



# Scientific Presentations

## Abstracts

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**ISNR RESEARCH PRESENTATION -  
Effect of Neurofeedback Training on the Neural Bases of Cognitive Deficits  
in Children with Attention-Deficit/Hyperactivity Disorder:  
Functional Magnetic Resonance Imaging (fMRI) Studies (R)**

**Mario Beauregard, PhD**

*Université de Montréal, Montréal, Quebec, Canada  
mario.beauregard@umontreal.ca*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: 1**

**Abstract:**

**Introduction**

These fMRI studies were undertaken to measure the effect of neurofeedback training (NFT) on the neural bases of cognitive deficits in AD/HD children.

**Methods**

Twenty unmedicated AD/HD children participated to the study. Fifteen children were randomly assigned to the experimental (EXP) group, whereas the other five children were randomly assigned to the control (CON) group. Only subjects in the EXP group underwent NFT. EXP subjects were trained to enhance the amplitude of the SMR (12-15 Hz) and beta 1 activity (15-18 Hz), and decrease the amplitude of theta activity (4-7 Hz). Subjects from both groups were scanned one week before the beginning of NFT (Time 1) and one week after the end of NFT (Time 2) while they performed a Counting Stroop task and a Go/NoGo task.

**Results**

At Time 1, for both groups the Counting Stroop task was associated with significant activation in the left superior parietal lobule (SPL). No activation was noted in the anterior cingulate cortex (ACC). For the Go/NoGo task, in both groups, there was no significant activity in the prefrontal cortex (PFC) and striatum at Time 1. At Time 2, for both groups the Counting Stroop task was still associated with significant activation of the left SPL. This time, however, there was a significant activation of the right ACC, left caudate, and left substantia nigra in the EXP group. No such activation was seen in CON subjects. For the Go/NoGo task, significant loci of activation were noted, in the EXP group, in the lateral PFC, bilaterally, as well the left caudate nucleus, left thalamus, left substantia nigra, and right ACC. No significant activation of these brain regions was measured in CON subjects.

**Discussion**

These results suggest that NFT has the capacity to functionally normalize the brain systems mediating attention and response inhibition in AD/HD children. Given the pivotal role played by dopamine in these executive functions, we hypothesize that NFT modulates dopaminergic neurotransmission in fronto-striatal circuits.

**Learning Objective:**

The participant will be able to: Discuss the impact of neurofeedback training on the brain regions and circuits underlying cognitive deficits in AD/HD

**Agenda:**

- Theoretical background about cognitive deficits in AD/HD (10 min)
- Presentation of our research findings (35 min)
- Discussion of our research findings and brief presentation of our new research project (15 min)

**Breaking the Silence: Brain-Computer-Interfaces in Paralysis (R & CA)**

**Niels Birbaumer, PhD**

*Full Professor of Medical Psychology and Behavioral Neurobiology,  
University of Tuebingen, Germany; University of Trento, Italy;  
Niels.Birbaumer@uni-tuebingen.de*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: 1.00**

**Abstract:**

Brain-Computer Interfaces (BCI) using neuro electric activity from the brain provide signals for external devices such as computers, wheel chairs, and prostheses. Here invasive and non-invasive BCIs using slow cortical brain potentials, mu (SMR) rhythm and high frequency gamma oscillations are presented. The "Thought Translation Device" trains completely paralyzed patients with Amyotrophic Lateral Sclerosis (ALS) to regulate their slow cortical potentials (SCP) with neurofeedback. After achieving 75% control patients can select letters or words. Locked-in patients continue to communicate with this system.

Data on quality of life and ethical considerations on doctor-assisted suicide are discussed. An invasive system using subdural implantation of macroelectrodes and Support Vector Machine- ECoG-Classification allows verbal communication with brain activity in very short time periods. A new system for rehabilitation in chronic stroke connects an artificial hand affixed to the paralyzed hand with the lesioned motor area: patients move the paralyzed hand with motor imagery and changes in SMR-rhythm.

**Learning Objective:**

The participant will be able to discuss Brain-Computer-Interface use and combine it with existing neurofeedback.

**Agenda:**

- Thought Translation device - 20 min
- Data and rehabilitation results for ALS patients using brain-computer interfaces - 20 min
- Quality of life and ethical considerations about doctor-assisted suicide - 20 min

## **S.T.A.R. Training: True, Real-Time Interpersonal Neurofeedback Training in a Group Setting (CE)**

**Valdeane W. Brown, PhD**

*Zengar Institute Victoria, BC, Canada*

*val@zengar.com*

**Abstract:**

S.T.A.R. Training is a group-based neurofeedback training environment specifically oriented to facilitating spiritual transformation and renormalization (S.T.A.R.). It integrates the use of concurrent, parallel neurofeedback training, as well as a completely unique cross-person training approach in which individuals are cross connected to shared neurofeedback equipment. Participants are arranged like the rays of a star, with their heads at the center of a circle while their feet point outwards. Multiple NeuroCARE Pro® installations are used - one per participant - and concurrent training is done using standard CARE® procedures as a "warm up." In the next phase, each training system is placed BETWEEN participants so that the A channel of a system is connected to the left hemisphere of one person, while the B channel of the same system is cross connected: to the right hemisphere of the next participant. This pattern of connection is repeated across all participants. In this way two people are connected to each training system and each person is functionally cross connected with at least one other person if only a couple is trained, or two other people if three or more participate. Data and experiences from this unique training environment will be presented.

## **ZenX Modes and Autonavagation: Self-Correcting Neurofeedback for the Home and Office Using NeuroCARE Pro® (CE)**

**Valdeane W. Brown, PhD**

*Zengar Institute Victoria, BC, Canada*

*val@zengar.com*

**Abstract:**

NeuroCARE Pro® has deployed increasingly more comprehensive and adaptive targeting approaches. Currently it is the only true two-channel, 16 target training system using real-time Gabor-based transforms to process EEG. From the beginning this training approach has been diagnostically agnostic as well as blind to symptom and condition. This has meant that a single comprehensive, adaptive approach to targeting can be - and has been - used across all settings in which neurofeedback has been utilized before. But it has also meant that trainers needed to continually adjust the width of each target in order to maximize the training response.

ZenX modes are pre-packaged combinations of targeting parameters that allow for a programmed sequence of training in which only a single difficult factor needs to be modified by the trainer. With these foundational tools in place, an additional layer of optional automation offers a truly revolutionary option - true real-time neurofeedback that is completely self-correcting. We call this process Autonavagation. This presentation will explore the use of these new tools.

## **Neurofeedback and Expressive Writing (R)**

**Dmitry Burshteyn, PhD**

*Siena College, Loudonville, NY  
dburshteyn@siena.edu*

### **Abstract:**

#### **Introduction**

The purpose of this study was to investigate the effects of alpha-increase neurofeedback training on emotional disclosure and health outcomes.

#### **Method**

Twenty participants were randomly assigned to each of two matched groups, one involved expressive writing (EW) only, the other include expressive writing as well as biofeedback (B+EW).

#### **Results**

The effect of Group  $\times$  Pre/Post interaction on systolic blood pressure was statistically significant, with  $F(1,18) = 5.96$  and  $p < .025$ . The simple effect for the B+EW group yielded an  $F(1,9) = 13.75$ ,  $p < .005$ , indicating a statistically significant decrease in systolic blood pressure for the B+EW group. No significant changes were observed in EW group. Our alpha increase training enabled all of our B+EW participants to successfully raise their alpha amplitudes as compared to the baseline. Among the ten B + EW participants, eight were able to raise their alpha amplitude by 15% from their baseline levels.

#### **Conclusion**

The results of our study seem to be promising, even though some theoretical and methodological issues need to be addressed. Among them, one question we would like to discuss is whether EEG biofeedback facilitates expressive writing? Our content analysis yielded slightly significance results for one out of three major categories; nevertheless, it should not be taken lightly considering the small size of our sample. Considering that the present study is exploratory in nature, the compromise of statistical power contributed by small sample size is understandable.

