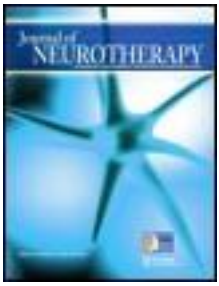

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Abstract

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ABSTRACTS

Correlations of IQ, Attentional, Reading, and Calculation Performance to EEG Coherence During Rest and Reading

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Previous research has shown that EEG coherence during rest was correlated to reading skills between individuals. Moreover, we have shown that EEG coherence differentiates between resting states and reading tasks within individuals. This presentation discussed the predictive value of EEG coherence during a series of reading tasks on a number of psychometric measures including I.Q., attentional, reading, and arithmetic scores. It was expected to find that EEG coherence during relevant tasks were more predictive of respective psychometric scores than EEG coherence during rest. The purpose of this analysis was to investigate the predictive properties of EEG coherence in reading and arithmetic performance, and the consequent guidelines that evolve for neurofeedback treatment of reading and arithmetic difficulties.

Electroencephalographic (EEG) Data from an Individual Experiencing Anomalous Mental Phenomena: A Case Study

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Life Quality Resources, Raleigh, NC

Nineteen channels of electroencephalographic (EEG) data were recorded from BSJ, a 53-year-old female subject who has reported previously experiencing anomalous mental phenomena. Data were collected during an eyes-closed baseline condition, a task designed to elicit anomalous mental phenomena (a psi task), and a control period. The raw eyes-closed baseline data were edited for artifacts and then compared to Sterman's adult normative database. The results of this analy-

sis show positive statistically significant deviations from the reference database in the Sensory Motor Rhythm (12-14 Hz), Betal (15-18 Hz), and Beta2 (18-24 Hz) bands. This suggests that BSJ has a more active mind and experiences a higher state of physiological arousal than other adults during this condition. Paired t-tests were computed on the data for the psi task and its associated control period. The magnitude and peak amplitude means for each artifact-free epoch for the nineteen different electrode sites and for four different frequency bands (delta, 0-4 Hz; theta, 4-8 Hz; alpha, 8-13 Hz; and beta, 13-20 Hz) were compared. The results of the t-tests indicate that BSJ has increased electrical activity in the frontal and temporal regions of the left hemisphere, indicative of increased cognitive activity in these regions during the psi task. The finding of beta activity in the left frontal region, F7, also corresponds with a previous finding by Alexander of activity in this same area by another selected subject during a task designed to elicit anomalous mental phenomena. The results presented in this paper are exploratory results based on a single subject. Further research with similar subjects using these for replication techniques will be required.

Neurofeedback and Pulsed Electromagnetic Therapy: A Match Made in Heaven

Elsa Baehr, PhD, Martha Lappin, PhD, Rufus Baehr, PhD, and Mia Matsumoto, MA
NeuroQuest, Inc., Evanston, IL

We reported on two case studies in which pulsed electromagnetic therapy in the Micro Tesla range was used in conjunction with the Alpha Asymmetry Protocol, a patented protocol for the treatment of depression.

Two patients with major depressive disorders failed to respond to medication or psychotherapy during the past three years. They each elected to try an alternative treatment, neurofeedback, as a last ditch effort to find relief from their symptoms. After the third week of training on the Alpha Asymmetry Protocol, the Enermed pulsed electromagnetic device, was attached to the nape of the neck, and remained in place for 15 minutes of right frontal alpha asymmetry training. The percentage of time the alpha asymmetry was in the right frontal cortex (PTAA) increased with the concurrent use of the magnetic stimulation and the Alpha Asymmetry Protocol. The PTAA scores held from one session to

the next. By the eighth week of training both subjects felt relieved of their depressive symptoms. Pre- and post-Beck Depression Inventory scores were presented.

The Relationship Between Performances on a Continuous Performance Task, Grade Point Average, and Self-Report Scales of Cognitive and Neuropsychological Functioning

Alyssa Braaten, BA
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The Intermediate Visual and Auditory (IVA) Continuous Performance Test, Neuropsychological Impairment Scale (NIS), Attention-Deficit Scale for Adults (ADSA), Connors' Adult ADHD Rating Self Report (CAARS), Western Utah Rating Scale (WURS), and the Attention Deficit Disorders-Evaluation Scale (ADDES) are often used to diagnose attention problems common to both clients with Traumatic Brain Injury and those with Attention Deficit Disorder. These measures not only aid in the diagnosis of attention problems before neurotherapy, but also can be used to measure treatment effectiveness. Our purpose in this study was to determine if there is a relationship between "self-report" scales and the Intermediate Visual and Auditory Continuous Performance Test.

We recruited 65 participants, between the ages of 18-50, from general psychology classes at St. Cloud State University. The participants completed the Intermediate Visual and Auditory (IVA) Continuous Performance Task, the Neuropsychological Impairment Scale (NIS), the Attention-Deficit Scale for Adults (ADSA), the Connors' Adult ADHD Rating Scale Self-Report: Long Version (CAARS-S: L), the Western Utah Rating Scale (WURS), and the Attention Deficit Disorders-Evaluation Scale (ADDES).

No significant correlations were found between the IVA continuous performance test and the self-report scales. However, a significant correlation was found among the self-report scales themselves. The self-report of attention, performance on a continuous performance task and real life outcome (GPA) were not shown to correlate. The results show the validity of self-report scales, but also show that both self-report scales and continuous performance tests are needed to measure outcome for EEG biofeedback or neurotherapy.

Bilateral 40 Hz Augmentation Used to Diminish Amplitude Excursions at 3, 5 and 10 Hz

Valdeane W. Brown, PhD
Zengar Institute, Port Jefferson, NY

Although the field of neurofeedback continues to develop along the lines of traditional diagnostics, there are alternative paradigms available. In the traditional approach, clients are thoroughly assessed so that an accurate diagnosis can be obtained. This precision is considered by some to be a prerequisite to developing an effective treatment plan using neurofeedback. These kinds of approaches rely heavily on presumed structural shifts in underlying CNS tissue even though the actual training intervention occur through monitoring and feeding back changes in EEG. The Period 3 Approach is fundamentally different from this, and recognizes that the CNS and neurofeedback are non-linear, dynamical processes. This means that training can be accomplished with little regard for differential diagnosis, as renormalization of CNS function occurs through the use of non-linear, dynamical control procedures as described by Kaptaniak, Ott, Grebogi and Yorke, among others. The practical import of this difference is that training paradigms can become much simpler, require considerably less "pre-training" workup, and can occur more quickly as multiple target problems resolve concurrently. To test the validity of this operational perspective, data obtained from the training records of 20 clients with widely divergent presenting problems and diagnoses were retrospectively analyzed using several forms of Joint Tim-Frequency and Non-Linear, Dynamical Analyses. What identified these clinical records were the large number of pulses and the large amplitude values of those pulses at 3, 5 and 10 Hz. In previous presentations, the value of 3, 5 and 10 Hz elevations in eyes open conditions as indicators of various forms of dysfunction have been described. The effect of 40 Hz augmentations was investigated in order to ascertain its relative effect in decreasing problematic excursions at 3, 5 and 10 Hz during eyes open training. All subjects were trained with two channels of EEG using a C3 and C4 active placements per the Period 3.

