacher through our exposure to these professions; however, we may not have easy access to biofeedback professionals or friends who have used and benefitted from these services. While it is natural for us to seek career advice from family and friends, this is an area where they lack helpful experience. Some students who took a beginning course learned, albeit in a very expensive manner, that right now this may not be a good career choice—and maybe biofeedback would not ever be a good fit.

What is the Importance of Setting Educational and Training Standards Internationally?

Biofeedback and neurofeedback have struggled for decades to gain their rightful place alongside other modalities in mainstream medicine. We do have the rigor of science and research on our side. We do have efficacy, and probably more than many traditional medical modalities. What could be holding us up?

Could it be that there is no standard accepted definition for biofeedback and neurofeedback? AABP and ISNR took on that task years ago, but it has not yet become the accepted standard definition used by every document that refers to biofeedback. There are thousands of definitions in textbooks, magazines, and on websites that bear no resemblance to what our membership organizations adopted. BCIA can help to support and promote those standard definitions with the hope that in the future, every fifth-grader can easily identify the term biofeedback.

Could it be that there are no universally recognized standards stating what one must learn about the science? We see great evidence of renewed interest in taking responsibility for one’s own health, both preventative and curative. Also, we see that more and more people are demanding alternatives to drug therapy and surgery, and are asking how biofeedback could improve their health and performance. While the interest is certainly there, many clients do not understand how biofeedback and neurofeedback work or which equipment achieves the industry’s highest standards and delivers expected performance.

These issues are not limited to those who live only in North America. There have been great strides and new interest in many other countries. On a daily basis we hear from people across the globe. Somehow the interest is spreading. Wouldn’t it be helpful to have universally-accepted standards of education and training? Wouldn’t it be wonderful if the people in Spain, South Africa, or South Carolina all had the same understanding of the modality and could learn from the same science? Also, if there is new research from another country, it may help all of us if we were joined together by a well-defined field.

What Other Roles Does BCIA Play?

BCIA serves as the standard-bearer for education. What other contributions does BCIA make to our field? BCIA has helped to identify what a person should know to be effective, outside of the blueprint. If a person wants to enter the field, BCIA has stated that one
should have a working knowledge of human anatomy/physiology or neuroanatomy. This is the science that binds the mind and body together.

Most health care education is based on the study of the science as well as residencies where one learns the hands-on application. BCIA has also defined the fundamentals for clinical training. We hear all the time how expensive mentoring may be for a person or that there are no other providers in their area so they can’t certify. Because it is too expensive or difficult, then is it acceptable to launch a career without this hands-on training? Do you want to go to a counselor or a nurse who had never completed practical skills training? No, we don’t either!

While new uses for the modality are growing, most especially in the fields of optimal and peak performance, BCIA has previously been concerned mostly with the clinical work of treating a medical or psychological disorder. To that end, we have looked at the research and efficacy studies and determined that to treat these disorders, one should have background in specific fields. BCIA has outlined the prerequisite education necessary to treat disease and disorders. We have gone one step further by our endorsement of requiring a state-issued license/credential to independently treat a medical or psychological disorder. That doesn’t mean we don’t certify people without licensure, but we define how they should legally work within state law that governs the treatment of disease and disorder. BCIA wants to endorse work within legal boundaries of health care practice and not against it. While there may be some gray area, we know that this is an important distinction that we hope will lead to continued respect and acceptance alongside of traditional medical and psychological interventions.

Is BCIA certification mandatory? If not, why not?

No. Sadly, BCIA certification, as with most other certifications, is not mandatory. Certification is a voluntary process by which individuals are evaluated against predetermined standards for knowledge, skills, or competencies. There are no degree-granting programs from regionally-accredited academic institutions that include biofeedback or neurofeedback as a mandated requirement, so BCIA has set those standards. Most state licensing laws include language that requires professionals to restrict practice to their area of expertise. It has long been our hope that once biofeedback becomes an accepted part of traditional medicine, that the various licensing boards would look at BCIA to help them decide how to make those determinations.

APA has pronounced biofeedback a proficiency and has yet to determine what psychologists need to work within their area of expertise. This is a huge collaborative project and we hope to see movement in the future.

Who BCIA is not!

BCIA is not the certification police. We cannot regulate a person’s clinical nor business practices. What we can do is to help direct clients to think about an issue in a more helpful way: Is this really a Better Business Bureau issue or is this really something dangerous that should be referred to the state authorities who regulate health care? We can also help to educate our certificants in order to guide them toward best business practices that will stand up well in comparison to other health care services.

BCIA does not function as a state licensing or credentialing board. One may certainly legally practice, in most cases, without
Research Foundation Update

Congratulations to the 2012 Mini-Grant Recipients:

Jeffrey La Marca (UC Riverside) and Alycia Roberts (USC)

Read more about their projects at http://www.isnr-researchfoundation.org.

ISNR Research Foundation 2012 Online and Silent Auction a Huge Success!

Thank you to everyone who donated items:


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Thank you to the authors: Cory Hammond and Jay Gunkelman

• Doing Neurofeedback: An Introduction
Thank you to the authors: Richard Soutar and Robert Longo

• The Other Side of the Desk: A Story About a Chronic Pain Specialist Who Became a Chronic Pain Patient & His Advice for Chronic Pain Sufferers, by Dr. Stuart Donaldson

Reference

certification. It is not our job to investigate complaints related to scope of practice or other professional issues. While we may receive complaints, we do not have the legal authority nor do we have the resources to investigate in a manner that would provide an appropriate outcome. What we can do is to set standards and to serve as a resource to these boards should they seek our advice.

BCIA is not a referral source for equipment. Our guidelines discuss the fundamental science and how to apply it that should be relatable to any standard FDA-approved device. We can tell potential clients that our BCIA-accredited training providers are often also equipment vendors and that they may wish to consult with them to learn more about how to make a purchase decision.

BCIA certification is not a vaccination. Just as we like to think that professionals educated from an Ivy League school may be better clinicians, we know that there is no way to ensure levels of competency. We can set standards so that clients or other professionals can easily determine how a person worked to learn what is necessary to add this modality to their tool kit.

BCIA gladly takes on setting educational and training standards in the hopes that this will continue to support the acceptance and spread of legitimate biofeedback and neurofeedback services so that the professionals who carry our logo will continue to be respected as “more than qualified—BCIA certified.”
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A Big Thank You!
- Mind Media 20 years and Stens 40 years -

We want to thank all our world-wide customers who have made it possible for us to grow our business, improve our products and excel in customer service and support. We are proud to be serving you and help advancing the exciting fields of Psychophysiology and Bio- & Neurofeedback.

Mind Media
Founded 1992 in Europe, Mind Media B.V. has grown from a pioneer in the fields of physiological feedback technology to a world-leading company with resellers in over 50 countries. The breakthrough product, our wireless NeXus line and BioTrace+ software, proved to be the perfect match for thousands of researchers, clinicians and therapists world-wide. We believe that people can learn to improve their health and performance with the help of smart technology. This is what drives us and will continue to inspire our entire team for the years to come. (Erwin Hartsuiker, CEO)

Stens Corporation
Stephen Stern, the President of Stens Corporation, (USA) has been involved in biofeedback training and product development since 1972. Now recognized nationally as the leader in biofeedback training and the distribution of all major lines of biofeedback instruments and software, Stens Corporation continues to provide innovative and cutting-edge products and unique, hands-on training to practitioners throughout the United States. Well over 12,000 individuals have graduated from Stens Professional Certificate Program, contributing to its leadership in the biofeedback field.

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