## **KEYNOTE PRESENTATION -**

### **Electrophysiological Models of Attention-Deficit/Hyperactivity Disorder: How Accurate is our Current Understanding of These Dysfunctions? (R)**

**Adam R. Clarke, PhD, Robert J. Barry, DSc, Rory McCarthy, FRACP,  
and Mark Selikowitz, FRACP**

*University of Wollongong, Department of Psychology, Wollongong NSW, Australia  
aclarke@uow.edu.au*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: 1**

### **Abstract:**

#### **Introduction**

Attention deficit hyperactivity disorder (ADHD) is one of the most common disorders of childhood, yet the causes of the disorder are not fully understood. Children with ADHD have been found to have consistent differences in their EEG compared to children without the disorder. These EEG differences typically include increased delta and theta activity, with decreased alpha and beta. However, other profiles such as increased beta activity are found in a small group of children. These results have been interpreted as representing several different underlying dysfunctions, including cortical hypo- and hyper-arousal, or a maturational lag of the central nervous system. However, the validity of the models has not been fully tested.

## Methods

Over the past ten years our group has collected data from children with and without ADHD. Children with ADHD have been medication naive patients at a pediatric practice. Children without ADHD have been drawn from schools and community groups in the local area. All subjects were tested using an eyes closed resting EEG.

## Results

From this work, a number of studies have been conducted in which each of the hypo- and hyper-arousal, and maturational lag models of ADHD have been explored. There appears to be little support for the hyperaroused model of ADHD, with many results indicated that these children have a similar dysfunction to those with excess theta activity. Results for the hypoaroused model are mixed as are those for the maturational lag model of ADHD.

## Discussion

These results have important implications for our understanding of this disorder, and for the development of treatment protocols. This will be discussed in this presentation.

## Learning Objective:

The participant will be able to: Interpret EEG data from children with ADHD.

## Agenda:

- Introduction to models of ADHD - 15 minutes
- Research on arousal abnormalities in ADHD - 25 minutes
- The maturational lag model of ADHD - 10 minutes

# Assessment-Guided Neurofeedback for Autistic Spectrum Disorder (R & CA)

Robert Coben, PhD

*Private Practice Massapequa Park, NY  
robcohen@optonline.net*

## Abstract:

### Introduction

The Center for Disease Control has estimated that between 1 in 500 (2/1,000) to 1 in 166 children (6/1,000) have Autism and Autistic Spectrum Disorder (Boyle et al., 1994). Jarusiewicz (2002) has published the only study documenting effectiveness for neurofeedback of autistic disorders, but included only 12 children in the experimental and control groups and was based on the use of only one assessment instrument. The present study seeks to extend these findings with a larger sample size and a wider assessment of outcome.

### Method

Twenty-five patients diagnosed with Autism or Autistic Spectrum Disorder underwent assessment-guided neurofeedback training. Each patient received approximately 20 sessions of training. Each patient received pre and post-treatment Neuropsychological, Neurobehavioral/Rating Scale, Infrared Imaging and QEEG assessments. A control group of 12 Autistic patients that did not receive neurofeedback were available for comparison on at least one rating scale measurement.

### Results

Findings were positive in showing that the patients changed significantly with improved neuropsychological test results and reduced autistic symptoms. There were also significant and therapeutic changes in measures of brain functioning. Our clinical group of autistic patients improved significantly. There was a 90% success rate over the course of the study. There was clearly a significant ( $p < .01$ ) difference on Autism Treatment Evaluation Checklist and Gilliam Aspergers Disorder Scale scores compared to a no treatment control group.

We then calculated a benefit : harm ratio as per the Autism Research Institute and compared the impact of the neurofeedback to that of medication, biomedical and speech therapy intervention. This ratio for NF was 90 which make it the most effective form of intervention for autistic problems compared to those listed above.

Further, there were statistically significant ( $p < .05$ ) improvement on neuropsychological tests related to attention and executive functions. There were also significant ( $p < .01$ ) improvements on behavioral rating scales related to socialization, emotional control, cognitive deficits, pragmatics, and behavioral problems.

Neurophysiological measures of change also showed promising results. There were significant ( $p < .05$ ) changes on Infrared Imaging reflective of greater metabolic flow to frontal cortices. There were also significant ( $p < .01$ ) QEEG changes in a therapeutic direction with movement towards normalization in relative power and connectivity analyses.

## Conclusion

These results suggest that neurofeedback is an effective form of intervention in cases of Autistic Spectrum Disorder. Changes in cognitive skills and behavioral ratings corresponded to changes in measures of brain functions. These findings will be discussed with regard to diagnosis, treatment formulation and outcome measurements.

## References

- Boyle, C. A., Decoufle, P. & Yeargin-Allsop, M. (1994). Prevalence and health impact of developmental disabilities in U.S. children. *Pediatrics*, 93, 399-403.
- Jarusiewicz, B. (2002). Efficacy of neurofeedback for children in the autistic spectrum: A pilot study. *Journal of Neurotherapy*, 6(4), 39-49.

# Passive Infrared Hemoencephalography for Traumatic Brain Injury

Robert Coben, PhD

*Private Practice Massapequa Park, NY  
robcohen@optonline.net*

## Abstract:

### Introduction

Approximately 1.4 million people suffer traumatic brain injury (TBI) annually in the US alone (CDC, 2004). EEG biofeedback has been shown to help this population (Schoenberger et al., 2001). Hemoencephalography has been presented as an alternate form of neurofeedback with promise. Carmen (2004) has shown passive infrared HEG to be effective in the treatment of migraine headaches. This study investigated the effects of pirHEG in treating TBI-related cognitive/neurobehavioral changes and post-traumatic headaches.

### Method

Twenty-five patients diagnosed with TBI received approximately 20 sessions of pirHEG over Fpz. Each patient received pre- and post-treatment neuropsychological, neurobehavioral, headache monitoring, infrared imaging and QEEG assessments. A control group of seven persons undergoing occipital nerve stimulation for TBI was available for comparison.

### Results

Findings showed significant improvement in 90% of our population. Improvements were noted in headaches, neuropsychological and neurobehavioral functioning, infrared imaging and QEEG connectivity measures. Comparison of infrared imaging with an alternate treatment group showed greater impact of pirHEG on frontal system functioning.

In addition to a 90% success rate, there were significant reductions in headache intensity ( $p < .01$ ), frequency ( $p < .01$ ) and duration ( $p < .01$ ). Significant pre-post improvements were noted on tests of attention ( $p < .02$ ), memory ( $p < .01$ ), and executive functions ( $p < .02$ ). Neurobehavioral measures showed significant gains for energy ( $p < .05$ ), emotional control ( $p < .05$ ), executive skills ( $p < .05$ ).

Neurophysiological measures showed improvements as well. Pre-post infrared imaging showed a significant ( $p < .05$ ) reduction in variability across the frontal cortex. QEEG measures showed significant improvement in global connectivity ( $p < .05$ ).

There was a significant correlation ( $r = .70$ ) between infrared and connectivity changes suggesting that these variables may be related in some way.

### Conclusion

These findings suggest that many of the problems associated with TBI can be successfully treated with pirHEG. This study has shown in a moderately large group of patients that neurofeedback, specifically pirHEG, can be effective in treating the multiple effects of TBI.

### References

- Carmen, J. A. (2004). Passive infrared hemoencephalography: Four years and 100 migraines. *Journal of Neurotherapy*, 8(3), 23-51.
- Centers for Disease Control (2004). Traumatic Brain Injury in the United States: Emergency Department Visits, Hospitalizations, and Deaths.
- Schoenberger, N. E., Shif, S. C., Esty, M. L., Ochs, L., & Matheis, R. J. (2001). Flevyx neurotherapy system in the treatment of traumatic brain injury: An initial evaluation. *Journal of Head Trauma Rehabilitation*, 16(3), 260-274.

## **QEEG Findings in Autistic Disorders: Absolute, Relative Power and Coherence Measures (R)**

**Robert Coben, PhD (1), Bill Hudspeth, PhD (2),  
Adam Clarke, PhD and Robert Barry, DSc (3)**

*(1) Private Practice, Massapequa Park, NY; (2) Neuropsychometric Laboratory, Los Osos, CA;  
(3) University of Wollongong, Wollongong, Australia  
robcoben@optonline.net*

### **Abstract:**

#### **Introduction**

Thompson and Thompson (2003) have examined the EEG of Asperger's and Linden (2004) examined the QEEG data of autistic disorders. In addition to regional QEEG anomalies, there is reason to believe that persons diagnosed with autistic disorders may have coherence deficits (Courchesne, 2004; Chung et al., 2004).

#### **Method**

We have collected QEEG data on 30 patients with autistic disorders. In part one of this study we have averaged this data and compared it to normative standards across QEEG databases. In part two of this project we have compared our patient group to an age-matched sample of normal controls in terms of multiple metrics of coherence.