Comparison of bilateral 40 Hz augmentations to other bilateral augmentation paradigms, demonstrated the ascendancy of using bilateral 40 Hz augmentations regardless of client diagnosis or presenting problem. Thus, effective training can occur across clients, across presenting problems and diagnosis, using the same intervention and the same sites, and renormalization of EEG occurs auto-poetically, exactly as predicted by non-linear, dynamical control theory.

EEG, Neurofeedback, and Non-Linear, Dynamical Approaches: Explorations into the Chaos at the Cutting Edge of Clinical Practice

Valdeane W. Brown, PhD, Zengar Institute, Port Jefferson, NY, *Jay Gunkelman, QEEGT, and Karl Pribram, PhD, Q-Metrx.com*, Stanford University, Burbank, CA

Data analysis has been a continuing issue in the rapidly emerging field of neurofeedback. Fundamental questions concerning the characteristics of the EEG signal itself directly affect equipment manufacturers, researchers and clinicians. These questions cannot be avoided any longer. With the easy availability of advanced computing platforms and sophisticated statistical packages, the average practitioner can reasonably address these concerns within the confines of his/her own office. This panel discussed many of the current issues concerning the role that Non-Linear, Dynamical or NLD approaches to data analysis may play in the field of Neurofeedback Chaos theory, as these approaches are also known, has been applied successfully to many other scientific domains including biology, economics, hydraulics, aerodynamics, cognitive science, meteorology. In fact, virtually every other field of inquiry has benefited greatly from the insights and techniques afforded by this revolutionary and essentially interdisciplinary approach to scientific inquiry. The Period 3 Approach is explicitly based on these ideas and it has been successfully applied to clinical neurofeedback across the range of disorders; however, other approaches have been used to explain the training outcomes demonstrated by effective neurofeedback. Thus, there is a clear difference in paradigm implied by a shift to NLD or Chaos Theory and the question really is: Is there any reason to make this shift in paradigm? Some of the other questions addressed by this panel included:

- Is EEG stationary or non-stationary and what are the implications of this difference?
- What are the differences between linear, non-linear and random processes and which best fits the data we see with EEG?
- If EEG can be easily contaminated by artifact, and in fact looks like rough sinusoidal waves, isn't it just noise?
- What is the significance of signal to noise ratio in EEG and what techniques are available to alter it to make our data acquisition more meaningful?

- What value does NLD analysis add to neurofeedback? And what is the cost of that value? Is it worth the effort?
- What is the value of traditional linear statistics in analyzing EEG?
- How can non-linear effects be used to provide "real-time" feedback to clients?

Passive Infrared Hemoencephalography (pIR HEG). A Discussion of the Evolution of the Technology, Combined with a Discussion of a Two-Year Set of Case Studies, Predominantly Focused on Treatment of Migraine Headaches

Jeffrey A. Carmen, PhD
Olde Barn Technologies, Manilus, NY

As of the date of SNR 2000, Passive Infrared Hemoencephalography only two years old, and was still in its infancy. Passive Infrared Hemoencephalography (pIR HEG) is a conceptual outgrowth of Hershel Toomim's Near Infrared Spectrophotometry Hemoencephalography (NIRS HEG) system. pIR HEG relies on thermal output from brain activity as the primary measure. In most cases, patient responses to the pIR HEG system appear to be similar to the responses seen with NIRS HEG, although there also appear to be some subtle differences, which need to be considered when comparing data.

Both systems share a freedom from eye movement and muscle artifacts. All systems do have artifacts that do not represent real data. pIR HEG is no exception. Sources and characteristics of these artifacts were discussed.

The reason HEG initially caught my interest was that 70% of my practice represents work with migraine patients. Although the precise etiology of migraine headaches has yet to be determined, there is universal agreement that the cerebrovascular system is intimately involved in the process (Bednarzcyk, Remier, Weikert, Nelson & Reed, 1998; Moskowitz, 1998). Because of the vascular theories regarding migraine headaches, my original work using pIR HEG with migraines was directed at attempting to retrain the vascular system. This turned out to be unproductive. The process evolved into one that uses the pIR HEG signal to train increases in frontal brain activity as measured by increases in the pIR HEG signal. These increases appear to correlate with increased inhibitory functions that serve to act to prevent migraines and also to abort them in progress.

While migraines represent the main focus, tension type headaches, cluster headaches, medication rebound headaches and conversion headaches will also be discussed. Individual case studies were presented. Supporting data included infrared video images with and without headache activity. Summary data were presented on response patterns using change in headache activity as the predominant dependant variable, with psychophysiological correlates as secondary dependant variables.

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Application of Repetitive Audiovisual Stimulation to EEG Biofeedback Protocols

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BrainMaster Technologies, Inc., Cleveland, OH

There is a great deal of recent attention to the methods for using auditory and visual stimulation in conjunction with EEG biofeedback. Although there are various systems in use, there is a need for a systematic understanding of how to include these stimuli in a protocol to produce desired effects.

Biofeedback and stimulation can be used for a variety of purposes, not just entrainment or modification of rhythms. There are also uses, for example, in reducing training time for conventional protocols, reducing undesirable rhythms, helping the brain to experience specific states, steady-state evoked potentials, and training of specific sensory pathways.

There are a wide range of choices for the configuration of the stimulation and biofeedback loops, how stimulators are controlled, frequency, amplitude, combination of stimulation and feedback in either or both modalities, and association with EEG parameters. This talk will describe some of the basic approaches to combining these modalities, and describe emerging possibilities for systems that can be configured in a flexible, programmable manner.

QEEG-Driven Neurotherapy with a Child Born Crack-Addicted

John W. DeLuca, PhD
Mind Stuff, Livonia, MI

This paper presents pre- and post-QEEGs and the course of neurotherapy with a nine-year-old male born addicted to crack cocaine. His adoptive mother complained of problems in reading, spelling, writing, comprehension, attention span, impulsivity, distractibility, completion of work, and disruptiveness. Math was a strength. He also evidenced assaultive behaviors during "rage" attacks. A traditional EEG was unremarkable. QEEGs were recorded using Lexicor NeuroSearch-24 and VI.51 software with an appropriate size electrocap. EEG activity was sampled from 19 scalp electrode sites in the standard International 10-20 montage with reference to ear lobes and ground just forward of site FZ. Sampling rate was 128 Hz with 32K gain and high-pass filter on. Data analysis was completed using Neurorep Version 4.0 software (Hudspeth, 1999), which incorporates the Adult QEEG Reference Database (Hudspeth, 1999) and the Thatcher Lifespan EEG Reference Database (Thatcher et al., 1987). EEG waveforms were inspected offline and artifacts eliminated. Measures of coherence, phase, and amplitude asymmetry were computed in four frequency bands among all combinations of left and right intrahemispheric sites and between homologous interhemispheric sites. Relative power in each of the same frequency bands was calculated. Initial QEEG results (eyes-closed condition) were unremarkable for measures of coherence, phase and asymmetry. Relative power measures were significantly elevated for alpha, particularly T5 and O1. Single-band topographies revealed elevated microvolt activity in O1 and O2 regions at 9-10 Hz. Treatment proceeded using Lexicor NRS2D and Biolex software. Baseline Biolex readings at O1, O2, and PZ were taken in both eyes-open and eyes-closed conditions. Eyes-open recordings revealed elevated microvolt levels in alpha and beta bands. Treatment involved inhibition of alpha at 01-O2 using a bipolar recording during both eyes-open and eyes-closed conditions. Course of treatment and post-treatment QEEG results were presented and discussed.

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EEG Coherence Effects of Reading Task Conditions in Young Adults

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Brain Research Laboratory, University of Tennessee, Knoxville, TN

As part of this laboratory's ongoing effort to develop neurometric methods for the assessment and treatment of learning disabilities, this study investigated the EEG coherence effects of several reading and cognitive tasks in 18 college students. Tasks were designed to selectively engage visual, phonological, semantic, spelling and arithmetic processing, and were administered in randomized order across participants. Coherences were evaluated among 19 electrode pairs (171 per band) across six frequency bands: 4-8, 8-10, 10-12, 12-21, 21-32, and 38-42 Hz (1026 independent variables/task condition). An eyes-open resting baseline was recorded prior to the tasks, and a second eyes-open resting baseline was recorded in random order among the tasks. Only 55 (or 5%) of 1026 repeated measures ANOVAs detected significant among these conditions at $p < .05$. However, 31 (or 56%) of these effects were observed in the 10-12 and 12-21 Hz bands. Comparing the first baseline to the five task conditions revealed that these changes were predominantly decreases in 10-12 Hz coherence (5/5 tasks), and predominantly increases in 12-21 Hz coherence (4/5 tasks). For example, in the visual task, 21/22 significant t-tests ($p < .05$, two-tailed) in the 10-12 Hz band revealed decreases, while 29/30 significant t-tests in the 12-21 Hz band revealed increases. To quantify exactly how nonrandom these patterns were, we performed chi-squared tests on the number of positive vs. negative changes in each frequency band, where the null hypothesis was 50%. However, the chi-squared distribution assumes independent sampling, whereas our 1026 variables were all measured from the same subjects, and were highly correlated with each other. A principal components analysis found that only 15 eigenvectors explained 70% of the variance in these data. Thus, a large number of variables changing in the same direction might be explained by random variance in a much smaller number of underlying factors. To correct for this interdependence in our data, we constructed empirical distributions based upon a randomization of the baseline vs. the average of the five task conditions, re-sampling each of 1026 t-tests 1000 times with replacement. Chi-squared tests were then performed on each of the 1000 randomized trials, and rank-ordered to create the bootstrapped significance table. The relative rank of the actual observed chi-squared statis-

tic (divided by 1000) among the 1000 randomized trials was thus its level of significance. Following this procedure, the pattern of decreases in 10-12 Hz coherence was significant in the visual ($p = .039$) and semantic ($p = .040$) tasks, and the pattern of increases in 12-21 Hz coherence was significant in the visual task ($p = .004$). Also, a pattern of increases in 38-42 Hz coherence was observed in the phonological task (14/14, $p = .035$). These same three patterns were also observed at non-significant levels in all five task conditions, with one exception (5 increases and 6 decreases were observed in the spelling task), supporting the likelihood that these are nonrandom effects. Convergent support came from comparisons with the second baseline recording. Comparisons between the two baselines were not significant. Although 47 of 1026 t-tests between the baselines exceeded the critical value for $p < .05$, chi-squared tests detected no significant patterns among these findings. The similarity of the two baselines was also supported by Tukey's post-hoc procedure. Among the 55 significant variables from the ANOVAs, Tukey's procedure found 132 significant differences ($p < .05$). Among these, 48 included the second baseline, 32 included the first, but none of them included both baselines. Thus, we used the second baseline to replicate the above comparisons with the five task conditions (t-tests $p < .05$, one-tailed). The pattern of decreased 10-12 Hz coherence and increased 12-21 Hz coherence was observed in all five task conditions, supporting the likelihood that this was not a spurious effect of the original baseline. The pattern of increased 38-42 Hz coherence replicated in the phonological task, but not the other tasks. Further analyses of these data will include comparisons between anatomical locations, and among the five task conditions themselves.

QEEG Based Subtypes of Adult ADHD and Implications for Treatment

Robert L. Gurnee, MSW
ADD Clinic, Scottsdale, AZ

The last seventy-five sequential adult patients diagnosed with ADHD at The ADD Clinic in Scottsdale, AZ. that received QEEG's were included in this study. They all clearly qualified for an ADD or ADHD diagnosis after a five-hour evaluation, which included testing for IQ, the TOVA, IVA and Conners' CPT, rating scales and clinical interview. The majority had a second or third diagnosis as well. All were 18 or older.

The subjects were categorized into the following groups based on one standard deviation increases or decreases in absolute and relative power based on the 19 sites specified in the 10-20 system based on the New York University E. Roy John Database. High is +1 SD, Low is !1 SD, Mixed is +1 SD and !1 SD, Normal is all locations < 1 SD + or −

If there appeared to be any significant chance that the deviations were due to artifact, the raw EEG was closely examined. If there was any doubt, the data was excluded from the study.

- Five subtypes of ADHD/ADD emerged from the analysis:

    1. Excessive Frontal Alpha, usually with a R > L asymmetry
    2. Excessive Frontal Theta, usually with a R > L asymmetry
    3. Excessive Frontal Theta and Alpha, usually with a R > L asymmetry
    4. Excessive Beta only
    5. Within normal limits

All of those in the last two groups failed to have Alpha attenuate during TOVA testing with a single electrode at CZ. The great majority of the last two groups had Alpha and/or Theta increase significantly during the TOVA, often increasing by 50% to 100%. In some of these cases, Delta increased as well. Slow wave increases with a cognitive challenge are a traditional marker for deactivation and research with the TOVA has found that increased Alpha correlates with increased errors.

The analysis has not been completed as of this date, but an analysis of 100 QEEG's on child and adult ADHD found that only 37% of the subjects had low Beta, and of these, a total of only 10% had both low relative and absolute power Beta.

- Implications for treatment from an analysis of this data would suggest the following treatment:

    1. Down train Alpha when excessive.
    2. Down train Theta when excessive.
    3. Down train Theta and Alpha when both excessive.
    4. Up train Beta only in the 10% of cases where Beta is deficit both in Absolute and Relative power.
    5. Down train Beta in elevated Beta subtype and if Beta is elevated in Theta and or Alpha subtypes if it does not drop with Theta and Alpha down training. Elevated Beta is associated

with sleep disturbance, anxiety, alcoholism, bipolar disorder and epilepsy. Up training elevated Beta could cause or exacerbate these symptoms.

- Added guidelines:

1. Utilize mean frequency data and one hertz bins to determine specific bands to train (e.g., 3-9 Hz, 6-10 Hz, 5-7 Hz). Usually only a part of Theta or Alpha is abnormally elevated.
2. Train primarily with EC if deviation is only with EC.
3. Train primarily with EO if deviations are only with EO.
4. Train primarily with tasks if deviations are only with tasks.
5. Train in appropriate combination of EC, EO or Task if two or more states appear to have deviations. (Without EO and task norms decisions will have to be made by an experienced evaluation of the data. For example, Alpha is less than 2 SD with EC, decreases even more with EO, but doubles with a cognitive challenge, then train down only with a task and perhaps train to increase Alpha EC posteriorally.)

We have found dramatic and rapid improvements and significant movement toward normalization with post QEEG's with these QEEG based strategies. Down training Beta usually improves insomnia, anxiety, ETOH/drug dependence, irritability and impatience.

EEG Based Subtypes of Anxiety (GAD) and Treatment Implications

Robert L. Gurnee, MSW
ADD Clinic, Scottsdale, AZ

Preliminary data was presented on forty or more cases of Generalized Anxiety Disorder (GAD) in children and adults. The vast majority of these subjects have other coexisting disorders and most were already on medication when referred for evaluation.