#### **Results**

Findings will be presented regarding deviation from normal in terms of absolute and relative power across EEG frequency ranges. There will be an emphasis on the EEG frequencies and brain regions most impacted in autistic disorders. We will also present deviations as compared to a normal control group in terms of coherence anomalies.

#### **Conclusion**

While patients with autistic disorders present with heterogeneous symptoms, it appears as though brain regions impacted are similarly. There is also evidence of significant hypocohereance as compared to a normal control group. Findings will be discussed in terms of their implication for diagnosis and treatment planning.

#### **References**

- Courchesne, E. (2004). Brain development in autism: Early overgrowth followed by premature arrest of growth. *Mental Retardation Developmental Disability Research Review*, 10 (2), 106-111.
- Chung, M. K., Dalton, K. M., Alexander, A. L., & Davidson, R. J. (2004). Less white matter concentration in autism: 2D voxel-based morphometry. *Neuroimage*, 23 (1), 242-251.
- Linden, M. (2004, August). Case studies of QEEG mapping & neurofeedback with autism. Presented at the 12th Annual ISNR Conference. Ft. Lauderdale, FL..
- Thompson, L. & Thompson, M. (2003, September). Asperger's and ADD differences and similarities: Preliminary observations. Presented at the 11th Annual ISNR Conference, Houston, TX.

## **Differential Training of Synchronous EEG Activity using Channel Recombination and Joint Time-Frequency Analysis (R & CA)**

**Thomas F. Collura, PhD**

*BrainMaster Technologies, Inc. Oakwood Village, OH  
tomc1@pantek.com*

### **Abstract:**

#### **Introduction**

A method is introduced that provides specific training for synchronous EEG events, based upon a simple, yet powerful signal processing model. This method reveals activity of the type reported by Freeman et al. (2003), Schack et al. (2002), Von Stein and Sarnthein (2000), and Lutz et al. (2004).

#### **Method**

Channel recombination (addition and subtraction) is used to differentially emphasize both synchronous, and asynchronous, EEG activity in different derived signals. This method combines the benefits of differential training with those of synchrony training (Fehmi & Sundor, 1989). Joint Time-Frequency Analysis provides a

further method for distinguishing detected events in both time and frequency.

### **Results**

It is possible to visualize a single brief transient in any band of interest, including gamma, using this method. Data will be shown illustrating the phase and frequency selectivity of this method, and quantifying its ability to discern synchronous vs. asynchronous activity.

### **Conclusion**

This approach is useful for assessment and visualization, as well as for training EEG rhythms. It is immediately applicable for real-time processing, and can be implemented on a wide range of systems. Results will be presented illustrating the ability to graphically depict rare and brief EEG transients, as well as the ability to train such rhythms for neurofeedback applications.

### **References**

- Fehmi, L. L., & Sundor, A. (1989) The effects of electrode placement upon EEG biofeedback training: The monopolar-bipolar controversy. *International Journal of Psychosomatics* 36(1-4): 23-33.
- Freeman, W. J., Burke, B. C. & Holmes, M. D. (2003). A periodic phase resetting in scalp EEG of beta-gamma oscillations by state transitions at alpha-theta rates. *Human Brain Mapping*, 19 (4), 248-272.
- Lutz, L.L. Greischar, N.B. Rawlings, M. Ricard, & Davidson, R. J. (2004) Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *Proceedings of the National Academy of Sciences*, 101 (46), 16369-16373.
- Schack, B., Vath, N., Hetsche, H., Geissler, H. G. & Moller, E. (2002). Phase-coupling of theta-gamma EEG rhythms during short-term memory processing. *Int. Journal of Psychophysiology*, 44 (2), 143-163.
- Von Stein, A. & Sarnthein, J. (2000) Different frequencies for different scales of cortical integration: From local gamma to long range alpha/theta synchronization. *International Journal of Psychophysiology*, 38 (3) 301-313..

## **Generating Wisdom and Compassion: QEEG and LORETA Findings (R & CA)**

**John W. DeLuca, PhD**

*Fearless Heart® and Colorado Center for Biobehavioral Health, Boulder, CO*  
*johndeluca@fearlessheart.com*

### **Abstract:**

#### **Introduction**

According to the Dalai Lama, we all share a common wish to find happiness. However, happiness is not found in the accumulation of possessions such as the latest hi-tech gadget or Prada handbag. Rather, true transformation comes from within. Fueled by our determination, the essence of transformation lies in our ability to see with a clearer vision (i.e., wisdom) and to live with an open heart (i.e., compassion). These Three Principles of the Path were taught by the great scholar/yogi, Tsong Khapa. Employing various practices including meditation, we purify and transform our afflictive emotions while increasing merit (e.g., generosity, gratitude). In this presentation, we examine QEEG differences in wisdom versus compassion meditation.

#### **Method**

We compare EEG activity in a Tibetan Buddhist monk during two forms of meditation: analytical meditation on wisdom and generating feelings of compassion. A Lexicor NeuroSearch24 was used for recording and NeuroGuide, LORETA-Key, EureKa3!, and MHyT3! software for analysis.

#### **Results**

Wisdom meditation involved increased activity in the superior, middle and inferior temporal areas, bilaterally. Compassion meditation involved increased activity in right orbital frontal, insula and medial frontal regions. Consistent with recent reports by Davidson's group (Lutz, et al., 2005), compassion meditation also evidenced increased left hemisphere beta coherence.

#### **Conclusion**

Different meditative practices produce unique mind states and patterns of brain functioning. Wisdom meditation activated areas consistent with insight into verbal problems, conceptual perspective taking, mental imagery in deductive reasoning among others. Compassion meditation activated areas associated with sense of self, flexibility, empathy among others. Implications for neurofeedback training are considered.

#### **Reference**

- Lutz, A., et al. (2005). Long-term meditators self-induce high amplitude gamma synchrony during mental practice. *Proceedings National Academy of Sciences*, 101 (46), 16369-16373

# The Iowa Gambling Task and the Right Orbital Frontal Lobe (R & CA)

John W. DeLuca, PhD

Colorado Center for Biobehavioral Health Boulder, CO  
johndeluca@fearlessheart.com

## Abstract:

### Introduction

Measuring pre-frontal lobe activity is an important although generally overlooked process in diagnostic assessments. In the past, most neuropsychological assessment batteries have been content with using the Halstead Category Test or Wisconsin Card Sorting test to measure « higher order functioning. » In fact, some have even used the latter two measures interchangeably despite the fact that they measure quite different functions. This presentation provides a brief overview of the dimensions and measures of executive and frontal lobe brain activity. More specifically, our focus will be on the utility of the Iowa Gambling Task (IGT; Bechara, Damasio, & Damasio, 2000) and its unique sensitivity to right orbital frontal lobe dysfunction.

### Method/Results

In addition to a task analysis of the IGT, we review the many neuroimaging studies using the IGT as an activation probe. We also discuss the numerous patient groups demonstrating difficulty on this task as well as present a sample case study review using the IGT.

### Discussion

The IGT has great utility in general clinical neuropsychological assessment as well as demonstrated usefulness as an activation probe in neuroimaging studies, including QEEG. The IGT is particularly useful in the assessment of individuals with head trauma, attachment disorders, and borderline personality disorders among others.

### References

- Bechara, A. (2004). The role of emotion in decision-making: Evidence from neurological patients with orbitofrontal damage. *Brain and Cognition*, 55, 30-40.
- Bechara, A., Damasio, H., & Damasio, A. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex*, 10, 295-307.
- Tranel, D., Bechara, A., & Denburg, N. (2002). Asymmetric functional roles of right and left ventromedial prefrontal cortices in social conduct, decision-making, and emotional processing. *Cortex*, 38, 589-612.

# Neurofeedback: A Relational Technology (CE)

Sebern F. Fisher, MA

Private Practice, EEG Spectrum International, Northampton, MA  
sebern.fisher@verizon.net

## Abstract:

Neurofeedback can improve brain function in many arenas, but most importantly in the arena of affect regulation. There is increasing consensus that affect regulation is the core issue in all psychopathology and in effective psychotherapy. Neurofeedback can (and should) promote affect regulation and, in this, enhances the capacity for relatedness. More than any other single affect, fear corrodes the capacity for relatedness. Neurofeedback can effectively quiet fear.