The subjects were categorized into the following groups based on one standard deviation increases or decreases in absolute and relative power based on the 19 sites specified in the 10-20 system on the New York University E. Roy John Database. High is +1 SD, Low is −1 SD, Mixed is +1 SD and −1 SD, Normal is no side + 1 or greater or −1 SD or less.

Examination of absolute and relative power raw maps, one Hz bin maps (Hudspeth and/or Neurodata QEEG analysis systems) was also made to assess for atypical patterns over the cingulate (midline area of FZ, CZ, PZ). This was not quantified but based on pattern recognition by the author. The following subtypes are emerging from the data analysis:

1. Excessive Beta
2. Excessive Frontal Alpha
3. Elevated Alpha Mean Frequency
4. Atypical Cingulate Findings: Increased Delta, Theta, Alpha or Beta over any combination of midline sites
5. Deficient Alpha
6. Elevated High Mean Frequency Beta
7. Combination of any of the above
8. Within normal limits

Any of the first seven might be suggestive of cortical over arousal.

Treatment implications based on the QEEG data would suggest efforts to:

1. *Elevated Beta Subtype:* Down train Beta in the specific band elevated (e.g., 22-30 Hz at relevant sites)
2. *Excessive Alpha Subtype:* Down train the specific elevated band width (e.g., 10-14 Hz)
3. *Elevated Alpha Mean Frequency Subtype:* Down train the specific elevated band width (e.g., 10-13 Hz), or up train the specific deficiency slow band width (e.g., 8 to 10 Hz)
4. *Atypical Cingulate Findings Subtype:* Down train specific elevations in Delta, Theta, Alpha or Beta or up train specific deficiencies
5. *High Mean Frequency Beta Subtype:* Down train specific elevated fast frequencies and/or up train the slower speed Beta as appropriate
6. *Deficient Alpha Subtype:* Up train the specific deficient bandwidth of Alpha (e.g., 8-10 Hz)
7. *Combination Subtype:* Combination interventions
8. *Within Normal Limits:* Other forms of biofeedback, such as EMG, thermal, EDR as appropriate combined with individual, couple and family cognitive, behavioral and psychotherapy interventions. Perhaps Alpha increase and decrease training to gain increased control over Alpha so that it is easier to relax when needed without actually increasing the within normal baseline.

Comparison of Therapist-Coached and Unsupervised Neurofeedback Practice

D. Corydon Hammond PhD
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Some neurotherapists carefully coach their patients and serve as another source of feedback to them as they do EEG neurofeedback training. Other therapists hook-up their patients and leave them unattended during their sessions. However, no research exists examining the differential effects of such training. Therefore, in a single-subject design, at identical times of the day, patients were trained with identical protocols with supervision and with the therapist in the room, but without making any reinforcing or supervisory comments. The within session results were then compared. Eighty percent of the patients achieved superior improvements during supervised compared with unsupervised sessions. No one did worse with supervision, but twenty percent of patients demonstrated equivocal results. Based on the preliminary results of this ongoing study, it is recommended that having a therapist present and engaging in coaching and reinforcing the patient will most likely facilitate more rapid progress.

Neuro-Neural Rehabilitation (NNR)

William J Hudspeth, PhD
Neuropsychometric Laboratory, Los Osos, CA

Coherence-phase measurements are an important index for evaluating the degree of connectivity, or NN integration, among the cerebral regions from which we obtain EEG recordings. The availability of commercial coherence (correlation) and phase training systems provide direct methods to carry out NNR (i.e., regulation of the connectivities among cerebral regions that exhibit NN disturbances).

Coherence and phase measurements are inextricably related by calculation. Normative studies of the coherence-phase relationship reveal negative correlations over -0.60, with L-shaped scatter plot distributions. The results show that phase delays larger than 10 msec, the sampling rate of the recursive filter, tend toward randomness and should not, therefore, be used for NNR. This finding suggests that correlation and coherence indices may be of equal value for NNR. The normative results were presented and discussed in detail.

Audio-Visual Entrainment (AVE) in the Management of Learning Disabilities

Michael Joyce, MA
A Chance to Grow, Minneapolis, MN

My first experience with AVE was in reducing the symptoms of ADD in children at two schools in Minnesota. Since then, over 100 children with various learning disabilities including autism have been given AVE, either alone or in conjunction with neurotherapy to help them with attention, cognition and improved behavior. This presentation reviewed the approach used typically at "A Chance to Grow–New Visions," special needs school, and the importance of using AVE at home.

Neurofeedback in the New Millennium: The Quest for Transformation in Body, Mind, and Spirit

Lynda Kirk, MA
Austin Biofeedback Center, Austin, TX

The quest for tools of transformation is as ageless as the human ego. From Elmer and Alyce Green's early work at the Menninger Institute, to our current applications of psychophysiological self-regulation, there have emerged stunning successes in body-mind-spirit healing. With neuro-biofeedback, we can now self-regulate our brain waves, physiology, emotions, cognition, intellect, and consciousness in ways that were not previously possible. This unprecedented ability heralds a dramatic breakthrough in the shift of power to the individual.

This extraordinary tool has the potential to produce enormous social and economic changes. Now is the time to apply ourselves and make these powerful tools of transformation widely available. What we have to gain is quantum leaps in health, human potential, and transcendence. What we have to lose is unnecessary human pain and suffering.

Pills, Politics and Placebos: Sham Controls, Ethics, and the Declaration of Helsinki (or, The FDA Never Met a Placebo It Didn't Like)

T. J. La Vaque, PhD
The Stress Clinic, Green Bay, WI

Psychophysiological interventions are coming under increasing scrutiny and demands for clinical trials that demonstrate efficacy. The Na-

tional Institutes of Health Consensus Development Conference regarding Attention Deficit Hyperactivity Disorder (ADHD) included a review of "alternative therapies" that included a specific call by the reviewer for a "sham controlled randomized trial" of EEG biofeedback treatment of ADHD. Critics have challenged EEG biofeedback therapy on the grounds that it "lacks appropriate controls."

A review of the literature concerning placebo controlled randomized clinical trials (RCT) reveals that medical ethicists have raised serious concerns about the use of placebo or sham controls when a known and effective treatment is available for an "active treatment" control. The primary reference document is the Declaration of Helsinki, published by the World Medical Association. Article 11.3 of the Declaration is broadly interpreted as specifically prohibiting placebo (sham) controls when an effective treatment is available. I will review the Declaration and relevant articles and examine the issue as presently discussed in the biomedical and psychiatric literature. I will present the FDA objections, and present alternative research designs.

The use of sham controls for the study of EEG biofeedback in ADHD would most likely be unethical, but the use of sham controls for other disorders having less well established treatments are ethically permissible.