The practitioner is encouraged to assess for early maternal-infant attachment disruptions and/or childhood trauma because both can contribute to high baseline states of fear and diminished capacity for trust, empathy and love. The practitioner is also encouraged not to abandon his/her role as a psychotherapist. Psychotherapy provides the relationship in which the patient can dare to experience new feeling states and the new sense of self that often accompanies neurofeedback training. The therapist helps the patient to discern the changes, to validate them and to embrace the new sense of identity as it emerges.

# Neurofeedback and the Origin of Self: Low Frequency Temporal, Frontal and Pre-Frontal Training in a Man with Anti-Social Personality (R & CA)

Sebern F. Fisher, MA

*Private Practice, EEG Spectrum International, Northampton, MA  
sebern.fisher@verison.net*

## Abstract

### Introduction

In his ground breaking work, Allan Schore finds that the right orbital frontal cortex is responsible for affect regulation, most importantly the regulation of fear, through the inhibition of the amygdala, and further, that sense of self and other can emerge only when affect is regulated. He demonstrates that the right orbital frontal cortex (ROC) is the most plastic area of the brain throughout the life span. This single case study of a 55 year-old man who reported living in a constant state of fear and rage suggests the saliency of Schores' theory and the efficacy of neurofeedback in appealing to the brains plastic capacity for affect regulation.

### Method

Neurofeedback training two to four times weekly at the following sites: T4-P4, T6-A2, F4-A2, FZ-A2, FP1-FP2, T6-F4 and FPO2-A2. Reward frequency was lowered and placements changed, as manifestations of fearfulness and rage required. The subject has trained for 81 sessions and, presently trains at T6-F4, FZ, FP1-FP2 and FPO2 at 0-8 Hz and 22-36 Hz inhibits, 0-3 Hz reward. Progress was tracked by clinical interview and SCL-90.

### Results

Subject reports no baseline fear, and experiences no rage. He describes a robust development of sense of self, particularly within relationship to the practitioner. In pre-testing, over two-thirds of his responses to the SCL-90 were « extreme » and in testing after 81 sessions, all responses were « not at all. »

### Conclusions

This case suggests several avenues for research. The first is the efficacy of frontal and pre-frontal training in fear based disorders. The second is the successful use of 0-3 Hz reward. Allan Schore calls ROC the greater amygdaloid region and concludes that it retains exceptional plasticity through the life span. This case appears to validate this view and suggests that neurofeedback may appeal to developmental regulatory mechanisms.

# Neurofeedback Combined with Floatation Restricted Environmental Stimulation Therapy Facilitate Meditative Experience (R & CA)

Dale Foster, PhD

*Memphis Integral Neurofeedback Institute, Memphis, TN  
dfoster1@MemphisNeurofeedback.com*

## Abstract:

### Introduction

This case study examines the qEEG and subjective effects of a technique in which neurofeedback (NFB) training is combined with floatation restricted environmental stimulation therapy (REST). REST and NFB training have each demonstrated positive effects on mind/body health and in this case, their combination appears to enable facilitation of meditative and unitive experiences.

### Method

In this study a single volunteer subject with no formal meditation training engaged in a 90-minute interactive floatation REST session. Before, during and after the session qEEG data were recorded and monitored and subjective experience was surveyed and monitored. NFB training and verbal guidance and communication were provided during the session. REST was provided through a ThinkTank Pathfinder FX3 floatation system. QEEG data and NFB training were provided using a Deymed 32 qEEG and NFB system with a specially modified ElectroCap interface to enable use in a floatation REST environment. Verbal interaction was maintained throughout the session via an intercom.

### Results

Pre- and post-qEEG data and subjective reports indicate the subject was able to enter into and transition through EEG and experiential states characteristic of meditative states. Measures of frequency, amplitude,

variability and connectivity all evolved in directions consistent with meditative states and generally paralleled published research regarding the EEG and experiential effects of effective meditation practice.

#### **Conclusion**

Based on this case study, combining NFB training with floatation REST may provide conditions more conducive to meditative experience than either technique alone.

#### **References**

- Barabasz, A., & Barabasz, M. (Eds.) (1993). *Clinical and experimental restricted environmental stimulation: New developments and perspectives*. New York: Springer-Verlag.
- Evans, J., & Abarbanel, A. (Eds.) (1999). *Introduction to quantitative EEG and neurofeedback*. New York: Academic Press.
- Murphy, M., & Donovan, S., (Eds.). (1983). A bibliography of meditation theory and research: 1931-1983. *J. Transpersonal Psychology*, 15, 181-228.

## **Psychophysics of EEG State Discrimination (R)**

**Jon Frederick, PhD**

*Department of Psychology, University of Minnesota, Minneapolis, MN  
smiile@umn.edu*

#### **Abstract:**

##### **Introduction**

Nearly all research on human EEG learning since the 1960s has focused on control of EEG constructs. Learning is difficult to measure in EEG control training because thresholds are constantly adjusted based on within-subject variation, and effects of training are often smaller than the baseline variation. By contrast, a direct measurement of success is intrinsic to discrimination learning. A rigorous method of measuring a subject's perceptual acuity for discriminating EEG states could provide insight about relationships between "control" and "awareness" of these states, and a practical experimental model of EEG control training. This study investigated the ability of one subject to discriminate high from low beta/theta and relative alpha amplitude states.

##### **Method**

EEG was recorded at Fz with a linked ears reference using custom software and a BrainMaster EEG. For the beta/theta task, the subject was prompted (randomly) to respond "high" or "low" when beta/theta exceeded 20 percentiles from the baseline median. For alpha, the subject was allowed to decide when to respond, alternating, when he felt a "high" or "low" alpha state was present.

##### **Results**

Success for beta/theta was insignificant, 53% over 487 trials. Success for alpha was 66% over 1168 trials ( $p < .0001$ ). The perceptual threshold for alpha discrimination appeared to be 30%, i.e., 0-40 and 70-100 percentile amplitude events were guessed correctly (63-84%,  $p < .001$ ), while events in between were guessed at chance levels. "High" alpha responses were more often correct (76%,  $p < .0001$ ) than "low" (55%,  $p < .01$ ).

##### **Discussion**

These results suggest relative alpha amplitude is discriminable and beta/theta ratios might be discriminable if subjects are allowed to decide when to respond. Future studies will assess perceptual acuity between subjects and among various EEG constructs and scalp locations.

## **Bridging the Gap Between Neurotherapy and Psychotherapy: A Clinical Report (CE)**

**David Freides, PhD**

*Psychology Department, Emory University, Atlanta, GA  
dfreide@emory.edu*

#### **Abstract:**

##### **Introduction**

Carmen (2004) described an effective neurofeedback treatment of migraine in which patients were trained to elevate infrared brain emissions from Fpz. To increase motivation, he added movie watching to the

procedure and arranged matters so that an emission threshold could be set, below which the film went on pause but above which, would resume. Observations are reported which suggest that this motivational innovation may have greater utility. By exposing the patient to thematic material in the film plot, sudden and persisting declines in infrared output may objectively signal areas of emotional conflict.

#### **Method**

While conducting neurotherapy with experienced patients who consistently elevated and sustained their infrared emission, it was observed that emissions suddenly plummeted and would not return to levels previously attained. The themes in the film-plots expressed just prior to these events were (a) relationship to father, (b) being gay, or (c) resigning from prior commitments. When the session ended, the patients were asked whether they recalled what was going on in the film when their emissions dropped.

#### **Results**

The ensuing discourse, lasting 5-10 minutes, verified that personal associations of a conflictual and distressing nature had been elicited by the film. This led to further discussion, much like occurs in psychotherapy, aimed at eliciting and resolving their conflicts.

#### **Conclusions**

- The brain responding to objective neurofeedback is the same brain that responds to stimuli associated with emotional conflict.
- Movies may introduce emotionally conflictual stimuli into the training session and disrupt brain activity.
- Such stimuli and accompanying emotions may interfere with the progress of neurotherapy but open avenues of communication relevant to psychotherapy. Doing both may be required to assure success with either form of therapy.

#### **Reference**

Carmen, J. A. (2004). Passive infrared hemoencephalography: Four years and 100 migraines. *Journal of Neurotherapy*.8, 23-51

## **INVITED PRESENTATION - A Physiologically Based Model of Mind/Brain and Consciousness: Implications Based on Timing (T, R and CA)**

**Jay Gunkelman, QEEG-Diplomate**

*Q-Metrx, Crockett, CA  
jay@q-metrx.com*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: 1**

#### **Abstract:**

A data-based model will be constructed using the modern neuroscience-based measurements such as Go-No/Go event-related potentials, CNV/Bereitschaft's potentials, bispectral analysis, and event related synchronization / desynchronization, as well as various peer reviewed observations of timing and neural network dynamics within the brain. This model will directly challenge many commonly taught concepts, such as gamma's role in binding.

#### **Learning Objective:**

Based on the content of this presentation, the participant will be able to identify synchronous gamma in event related synchronization / event related desynchronization joint time-frequency analysis displays.

#### **Agenda:**

- Event related potentials (ERP) timing, perception and awareness - 20 min.
- Memory, ERPs, alpha and theta - 20 min.
- Bispectral analysis and consciousness - 20 min.

## Improved EEG Coherence Estimates of the Effects of Ayahuasca and Related Experiences (R)

David Joffe, BA (1), Frank Echenhofer, PhD (2), Katee Wynia, MA (3),  
and Luis Eduardo Luna, PhD (4)

(1) Lexicor Medical Technology, Boulder, CO; (2) California Institute of Integral Studies, San Francisco, CA; (3) Sonoma State University, Rohnert Park, CA; (4) Swedish School of Economics, Helsinki, Finland

<fechenhofer@ciis.edu>

### ABSTRACT:

#### Introduction

This presentation reports EEG and experiential correlates of ayahuasca experiences. Ayahuasca is a hallucinogen used by Amazonian shaman to facilitate visionary experiences for healing and knowledge acquisition (Luna, 1984).

#### Method

In Brazil in January, 2005 twelve participants experienced in ayahuasca took part in a seven-hour individual EEG ayahuasca session. Nineteen EEG and two eye movement electrodes were attached using standard procedures. Dr. Luna was present at sessions to facilitate using shamanic interventions as needed.

#### Results

This study followed an earlier pilot EEG research conducted by Frank Echenhofer and David Stuckey in Brazil in July, 2000. EEG of two experienced individuals was recorded during ayahuasca experiences (Stuckey, 2004). Enhanced EEG gamma coherence from 36 to 64 Hz was observed among the majority of 19 standard EEG recording locations during eyes-closed ayahuasca compared to the eyes-closed baseline condition.

#### Conclusion

Enhanced gamma coherence during ayahuasca may indicate an enhancement of the neural processes that “bind” the elements of consciousness into one unified experience. Enhanced gamma coherence may be an EEG marker for visionary states of consciousness. The next step in this research program is to develop biofeedback protocols based upon the EEG gamma coherence patterns observed during ayahuasca experiences and then to use EEG biofeedback methods to attempt to facilitate voluntarily access to visionary experiences without the need of ayahuasca. This paper will report upon improved EEG coherence estimates occurring during ayahuasca with twelve participants.

#### References

- Luna, L. E. (1984). The healing practices of a Peruvian shaman. *Journal of Ethnopharmacology*, 11(2), 123-33.
- Stuckey, D. (2004). EEG gamma coherence and other correlates of subjective reports during ayahuasca experiences. (Doctoral dissertation, California Institute of Integral Studies, 2004). University Microfilms International.

### INVITED PRESENTATION -

## QEEG Patterns: Subgroups, Profiles, Phenotypes (T and CE)

Jack Johnstone, PhD

Q-Metrx, Inc., Los Angeles, CA  
jack@q-metrx.com

APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: .5

### Abstract:

#### Introduction

We propose development of evidence-based methods to guide clinical intervention in neurobehavioral syndromes based on categorization of individuals using both behavioral measures and quantification of the EEG (qEEG). The notion of EEG “phenotype” is presented and contrasted with the use of qEEG for behavioral diagnosis.

#### Method

This presentation is based on clinical experience and review of the literature.

## Results

Review of a large number of clinical EEG and qEEG studies suggests that it is plausible to identify a limited set of individual profiles that characterize the majority of the population. Statistical analysis has already been used to document “clusters” of qEEG features seen in populations of psychiatric patients (John, Prichep & Almas, 1992). These clusters are considered as intermediate phenotypes, based on genetics, and are reliable indices of brain function, not isomorphic with DSM categories, and with implications for therapeutic intervention.

## Discussion

We call for statistical analysis methods to be applied to a broad clinical database of individuals diagnosed with neurobehavioral disorders in order to empirically define clusters of individuals who may be responsive to specific neurophysiologically based treatment interventions, namely administration of psychoactive medication and/or EEG neurofeedback. A tentative set of qEEG profiles is proposed based on clinical observation and experience. Implication for intervention with medication and Neurofeedback for individuals with these neurophysiological profiles and specific qEEG patterns is presented (see Johnstone et al., 2005).

## References

- John, E. R., Prichep, L. S., & Almas, M. (1992). Subtyping of psychiatric patients by cluster analysis of qEEG. *Brain Topography*, 4, 321-326.
- Johnstone, J., Gunkelman, J., & Lunt, J. (2005). Clinical database development: Characterization of EEG phenotypes. *Clinical Electroencephalography and Neuroscience*, 36(2), 99-107.

## Learning Objective:

- The participant will be able to describe how EEG phenotypes can be used as a guide to clinical intervention.

## Agenda:

- Validity and reliability of qEEG measurement and the problem of using EEG for behavioral diagnosis (10 min.)
- EEG subgroups, developmental vs. acquired disorders (10 min)
- EEG phenotypes as guide to clinical intervention (10 min)

## Comodulation and Coherence: Separate but Equal Measures of EEG Synchrony (R & CA)

David A. Kaiser, PhD

*Rochester Institute of Technology Churchville, NY*  
*dakaiser@mail.rit.edu*

## Abstract:

### Introduction

Coherence and comodulation analyses assess linear signal similarities between brain areas. Coherence quantifies phase relationship and comodulation amplitude relationship between EEG signals. Each approach captures two estimates of linear similarity: coherence and phase delay, comodulation and amplitude proportion. In general, coherence assesses shared constraint between signals (e.g., a common generator) and comodulation quantifies shared autonomy, intrinsic to mental representation. Both techniques are normally performed on the same frequency band, although investigation of nested rhythms and similar energies of disparate frequencies can also be addressed.

### Method

Comodulation and coherency were compared using random numbers and empirical data. Twenty adult normals, 10 children with Asperger's syndrome, and 9 children with attentional deficit hyperactivity disorder (ADHD) were also analyzed.

### Results

As expected, no significant coherence or comodulation was found between 2000 pairs of random number epochs. Despite being orthogonal measures, coherence and comodulation revealed modest correlations with each other in this analysis, possibly due to the ideal energy distribution across a spectrum. Empirically, comodulation and coherence did correlate strongly with each other, in the  $r=.70$  range for eyes closed data. Related comodulatory measures were also analyzed, including a gross mean that may reflect cortical maturation. This measure correlated with age in ADHD children, and separated ADHD from age-matched Asperger's children, and children from adults.

## Discussion

The role of coherence and comodulation in QEEG assessment are discussed, along with practical issues in implementing training of either measure such as the length of history to use and the sampling rates of this history. Techniques to provide fluidic, moment to moment representations of comodulation and coherency are described. Finally, a clarification of spectral analysis is provided, separating frequency analysis from power transformation which was mistakenly conjoined by past investigators (e.g., Blackman & Tukey, 1958).

## Low Energy Neurofeedback System (LENS): A Study of 100 Patient Outcomes (R & CA)

Stephen Larsen, PhD (1) and Kristen Harrington, MA (2)

(1) Director, Stone Mountain Center, New Paltz, NY, (2) Clinician, Stone Mountain Center, New Paltz, NY  
*office@stonemountaincenter.com*

### Abstract:

#### Introduction

Over a period of five to seven years, Stone Mountain Center has collected data on 100 patients in a clinical outcome study of neurofeedback. Patients rated their five most significant symptoms at each session, using a 1 to 10 rating scale (0 being no discomfort, 10 being the highest discomfort). The change in symptom severity was measured by subtracting the value of the last session's score from the value of the first session's score. Changes in all five symptoms were averaged together to get one final change score.

#### Method

Presenting problems / diagnoses include: headaches, post accident traumatic brain injury or spinal injury, post traumatic stress disorder, fibromyalgia or chronic fatigue syndrome, Parkinson's disease, affective disorders including depression, bipolar disorder, anxiety disorders and Attention Deficit Disorder. Ages of the patients varied from 5 to 80 years of age. The male to female ratio was 40/60.