Frontal Alpha Coherence Asymmetry and Percent Time Frontal Alpha Greater Than Left as Predictors of Depression Severity

Robert Lawson, MS, Timothy Barnes, MS, Eugenia Bodenhamer-Davis, PhD and Sheila Reed, PhD
University of North Texas, Denton, TX

Several measures of EEG frontal alpha asymmetry can predict fairly well whether a person is a member of a depressed or a non-depressed group. This study is part of on going research seeking EEG measures that not only predict group membership but also predict depression severity. Last year, the authors presented that frontal alpha coherence asymmetry has been found to correlate r = .56 with depression severity as measured by MMPI-2 Depression Scale. Rosenfeld, Baehr, and Baehr found in a within-subjects design, that the percentage of time right frontal alpha is greater than left (PCT) increases as depression severity reduces. Baehr, Rosenfeld, and Baehr also found that PCT scores predict membership in a depressed or non-depressed group with PCT scores below 60 predicting depression. The study to be presented ex-

tends the Rosenfeld and Baehr work by testing how well PCT predicts depression severity in a between subjects design. PCT and frontal alpha coherence asymmetry have also been compared as predictors of depression severity.

Participants

The data from all but two of the participants who participated in the original coherence asymmetry study were re-analyzed to derive their PCT scores. These two participants were dropped because their original EEG files were unreadable. All participants were patients who came to UNT Neurotherapy Lab for treatment or assessment, n = 16, 9 male, 7 female. Eligible participants needed an MMPI-2 Scale 2 T-score greater than 60, no reported TBI with loss of consciousness, and no current drug or alcohol abuse or dependence.

Methods

Variables of Interest were:
MMPI-2 Depression Scale
PCT = percent time F4 alpha > F3 alpha
How often F4 > F3
Cohsym = F3-Cz to F4-Cz alpha coherence
A measure of similarity between frontal and central differentiation in each hemisphere. MMPI-2 was administered and EEG measured at intake. EEG recorded with linked ear reference on 24 channel Lexicor. Data were remontaged to Cz reference. A 2 channel bipolar montage, F4-Cz, F3-Cz, was used. A separate study found the correlation between actual Cz reference and linked ear reference remontaged to Cz was r = .82, which was judged to be sufficiently reliable. PCT was calculated by using the full Lexicor report that reports all epochs. Data were imported into SPSS and percentage of epochs with F4 delta < 20 and F4 > F3 were calculated. This method matches Biolex, which calculates PCT by using percentage of epoch in a session that meet threshold.

Results

MMPI-2 Depression Scale correlated with coherence asymmetry, r = .59 and with Percent Time r = .62. Average PCT score was 42 percent. The average PCT results are consistent with the Baehr, Rosenfeld, and

Baehr data that found members of a depressed group had PCT scores below 60. However, this data does not show that across individuals greater depression severity will be predicted by a smaller percentage of time that right side frontal alpha is greater than left side. The data show that more depressed individuals had right side alpha higher relatively more often than less depressed individuals. This finding suggests that the PCT increases with depression severity reduction observed by Rosenfeld et al. were relative to each person's baseline and that between individuals, specific PCT scores can not be linked to depression seventy scores. On the other hand, coherence asymmetry may be a reliable predictor for depression scores. Replication with different samples is needed to see if these results are consistent across the population.

The Nose or Window to the Brain

Rosemary P. MacGregor, RN
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Are we doing this backwards? Is neurofeedback training ultimately breath training? Can breath training enhance and direct EEG or neurofeedback training? What are the known issues about breathing and its affect on the brain, the ANS, behavioral and intellectual performance? Can we improve neurofeedback training with the incorporation of some teaching and principles of breath training?

EEG and Executive Processing

Karl H. Pribram, PhD, Professor Emeritus, Stanford University, James P. and Anna King Distinguished Professor and Eminent Scholar, Commonwealth of Virginia, Distinguished Research Professor, Georgetown University

What parts of the brain are involved when a subject tries to control his/her perceptions? The results of experiments utilizing shifts in views of ambiguous figures will be presented. Rather than anchor the brain electrical recording on environmental events (ERPs), we anchored our recordings on a response to a shift in the view of the ambiguous figure (SRP). Brain systems (executives) involved in regulating other brain systems and the coordinate changes in this extraordinary tool have the potential to produce enormous social and economic changes.

EEG Training on 71-Year-Old Female Stroke Patient

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This single case presentation concerned the treatment of a 71-year-old female stroke patient. The patient's MRI revealed that the location of the stroke (hemorrhage) was in the right side basal ganglia with projection onto the right side parietal area. She presented with a virtual paralysis of the left side of her body (hemiplegia–with immobilized left arm, contracted fist, minimal motor control over left leg, absence of muscle tonus in left side of face and slurred, monotonic speech). She required full time use of a wheel chair and a great deal of assistance when moving from the chair to her bed.

The patient's EEG revealed excessive theta (3-7 Hz) activity on the right side as measured at C4. EEG training protocols included SMR (12-15 Hz) enhancement at C4, C4-Pz and T3-T4 with theta suppression; beta (15-18 Hz) enhancement with theta suppression at C3 and at C3-Fp1. Additional biofeedback measures were temperature and EMG (electromyograph) to monitor peripheral vasodilatation and neuromuscular activity in the left arm. EMG measures were used primarily to monitor the area with the greatest degree of motor impairment. The primary treatment was EEG training.

The patient showed significant improvement in gross motor control and range of movement of left arm and leg. The most dramatic improvement was observed in speech (articulation, strength and tone). Since she was receiving additional treatment (physical therapy and medication management) it is impossible to attribute the improvement in functioning solely to the EEG training. However, the consensus among the attending medical personnel was that these improvements took place with unusual expeditiousness. T3-T4 proved exceptionally beneficial regarding improvements in motor control. The reason for this may be that bipolar training essentially imposes a phase relationship on the two sites, thereby requiring greater involvement of the thalamocortical regulatory circuitry. This is particularly true with placements that cross the midline where the connections are exclusively subcortical. These subcortical shifts may then result in a more global differentiation of function at the level of the cortex. Further investigation is, of course, needed.

Detection of Deception Using Evoked Potentials

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Does the profile or pattern of event-related brain wave (ERP) amplitudes across the scalp vary from deceptive to honest mind states? We mostly look at the P300 ERP in response to autobiographical information. There is an obvious application here to the field of detection of deception, but there are other more theoretical concerns: Is there a profile specific to deception (a "Pinocchio" effect)? Does the brain work in a unique way during deception? Does altruistic deception show a different P300 profile than selfish deception? Do the brains of psychopaths produce different P300 profiles than the brains of normals during deception? (The preliminary answer here is "no.")

What is the difference in brain function during retrieval of (a) real memories, versus (b) honestly believed, but false memories, versus (c) malingered false memories (which the subject knows are not real, but dishonestly claims are real)? This question is addressed by comparing P300 scalp profiles associated with the three kinds of memories. We also look at the latency of the P300 wave (time from stimulus to wave peak) and have so far found it is the best discriminator of (a) and (b) above. This suggests that P300 latency is a correlate of unconscious recognition.

The Effect of Music on Attention

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The IVA Continuous Performance Test was used to compare whether a particular type of music (i.e., classical or pop) or no music, quiet test conditions enhanced attention functioning. Many young people like to listen to music while they study and a number of studies were found in the research literature that reported music composed by Mozart enhanced visuo-spatial cognitive functioning. Other studies did not find any benefit in cognitive functioning from listening to Mozart's music. More research was clearly needed to find out if music can enhance a person's attention.

The first hypothesis was that a person would be better able to pay attention while listening to classical music than to no music. The second hypothesis was that a person would be better able to pay attention in a condition of no music than while listening to pop music. The third hypothesis was that a person would be better able to pay attention while listening to classical music than to pop music. The IVA CPT was utilized, as it assesses both auditory and visual attention and, thus, could help identify any effects in either sensory modality. Twenty subjects between the ages of ten and eighteen were used in this experiment. The subjects were tested in a counterbalanced, random order with half of the participants tested under both no music and pop music conditions. The remaining subjects were tested under both no music and classical music conditions.

The first hypothesis was not supported. Individuals, while listening to classical music, did not show improvement in their visual or auditory attention or in their visual or auditory response control. There was no significant difference between the pop music group and the no music group in visual attention, auditory response control or auditory attention. There was a significant difference ($p < .02$) for popular versus no music but not in the predicted direction. Pop music led to better visual response control than no music. There was no significant difference in auditory response control and visual attention between popular and classical music conditions. There was a significant difference ($p < .04$) in visual response control between pop and classical, but it was not in the predicted direction. A very strong trend was also found for auditory attention, ($p < .06$), which again was not in the predicted direction, with people performing better while listening to popular versus to classical music.

These results may be due to the fact that these subjects were used to listening to pop rather than classical music, so the classical music creates more of a distraction than the music they normally listen to. Another possibility is that classical music may be harder to listen to as background music because it is more complex than pop music. If this experiment were repeated, the scientist might want to try it with people who normally listen to classical music. The scientist also might want to try this experiment with different types of tasks such as reading comprehension or memory tasks. It would be interesting to try the experiment with some other kinds of classical or pop music and with a larger number of subjects.

Malingering and Sustained Attention

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Malingering is, "The deliberate exaggeration of psychological and/or physical complaints for purposes of tangible gain (monetary rewards, etc.)." It is a difficult problem in health care. Head injuries frequently cause problems in attention and memory. Tests of attention capacity require the subject to make reasonable effort. This makes them easier to fake than most medical evaluations. The purpose of the experiment was to determine if behavioral observations or a mathematical decision rule could identify malingering on a test of sustained auditory and visual vigilance. The hypothesis was that subjects attempting to malinger would respond in a way that was clearly different than when they were instructed to try their best.

Thirteen adult volunteers took a computer-administered test of attention on two separate occasions. On the first testing half the subjects, chosen at random, were told to do their best. The other subjects were instructed to fake an attention problem as cleverly as they could. On the second round, each subject was given the instruction he/she had not received in the first trial. Behavioral observation identified persons attempting to malinger 31% of the time. Analysis of test scores showed five variables of attention to change greatly under the malingering condition. When these were added together for each subject, the summary score separated the malingering subjects from those told to try hard with 100% accuracy, on both testing trials. On cross-validation, a modified decision rule classified all brain injured and Attention Deficit Disorder subjects as making satisfactory effort.

Can Audio Visual Entrainment Enhance Neurofeedback Training?

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The issues surrounding this question are complex and full of unexpected caveats. In using these two technologies in our office we have found intriguing patterns emerging. Clients report qualitative differences between the two technologies. At times AVE appears to enhance performance and at other times to impede it. Results seem to vary predictably based on baseline profiles, but unusual exceptions consistently occur. In addition, the effect of AVE also appears to vary over the

course of the training cycle in relatively consistent patterns, which further complicates investigation. Other questions emerge regarding when in the session it is most effective to use AVE and at what point, if any, it is no longer useful. The training patterns suggest the possibility that these two technologies utilize different attentional networks for their impact.

This presentation reviewed case studies, which highlight important issues to be considered in future research in this area. An attempt will be made to generate tentative axioms of AVE assisted NFB and explain why it is important to test these axioms as well as what difficulties might be involved in the effort.

EEG Changes on TBI Patients with Attention Deficits After Implementation of Cognitive Rehabilitation Using a Computerized Program for Attentional Skills

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The purpose of this study is to test the relationship between cognitive rehabilitation and changes in the EEG patterns in primarily TBI patients with attention deficits. The rationale is that while EEG biofeedback apparently constitutes a direct way of changing one's brain waves, computerized cognitive rehabilitation achieves the same results, in an indirect way. No related previous research seems to have been conducted before.

The first purpose of this study is to identify the relationship between cognitive rehabilitation of attention deficits and changes in the electroencephalographic (EEG) patterns in traumatic brain injured (TBI) patients with attention deficits, as well as one participant suffering from attention deficits due to breathing of pesticides. The patients have been trained in a software program called Captain's Log, which provokes positive attentional behavioral changes.

The second purpose of this study is to identify possible correlations between the EEG patterns–measured after implementation of the cognitive rehabilitation treatment on attention deficits–and improvement on different kinds of attention. The four participants (three TBI and one from breathing of pesticides) after being assessed with all the measures and an eyes-open/eyes-closed baseline of EEG activity, received 24 sessions training with the software program Captain's Log. The same measures and EEG recordings were given to them at the end of the train-

ing. The WAIS-R Digit Span Subtest, the WAIS-R Digit Symbol Subtest, the Paced Auditory Serial Addition Test (PASAT) and the Stroop Test, have been given to all participants in order to assess respectively their immediate or working memory, their information processing speed performance, their divided attention skills and their distractibility attention capacities. The IVA Continuous Performance test, which measures attention and hyperactivity, has also been administered. In the Captain's Log different kinds of tasks are involved on attention, visuo-spatial skills, memory vigilance, impulsivity, focus and speed. An eyes-open/eyes-closed baseline of EEG activity has been recorded using a 19-channel electrode cap to measure participants' brain electrical activity for deviations from a normative database. Each recording includes one eyes-open/eyes-closed baseline, a recording during eight cognitive tasks and a second eyes-open baseline after the tasks.

The EEG recordings, as well as the five measures, will be compared before and after the training period. Since an improvement in most of the measures has been assessed after the training period, suggesting an objective measure of improvement in attention, normalization in their EEG recording is also expected. This finding would constitute a significant suggestion that cognitive rehabilitation may affect the EEG. A further purpose of this study is to compare these data to a later collection of data from the same patients trained for the alleviation of their attention deficits with EEG biofeedback.

ADD Subtypes in QEEG with Multi-State Analysis

M. Barry Sterman, PhD
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This discussion focused on the important contribution of quantitative EEG findings to both the classification and treatment of attention and conduct disorders in children. Recent quantitative EEG findings have indicated that a number of different abnormal markers can be found in the eyes-closed EEG within this population. This fact has provided differential guidelines for more effective pharmacological treatments. The addition of multi-state analysis, and particularly mathematics performance, to QEEG assessment has significantly improved pattern differentiation in our clinical studies. In several subtypes, QEEG disturbances were seen only during math performance. Three distinct but partially overlapping QEEG subtypes of ADD were described, associated tenta-

tively with affective, attentional, and impulsive disturbances, respectively. QEEG assessment with multiple-state analysis promises important advances for neurotherapy as well. The concept of EEG normalization that is basic to the "re-regulation" model of this treatment modality dictates that these markers in fact guide differential treatment strategies.

Operant Conditioning or Conditioned Operation, Scientific Panel

M. Barry Sterman, PhD, School of Medicine, University of California, Los Angeles, CA and *Gail Peterson, PhD*, Department of Psychology, University of Minnesota, MN

From a theoretical perspective, two different models have emerged in the clinical application of neurotherapy. The first derived initially from animal research, and was based on the use of EEG operant conditioning to promote the exercise and thereby the normalization or enhancement of underlying neural substrates. This model has been used primarily in the treatment of structural and metabolic disturbances of the brain, as well as in the pursuit of "peak performance." The second model seeks to guide changes in state deemed to be therapeutic. It has been used primarily in the treatment of substance abuse and psychological trauma resolution.