The hypotheses of our study are:

- Neurofeedback treatment generally, and LENS in specific, reduces the severity of CNS symptoms.
- Patients will report a reduction in the severity of their symptoms at each session, with a greater reduction of symptoms in the first ten sessions than in the second and third rounds of ten session treatments.

#### Results

The design of our study is single group, pretest/posttest. We are using t-test statistics to measure the relationship between different measures of outcome for each client: drop in severity of symptoms from first to last session, drop in frequency of symptoms from the CNS questionnaire pretest to posttest, and drop in amplitude of CZ and each patient's highest amplitude site.

For the 55 cases processed so far, there is a robust drop in severity of patient symptoms from intake to the last session. On a scale of 0 to 10, ten being most severe, the average drop in symptom severity is 4.84. That means that symptoms dropped by slightly less than 50% across the diagnostic categories.

We will also be measuring changes in the amplitude of two key sites per client for a sub-sample of our group: CZ and the individual's own highest amplitude site as measured at intake. Preliminary results indicate a correlation between the amplitude drop and the symptom severity drop.

#### Conclusion

We intend to compare rate of improvement over the complete course of treatment. Preliminary data also shows greater improvement at the beginning of treatment with this method. Other similarly useful parameters for clinical treatment will be studied and presented.

INVITED ADDRESS -  
**Status of Neurofeedback:  
Past, Present, and What Needs to be Done (R & CA)**

**Joel F. Lubar, PhD**

*University of Tennessee, Knoxville, TN  
jlubar@utk.edu*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: .5**

**Abstract.**

Since the 1970s only a few hundred papers have been published in peer reviewed journals regarding basic or clinically based research in neurofeedback. There are excellent experimental designs for validating the effectiveness of neurofeedback yet for example only three double blind A-B-A studies have been published. These include two by me in the area of ADHD and epilepsy, yet this is a « gold standard » for most studies in medicine for evaluating effectiveness of treatments, along with randomized matched group studies.

Graphing training parameters within and across sessions is critical along with pre and post measures such as QEEGs, psychometric measures, learning measures for some patients and other metrics. This is the best and most valid way to prove to patients, insurers and regulatory agencies that neurofeedback is specific, powerful and worthy of recognition as a valid methodology. I will demonstrate this in the presentation. Last, I will discuss the current status of databases and what still needs to be done to make them even better.

**Learning Objective:**

The participant will be able to:

- Discuss the progress in the development of neurofeedback interventions.
- Discuss the « court of science » requirements that would help neurofeedback enjoy the status of main line approaches for the evaluation and treatment of many disorders.

**Agenda:**

- Status of neurofeedback publications: 10 minutes
- Designs for validating neurofeedback with examples from our research: 20 minutes.
- Current status and future needs regarding databases: 10 minutes.

KEYNOTE ADDRESS -  
**Overcoming the Barriers to Effective Treatment  
for ADHD: A Neuro-Educational Approach**

**Vincent J. Monastra, PhD**

*Clinical Director, FPI Attention Disorders Clinic, Endicott, NY  
Adjunct Associate Professor, Department of Psychology, Binghamton University, Binghamton, NY  
poppidoc@aol.com*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: 1**

**Abstract:**

**Introduction**

Despite specific diagnostic criteria, published practice guidelines for assessing patients, and the availability of effective pharmacological treatments for children diagnosed with ADHD, an overview of prescription practices in the United States indicates that as few as 25-50% of these patients receive even minimal medical treatment for this condition. Review of the scientific literature revealed that parental concerns about cost of treatment, insufficient information about ADHD and medication, and fear of adverse treatment response, were associated with a decision not to comply with treatment recommendations. Because of the risk for long-term psychiatric, social, and health care problems in children with ADHD who are untreated, the development of intervention programs designed to address the barriers to treatment appeared necessary in order to promote the well being of these children.

**Methods.**

In order to further clarify the factors impeding treatment of ADHD during childhood and develop a targeted intervention program to overcome these barriers, two studies involving 1,514 families were conducted. Each family included one child who had been diagnosed with ADHD by a board certified physician, but whose

parents/guardians had either never proceeded with treatment or who decided to discontinue treatment within the first three months. In the first study, 856 families completed the "Barriers to Treatment Survey" (BTS) in order to clarify the factors that led to the lack of treatment. Parental responses to this survey led to the development of a three-session intervention program.

In the second study, 658 families participated in the three session intervention program, which included a comprehensive evaluation process (including neuro-psychological and neurophysiological tests of attention; medical screening for other health problems associated with inattention and hyperactivity) and parent education about the medical causes of ADHD, the biochemical action of medications, the relationship between dietary habits and attention, and the educational rights of children with ADHD. We also developed two medication protocols (based on QEEG findings). Stimulants (methylphenidate; mixed amphetamine salts) were recommended for patients demonstrating cortical underarousal at Cz. Non-stimulants (atomoxetine; guanfacine; clonidine) were recommended for patients who demonstrated cortical hyperarousal or no slowing over this region. Follow-up sessions were conducted over a two-year period.

#### **Results:**

Study 1. Review of parental responses to the BTS revealed that over 90% of parents failed to follow-medical advice because of discomfort over administering medication without direct testing of attention and due to a fear of medication side effects. Among parents whose children had been treated with medication, over 95% of parents decided to discontinue treatment due to the development of side effects or the persistence of problems at home or school despite medication. Additional parental concerns included lack of information about ADHD and medication risks.

Study 2. Examination of treatment compliance rates revealed that over 70% of patients had begun pharmacological treatment within the first six weeks after assessment. By the six-month follow-up, over 90% of all patients were being treated. At the two-year follow-up, 95% of all patients were responding positively to medication. Significant reduction in rate of side effects was also noted, as approximately 10% of patients continued to demonstrate appetite loss, insomnia, or increased irritability by the two year follow-up.

#### **Discussion.**

Parental concerns about medication side-effects, a lack of understanding about ADHD, and discomfort over administering medication without direct evaluation of attention pose significant impediments to the effective treatment of children with ADHD. A three session intervention program that included neuropsychological and QEEG examination of patients, provided information about the nature of ADHD, and addressed parental concerns, led to significant gains in treatment compliance and reduction in side effects. These results lend further support for the integration of QEEG procedures in the assessment of children suspected of ADHD.

#### **References**

- Angold, A., Erkanli, A., Egger, H.L., Costello, E.J., 2000. Stimulant treatment for children: A community perspective. *Journal of the American Academy of Child and Adolescent Psychiatry* 39, 975-984.
- Jensen, P.S., 2000. Current concepts and controversies in the diagnosis and treatment of attention deficit hyperactivity disorder. *Current Psychiatry Reports* 2, 102-109.
- Monastra, V.J., 2005. Overcoming the barriers to effective treatment for attention-deficit/hyperactivity disorder: A neuro-educational approach. *International Journal of Psychophysiology* (In Press).

#### **Learning Objectives:**

The participant will be able to:

- Identify the barriers to treatment of ADHD.
- Describe how an integrative assessment process (that includes QEEG) and parent education can contribute to an increase in rate of treatment compliance and reduction in medication side-effects

#### **Agenda:**

- Scope of the Problem: Review the literature on prescription practices and treatment compliance. (10 minutes)
- Barriers to Treatment: Review the results of Study 1, clarifying the nature of factors impeding treatment (10 minutes)
- Neuro-educational Intervention: Describe the assessment and counseling procedures used to address parental concerns (20 minutes).
- Review the results of Study 2, illustrating the use of QEEG data in guiding medication selection, reducing side effects and enhancing compliance (20 minutes)

INVITED ADDRESS -  
**Expectation, Observation and Understanding:  
Development of a Clinical Model of Neurofeedback (CE)**

**Susan F. Othmer, BA**

*EEG Institute, Woodland Hills, CA  
sue@eeginfo.com*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: .5**

**Abstract:**

Our clinical model of neurofeedback has evolved through a cycle of changing clinical approaches, changing clinical results, and a changing clinical model. Certain client populations have presented special challenges to our clinical approach, which then push us to improve our approach so as to improve our results. Efforts to understand the clinical results we observe have then led us to modify our model of efficacy. We have also been challenged by the results of functional brain imaging and theoretical models of brain function to try new clinical approaches and to rethink the clinical model.

This presentation will outline our path from simple beta and SMR training to a more client-centered and individualized approach to learned self-regulation. Significant clinical and theoretical challenges will be discussed that have led to breakthroughs in clinical approach and results. We will also discuss our evolving appreciation of each individual's unique experience of neurofeedback, and how we can observe subtle shifts in brain state that allow fine-tuning of the clinical approach. We continue to be challenged by the power and specificity of neurofeedback and our evolving understanding of how the nervous system responds to this simple yet profound functional challenge.