Our interest in this discussion was directed exclusively to the first model. Contemporary approaches to "exercise" neurofeedback are dictated by the equipment available for treatment. This equipment has been developed by engineers who know little of learning theory, or who have failed to obtain necessary information from those who do. The result is a field driven by methods that disregard some of the fundamental principles of operant conditioning. Such deficiency, in turn, may seriously constrain the efficacy of this important new treatment modality. This issue and these principles were discussed in detail.

Quantitative EEG Research with Precociously Reading Children: The Importance of Alpha Peak Frequency

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EEG research with particular clinical populations (e.g., Alzheimer's and mental retardation) has confirmed that reduced alpha peak frequency is often associated with cognitive deterioration. However, a

comparable body of research with high-functioning populations does not exist. Thus, increased peak frequency in alpha has only been hypothesized to relate to advanced brain maturation. The purpose of this investigation was to compare the alpha peak frequency of precociously reading children to that of normal children. The experimental group in this study consisted of 15 Early Readers (ER), labeled such due to exceptional performance on the Reading composite of the Wechsler Individual Achievement Test (WIAT) and the Test of Early Reading Ability (TERA-2). One comparison sample included 15 Age-Level Matched (ALM); this group was similar to the ER groups in terms of cognitive functioning (as assessed by the Kaufman Brief Intelligence Test: K-BIT) and age, but scored in the normal range of the WIAT and TERA-2. A second comparison group, composed of 15 Reading-Level Matched (RLM) controls, had WIAT and K-BIT scores equivalent to the ER group, but were 2.5 years older than the experimental sample. QEEG evaluations of each participant were made during a resting, eyes-closed condition.

Results indicated that, as hypothesized, peak frequency in alpha did separate the groups. Specifically, the ER group had significantly higher alpha peak frequency than the ALM group at 16 of the 19 sites examined. This difference was consistent across all brain regions, as the mean alpha peak frequency at each site was between 9.0 and 9.3 Hz for the ER group and between 8.6 and 8.8 Hz for the ALM subjects. Furthermore, peak frequency in alpha did not differ significantly between the ER and RLM sample. These results suggest that increased peak frequency in the alpha band is indicative of brain maturation and is associated with precocious reading ability.

(The author gratefully acknowledges James Evans, PhD and Lynn Olsen, PhD for their extensive contributions to this work.)

An Integrated Program for Enhancing Peak Performance

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What is the inner experience that leads to peak performance? What ingredients facilitate building the inner resources to be able to achieve this state at will? Benchmarking common characteristics of optimal performers within business, the performing arts and athletics reveal key competencies and skills. The business and sports communities identify the following as some of these traits.

- A personal mission or vision
- Flexibility of attention
- Stamina with recovery techniques
- Consistently challenging one's self
- Lack of self consciousness
- The ability to lead and motivate
- Expertise in mental imagery
- Spiritual connection

How can we help those who want to achieve consistency and optimal functioning in performance? This model draws upon techniques that include EEG biofeedback, physiological balance, inner journey, mental rehearsal and coaching.

The EEG biofeedback training assists the client in recognizing the inner experience of optimal state and learning to replicate that state. Managing arousal and balance in performance means synchronizing mental and emotional imagery with logical thinking. EEG biofeedback is transformative in improving attention, control, and steadfastness and helps in dissolving memories and barriers to performance. The transfer of the ideal state of arousal and physiological balance is greatly reinforced with the use of Open Focus. This technique, developed by Dr. Les Fehmi, is utilized following the biofeedback as a tool to facilitate the shift of state. Through the use of guided imagery and hypnosis, the client co-creates an inner journey that facilitates the replacement of old, maladaptive thought patterns with new, positive ones. Critical as well to the enhancement of performance is learning the skills associated with mental preparation and simulation.

Non-Invasive Intentional Increase of Regional Cerebral Blood Oxygenation; Effects of Brain Exercise: A Controlled Study

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Many brain disorders such as attention deficit disorder, schizophrenia, Alzheimer's disease, traumatic brain injury, depression, bipolar disorder and senile dementia show reduced blood flow to affected areas. Reduced regional cerebral oxygenated blood ($rCBO_2$), limits brain function. Increased brain dendritic density and vascularity resulting from brain stimulating exercise has been demonstrated in mice. In-

creased dendritic density and vascularity in hypo-perfused brain volumes can be expected to improve brain function. The present study supports that possibility in humans. Brain imaging studies show that stimulation with intentional brain actions is marked by local increases in blood flow and metabolism. Here we demonstrate that one can voluntarily increase $rCBO_2$ at the monitored hypo-perfused brain position. We define "Hemoencephalography" (HEG) as graphs of brain blood characteristics. With this technique we explore voluntarily increasing brain $rCBO_2$ as a simple easily learned repeatable brain exercise which measurably improves brain function. The effect of ten brain exercise sessions on an experimental group is compared to the effect on a similar group undergoing ten less strenuous sessions. Results are compared with a standard normalized reaction time test. Separate before and after SPECT studies illustrate the effect on a subject's $rCBO_2$ of thirty such brain exercise sessions.

Psychopathological Evaluation of Children and Adolescents: Case Studies Involving QEEG

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This paper's discussion centered around a collaborative effort between two extensions of the University of Tennessee, Knoxville Psychology Department: the Brain Imaging Lab directed by Joel Lubar, PhD and the Child & Adolescent Assessment Project under the direction of Robert Wahler, PhD. Traditional psychological assessments combined with QEEG assessments were used to evaluate children referred to the clinic between the ages of six and sixteen. QEEG researchers were blind to the conditions and results of the psychological exams in order to remove biases in data evaluation. Several case studies were presented, which involved complex psychological diagnoses and combined pathologies accompanied by unique QEEG results.

QEEG data was obtained using eyes-open and eyes-closed baselines followed by a reading task. The eyes-closed data were evaluated with the Thatcher Lifespan database. Psychological batteries were used to evaluate stress perception in the development of psychopathology in children and adolescents. The batteries consisted of such instruments as the NIMH Computerized Diagnostic Interview Schedule for Children-

IV, Child Behavior Checklist, Youth Self-Report, Children's Depression Inventory, Revised Children's Manifest Anxiety Scale, Personality Inventories for Children and Youth, Psychopathy Screening Device, Life Events Checklist, and COPE. All cases were evaluated for attentional deficits. Features, results and implications specific to each case were discussed.

Individualizing EEG Biofeedback in Addictive Disorders
David L. Trudeau, MD
Editor, *Journal of Neurotherapy*

While alpha-theta training has become synonymous with brainwave biofeedback for addictive disorders, the relationship of alpha-theta training to underlying alcoholic neurophysiology is not understood. There are several conditions commonly associated with addictive disorders that have known neuroelectrophysiologic aberrations. Three of these, Depression (unipolar), Attention Deficit Hyperactivity Disorder (ADHD) and Traumatic Brain Injury (TBI), have been the focuses of specific brain wave biofeedback approaches. In addition, neurotoxicity associated with chronic stimulant and cannabis abuse produces characteristic pronounced aberrations of QEEG thought to be electrophysiologic manifestations of the underlying brain dysfunction known to be associated with these drugs.