**Learning objective:**

The participant will be able to describe the clinical experience and insights that have led from simple beta and SMR training to a more client-centered and individualized approach to learned self-regulation.

**Agenda:**

- Changes in clinical approach over time based on clinical experience with challenging client populations, functional brain imaging and theory. (20 min)
- Tuning into brain states - discovering how to communicate with clients regarding their individual experience of neurofeedback. (10 min)
- Evolving the clinical model to allow for ongoing clinical results and efficacy of changing clinical approaches. (10 min)

**TOVA Results for Inter-hemispheric Training,  
a Historical Comparison, and Model Implications (R & CA)**

**Siegfried Othmer, PhD, Susan Othmer, BA, John Putman, MA, MS**

*The EEG Institute at the Brian Othmer Foundation Woodland Hills, CA, USA  
siegfried@eeginfo.com*

**Abstract:**

**Introduction**

Protocol-based or mechanism-based training has recently moved toward the adoption of bipolar inter-hemispheric training at homologous sites as a mainline approach. In this presentation, recent continuous performance test results for such protocols are compared with earlier findings using standard lateralized approaches. Improved results mandate the consideration of models of efficacy that might explain the clinical improvement. Recently acquired TOVA data on over 100 clients are presented and compared to data acquired with earlier protocols in order to document that an advance in clinical efficacy has indeed been achieved.

**Method**

Reward and inhibit-based training using bipolar inter-hemispheric placement on homologous sites, principally on the sensorimotor strip, was evaluated in more than 100 participants and compared with earlier results using lateralized training optimized to each hemisphere. TOVA results were used as a measure. Principal site pairs were T3-T4, Fp1-Fp2, and P3-P4. The reward band was individualized on the basis of clinical response. Broadband inhibits were used.

## Results

Success rates in achieving normalization of TOVA scores are shown to have improved with the adoption of the new protocols. In particular, saturation of inattention scores at zero omission errors is more routinely achieved. The numerical improvements have come despite extensions of this work to more severely deficated populations and to ostensibly more intractable conditions such as the autism spectrum.

## Conclusion

The improved outcomes mandate the consideration of models of efficacy on the one hand, and a consideration of various possible contributors to the clinical improvement. Theoretical modeling indicates that bipolar training in general and inter-hemispheric training in particular, may reinforce phase changes even in standard amplitude-based training. Hence the efficacy of protocol-based training may be traceable to a very general modulation of cortical timing relationships.

# Neurofeedback and Cognitive-Behavioral Therapy Based Intervention in Dual Diagnosis: A Neurobiological Model (T)

Tato Sokhadze, PhD

*Department of Psychiatry, University of Louisville, Louisville, KY  
tato.sokhadze@louisville.edu*

## Abstract:

### Introduction

Co-morbid psychopathology, and specifically PTSD which is highly prevalent among substance abusers is known to be associated with poorer treatment outcomes. Cognitive factors (e.g., craving, cue reactivity) and level of their persistence are important predictors of relapse. Previously we reported effects of a behavioral intervention on behavioral measures and ERP during performance on cognitive tasks (selective attention, cue reactivity) in cocaine addicts (Sokhadze et al., 2004). On the basis of results and earlier pilot (Filkenberg et al., 1996) we propose a neurobiological model of factors contributing to aggravation of drug seeking in cocaine abuse co-occurring with PTSD.

### Method and Results

In the study underway we will test hypotheses derived from this model, and in particular predictions that patients with dual diagnosis will show impairments in cortical inhibition, decision making, and over-reactivity to both drug- and trauma-related cues in a battery of cognitive (Go-NoGo, Iowa Gambling, cue reactivity) tasks before treatment and will improve performance after cognitive behavioral therapy and neurofeedback. Dense-array ERP components (P2a, N2b, P3b, ERN) are used in the study to elucidate the cortical neural substrates and specific cognitive processes affected by cocaine use and PTSD. We will present design of study, functional significance of ERP components and methods aimed to test predictions of the model.

### Conclusions

The proposed model is aimed to outline cognitive factors that impact drug abuse treatment in dual diagnosis and to develop more effective treatment by integration of behavioral interventions under study.

### References

- Sokhadze, E.M., Martin, L.E., Stotts, A. L., & Potts, G. F. (2004). Motivational interviewing enhances cognitive ERPs in a selective attention task in cocaine addicts. Society for Neurosciences 34<sup>th</sup> Annual Meeting, San Diego, California.
- Filkenberg, A., Sokhadze, E., Lopatin, A., Shubina, O., Kokorina, N., Skok, A., & Shtark, M. (1996, March). The application of alpha-theta biofeedback training for psychological improvement in the process of rehabilitation of the patients with pathological addictions. Proceedings 27<sup>th</sup> Annual AAPB Meeting, March 22-24, Albuquerque, NM., page 37.

INVITED ADDRESS -  
**Principles of Neurotherapy: What Are We Really Trying To Do? (R)**

**M. Barry Stermán, PhD**

*School of Medicine, UCLA  
msterman@ucla.edu*

**APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: .75**

**Abstract:**

Like all areas of investigation and treatment in the realm of the brain and behavior, the field of neurotherapy has evolved many differing methodological and conceptual perspectives. And all of these perspectives report positive clinical results. What appears often to be lacking however, is a convergent or coherent theoretical basis for these findings. Recent developments in cellular and molecular biology have begun to elucidate the probable synaptic mechanisms at the core of neuroplasticity. Of great significance to the field, these mechanisms share a common basis with the thalamocortical generation of the EEG oscillations that are the focus of neurotherapy. Of particular relevance due to timing and topography is the fast sensorimotor cortex rhythm known as the SMR and the somewhat slower post-response parietal rhythm termed the PRS. The functional basis and possible synaptic correlates of these and slower abnormal rhythms on cortical networks will be reviewed in the development of a rational theoretical framework for effective neurotherapy.

**Learning Objective:**

The participant will be able to:

- Explain the significance of the SMR EEG pattern.
- List the physiological events associated with this rhythm.
- Discuss the likely synaptic effects of competent SMR training
- Describe a model providing a rational basis for its therapeutic efficacy with corrupted neurocircuitry.

**Agenda:**

- The physiological origins and functional role of the SMR. - 13 min
  - a. Principles of thalamocortical oscillations and EEG epiphenomena
  - b. Effects of reduced proprioceptive input to thalamus during wakefulness and sleep
  - c. Electrocortical effects of thalamocortical oscillations
- Mechanisms of synaptic long-term potentiation (LTP) and circuit plasticity. - 12 min
  - a. Post-synaptic AMPA and NMDA receptor processes
  - b. Effects of strong afferent inputs
  - c. Early and late LTP
- Evidence supporting the LTP effects of SMR enhancement - 13 min
  - a. Animal studies
  - b. Human studies
- Maximizing circuit plasticity -12 min
  - a. Timing of contingency
  - b. Post-reinforcement consolidation

**QEEG-Guided Neurofeedback in the Treatment of Children  
with Histories of Relational Trauma (R & CA)**

**Lark Huang-Storms, MS (1), Richard Davis, MS (2),  
Janice Dunn, MA (1), and Eugenia Bodenhamer-Davis, PhD (1)**

*(1) University of North Texas, Denton, TX; (2) Private Practice, Hurst, TX  
genie@unt.edu or larktim@teleport.com*

**Abstract:**

**Introduction**

Poor self-regulation of arousal is central to the behavioral difficulties experienced by children with traumatic attachment histories. EEG biofeedback teaches children to self-regulate brain rhythmicity, which may in turn affect global improvements in the areas of attention, aggression, impulse control, and trust formation. Research literature supports the use of neurotherapy for children with ADHD (e.g., Lubar et al.,

1995), autism (e.g., Sichel et al., 1995), asthma (e.g., Tansey, 1992), stroke (Ayers, 1995), and migraine (Siniatchkin et al., 2000). This study extends current research by investigating the effectiveness of neurotherapy in reducing behavioral problems commonly observed in abused/neglected children.

#### **Method**

Fifteen children with histories of removal from the home by Child Protective Services received 30-40 individualized sessions of QEEG-guided neurotherapy treatment. Pre- and post-scores on the Child Behavior Checklist (CBCL) and the Test of Variables of Attention (TOVA) were compared to assess effectiveness of treatment.

#### **Results**

T-tests analysis of pre- and post-scores on the CBCL showed most significant changes in the areas of externalizing problems, social problems, aggressive behavior, delinquent behavior, and attention problems ( $p < .05$ ). TOVA commission error and variability scores also improved significantly following neurofeedback training ( $p < .05$ ).

#### **Conclusion**

This clinical sample of 15 children with traumatic attachment histories showed significant improvement in self-regulatory behaviors following individualized neurofeedback training, as measured by changes in scores on the CBCL and the TOVA.

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## **A Meta-Analysis of Neurofeedback and Epilepsy (R)**

**Gabriel Tan, PhD (1), D. Corydon Hammond, PhD (2),  
and John Thornby, PhD (3)**

*(1) VA Medical Center and Baylor College of Medicine Houston, TX, (2) University of Utah School of Medicine, Salt Lake City, UT, (3) Baylor College of Medicine  
tan.gabriel@med.va.gov*

#### **Abstract:**

##### **Introduction**

Since the publication of the first scientific paper applying EEG operant conditioning to the treatment of seizure disorder in 1972, many studies have been published in this area. Unfortunately, many of these studies were either case studies or employed very small sample size. In reviewing the research on the clinical efficacy of EEG biofeedback for epilepsy, Sterman (2000) found a total of 18 peer-reviewed articles between 1972 and 1996, which showed clinical improvement in 82% and EEG improvement in 66% of the subjects. An excellent discussion on the relevant physiology of epilepsy and a model on how neurofeedback might raise the seizure threshold for epileptics were recently presented by Walker and Kozlowski (2005). The purpose of this paper is to conduct a meta-analysis of the research on neurofeedback and epilepsy.

##### **Method**

A literature search of the Pubmed, MedLine, PsychInfo, and PsychLit data bases between the years of 1970 and 2005 was conducted with the search algorithms of EEG biofeedback or neurofeedback or neurotherapy for the treatment of epilepsy or seizure disorders

## Results

While over 40 studies were identified, only a handful of these studies were included due to the lack of control groups and the unavailability of data needed for the meta-analysis. The largest study with a control group design has an N of 34 and utilized slow cortical potential (SCP) training. Several studies using sensorimotor rhythm (SMR) training with control group were included. Several more studies with no control group were also included as long as they provide pre and post seizure rates.

## Conclusion

At the time of this submission, the meta-analysis is still in process, therefore, effect size information is not yet computed. However, preliminary analysis indicated that EEG biofeedback in the form of SCP or SMR training is efficacious for the treatment of epilepsy based on the template developed by the Efficacy Task Force established jointly by the Association of Applied Psychophysiology and Biofeedback (AAPB) and the International Society for Neuronal Regulation (ISNR; La Vaque et al., 2002).

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## LORETA and QEEG Correlations with the Alzheimer's Disease Assessment Scale (R & CA)

Alicia L. Townsend, PhD,(1) and Leslie H. Sherlin, MS (2)

(1) *University of North Texas Health Science Center, Roanoke, TX;*

(2) *Nova Tech EEG, Inc., Knoxville, TN, Q-Metrx, Inc. Burbank, CA,*

*Southwest College of Naturopathic Medicine, Tempe, AZ*

*pnpdralicia@yahoo.com*

## Abstract:

### Introduction

Alzheimer's disease (AD) promises to be a threat to the health system, making early detection and treatment imperative. Research has shown that quantitative EEG (QEEG) measures of AD patients show increased measures of delta and theta, and decreased alpha and beta, as well as decreased coherence (Jeong, 2004). The purpose of this study is to examine the relationship between memory loss and brain electrical activity.

### Method

One hundred participants between the ages of 65 and 85 were administered the Alzheimer's Disease Assessment Scale - Cognitive (ADAS-Cog), a QEEG, and a clinical interview. Brain electrical activity was digitally recorded on a Lexicor NeuroSearch-24 system from 19 scalp electrodes, according to the International 10-20 system of electrode placement. The recording was digitized and edited to reduce artifact and subjected to quantitative spectral analysis using Eureka3 software.

The cross spectra was averaged and LORETA correlation maps computed and displayed using the LORETA Key viewer software. Correlations were computed for each individual's ADAS-Cog score compared to each voxel (7x7x7 mm) of their baseline LORETA. The eyes closed data cross-spectral analysis was examined in nine bands.

### Results

Initial overview of the data suggests a positive correlation between slower activity and elevated ADAS-Cog scores, with primary focus in the temporal lobes. The data is still being collected and calculated. Currently there are 85 subjects compiled for analysis. The complete study that will be complete by August will contain 100 subjects total.

### Conclusion

This study is expected to corroborate previous literature that indicates a decline of central, parietal, temporal, and limbic alpha 1 (low alpha) sources for more severe AD. It is expected for those who are less severe and may instead have vascular dementia distributed theta sources are expected to be more involved. If these findings are a consistent the investigation can further validate that the level of EEG sources vary in AD

patients having different severity of the disease (Babiloni et al., 2004). The clinical usefulness of this approach in early differential diagnosis, disease staging, and therapy monitoring could be critically relevant.

#### References

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- Jeong, J. (2004). EEG dynamics in patients with Alzheimer's disease. *Clinical Neurophysiology*, 115(7), 1490-1505.

## Left Prefrontal NIRS Activation as Add On Treatment in Depression and Schizophrenia (R & CA)

J. C. Vouakouanitou, MD

*EEG and Clinical Neuroscience Research, France*

*bek@bek.fr*

#### Abstract:

#### Introduction

Different psychiatric disorders, such as schizophrenia, major depression, and obsessive-compulsive disorder are analyzed with a functional brain imaging techniques such as fMRI and fNIRS. We used our own prototype CW-NIRS system (48 channels) to investigate the cortical information processing and to study therapeutic applications in psychiatry and neurology.

#### Methods

We measured concentration changes in cerebral hemoglobin oxygenation in the frontal and parietal cortex during performance of a verbal fluency task in patients with schizophrenia (n=10), obsessive-compulsive disorder (n=10), major depression (n=10) and 10 healthy volunteers. All subjects participated in functional NIRS-imaging system experiments. While participants listened to classical and Gregorian music, they are invited to vigorously write in the air a large "1 « by feeling the movement of the arm, by seeing the gesture, by pronouncing « 1 » mentally and by hearing it. In the present study, we evaluated the activity of the muscle and its local oxygen uptake (VO<sub>2</sub>) induced by auditory (music) stimulation in the prefrontal cortex in the supplementary motor area. Cognitive functions were evaluated by neuropsychological tests

#### Results

Results showed activation of the supplementary motor area, inferior frontal gyrus (Broca's area) and a decrease in the left prefrontal areas reached significance ( $p < .05$ ) and in COV; partial increase ( $P < 0.005$ ) in CBV and COV with calculation tasks, and continuing increase in CBV and COV with verbal fluency tasks.

#### Conclusions

fNIRS is a non-invasive optical system useful for monitoring the regional cerebral blood volume (rCBV) dynamics coupled with neuronal activities. This method applied to the prefrontal cortex has anti-depressive properties.

#### INVITED ADDRESS -

### Billing and Insurance:

## What You Gotta Know and What You Don't Want To Do (CE)

Bob Whitehouse, EdD

*Former AAPB Insurance Chair; Colorado Center for Biobehavioral Change, Boulder and Denver, CO*

*BobWhitehouse@gmail.com*

APA, NBCC, ASWB CE Credits and BCIA Recertification Credits: .75

#### Abstract:

Experiencing reimbursement blues? Likely to get busted for your billing? Are you coding and billing right? Do you know what codes to safely use, who can use them, how to seek authorizations, and who gets investigated for fraud? This talk will be a "quick and dirty" summary of this and how to handle denials. Even if you have a billing company, they may not know this info, and yet you're responsible ethically and legally for what is

billed. This topic is boring to us all but essential to know, may keep you out of trouble, and may open some doors to better reimbursement. Know your codes, laws, ethics, and rights. Come to this and see the questions I ask insurance companies to get approvals.

**Learning Objective:**

The participant will be able to:

- Identify which codes can be used at which times.
- Discuss how to seek authorizations for third party reimbursement.

**Agenda:**

- How to get investigated/busted for billing (15 minutes)
- Codes to use & codes not to use and who can use them (15 minutes)
- Getting authorizations, handling appeals, questions to ask (20 minutes)