Specific EEG biofeedback strategies to correct these aberrations may be useful clinically. There are no published systematic studies of neurotherapy treatment of co-occurring depression, TBI, ADHD, or drug neurotoxicity on the course and outcome of addictive disorders. Nevertheless, it may make good sense clinically to consider specific neurotherapy treatment of these disorders either in place of or preceeding alpha-theta therapy. Secondly, applicable neurotherapy approaches are attractive alternative therapies for coexisting or underlying conditions in PSUD clients who have high-risk behaviors for medication treatment, such as overdosing, abuse, or poor compliance.

Maybe You Are an AUTHOR After All!
David L. Trudeau, MD
Editor, *Journal of Neurotherapy*

This presentation addressed clinicians who have been thinking about writing for a Journal, but just haven't gotten around to it. Types of clini-

cal writing that are publishable by clinicians (correspondence, brief reports, case studies, open clinical trials, book reviews, literature reviews, essays) were discussed and tips and resources for effective writing were presented.

Quantitative Encephalograms (QEEG) in Children with Reactive Attachment Disorder

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Recent work with 39 subjects–all diagnosed with Reactive Attachment Disorder (RAD)–showed specific patterns of EEG slowing at specific sites in the brain. Of 39 subjects under eighteen, 97.44% had frontal lobe problems (midline [FZ] and/or vertex slowing [CZ]) and 89.74% had right temporal slowing [T6].

The subjects were clients from Cascade Center for Family Growth (Orem, UT), under 18, who have a QEEG report with neurofeedback protocol formulated by Jay Gunkelman, and who have a previous diagnosis of RAD. EEG data was taken on a Lexicor NRS-2D at nineteen sites. Data was taken, eyes-closed, eyes-open, reading, math, and hyperventilation. Data was then sent to Q-Metrx in Burbank, CA for analysis. Reports were formulated, returned and filed in our office.

I reviewed neurofeedback protocols formulated by Jay Gunkelman and tabulated whether or not Fz or Cz, and T6 were indicated as areas needing treatment. Data was then arrayed. Each site was shown as a percentage (e.g., 80% of subjects had treatment suggested at T6). I then visually inspected all reports, where T6 was not designated for treatment, to see if the map indicated any slowing at T6. Those eyes-closed QEEG data were reviewed with Jay Gunkelman. If he concurred that there was T6 slowing, those subjects were included and a new percentage and category was formulated.

There were 39 subjects. Eighteen had Fz indicated for treatment (46.15%) and 18 had Cz indicated for treatment (46.15%). Therefore, 38 had Fz or Cz indicated for treatment (97.44%). There was only one subject that did not have midline treatment indicate. That child had F3 indicated for treatment and the diagnosis may have not been appropriate since the primary problem was that the child was a 'crack baby.' Twenty-six had T6 indicated for treatment (66.66%–2/3rds). After reviewing the maps and including those reviewed, 35 had T6 slowing as confirmed by the author and Jay Gunkelman (89.74%).

The frontal lobe condition (anterior cingulate gyrus and the attendant cortex affected) has been shown by others (Daniel Amen) to be consistent with Obsessive Compulsive Disorder, addictions, and Oppositional Defiant Disorder. Those who live and have extensive experience with this population (RAD) know that there are obsessions and compulsions commonly exhibited. Obsessions such as: control, sex, stealing, lying, hoarding, picking at skin–scabs, etc. Also, it would be hard to find a Reactive Attachment Disordered (RAD) child who hasn't exhibited oppositional or defiant behavior.

The right temporal lobe problem is consistent with the socio-perceptual problems commonly seen in RAD children. These children do not reference social context well (i.e., the feelings of their mother, frustrations of others, how other children feel when the RAD child is controlling). This leaves them very in touch with what they want but very unaware of their impact on others. Therefore, empathy and the 'golden rule' can be quite "lost on them." Violence is not uncommon with these children.

Quantitative Electroencephalography and Neuropsychological Assessment of Adult ADHD

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Contemporary diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) is based on subjective reports of developmentally inappropriate behaviors across the three symptom domains of inattention, impulsivity, and hyperactivity (American Psychiatric Association & American Psychiatric Association. Task Force on DSM-IV, 1994; Monastra et al., 1999; Swanson, Castellanos, Murias, LaHoste, & Kennedy, 1998). Although originally considered a disorder of childhood, ADHD symptoms have been shown to persist into adolescence and adulthood (Barkley & Biederman, 1997; Gansler et al., 1998; Mancini, Van Ameringen, Oakrnan, & Figueiredo, 1999; Murphy & Barkley, 1996). Given the enduring quality of clinical symptoms and the present reliance on subjective methods for determining an accurate diagnosis, attempts have been made to identify objective measures and criteria to aid in the diagnostic process. However, instruments with sufficient sensitivity and specificity have not yet been established to replace a thorough clinical case history for diagnosing ADHD (Swanson et al., 1998).

Research has indicated that quantitative electroencephalography (QEEG) may be a useful adjunct in the diagnosis of ADHD (Chabot, Merkin, Wood, Davenport, & Serfontein, 1996; Chabot & Serfontein, 1996; Mann, Lubar, Zimmerman, Miller, & Muenchen, 1992; Monastra et al., 1999). The typical QEEG pattern of ADHD consists of an excess of theta activity and a deficiency of alpha or beta activity in children (Chabot & Serfontein, 1996; Clarke, Barry, McCarthy, & Selikowitz, 1998; Mann et al., 1992). In other children and adolescents, increases in theta or alpha activity may be prevalent (Chabot & Serfontein, 1996; Lazzaro et al., 1999). Given that there are age-related changes in the EEG and possible QEEG age-related changes in adult ADHD (Bresnahan, Anderson, & Barry, 1999), additional QEEG measures may have diagnostic qualities for adult ADHD.

The current study examines the QEEG relationships of college-aged adults, with and without ADHD. All recordings were obtained from 19 locations according to the 10-20 system of electrode placement (Jasper, 1958) against linked earlobe references. EEG recordings were made using a fitted electrode cap (Electro Cap Co.) and a Lexicor NeuroSearch-24 Electroencephalograph with a sampling rate of 128 samples per second. In addition to the EEG channels, electrodes were placed at the outer cantheus of each eye to monitor horizontal eye-movement; 2 cm above and below the left eye to monitor vertical eye-movement; and at the base of the mentalis muscle on the chin with reference to the left cheek to monitor jaw movement during vocalization.

QEEG recordings were obtained during two baseline conditions and during three neuropsychological test procedures. The baseline conditions included both an eyes-closed and an eyes-open recording. The three task conditions included administration of the Paced Auditory Serial Addition Task (PASAT) to assess attention and information processing; administration of the Wisconsin Card Sorting Test–Computerized Version (WCST-CV) to assess abstract reasoning ability and ability to shift cognitive sets; and administration of the Intermediate Visual and Auditory Continuous Performance Test (IVA) to assess response control and sustained attention.

The initial results are based on a sample of ten adults with ADHD and twenty-one adults serving as non-clinical controls. Preliminary findings suggest that there are QEEG differences both between the ADHD and control groups and between the baseline and task conditions. Of particular interest is the finding that activity in the low-alpha (8-10 Hz) range compared to activity in the low beta (13-21 Hz) range, as indicated by a higher low-alpha/beta power ratio appears to show greatest diagnostic

quality for these ADHD adults. Implications of various QEEG measures will be discussed accompanied by a review of the procedural and methodological concerns for concurrent neuropsychological and QEEG assessment.

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