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Summary of Articles with Abstracts

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Volume 4, Number 1

Editorials
The Journal of Neurotherapy welcomes associate editors Jay Gunkelman (Technical Notes), Cory Hammond (Clinical Corner) and David Kaiser (News from other Journals and Websites). Changes in editorial policy explained for technical standards. Keeping the peer review process unbiased and objective. Cash award for paper announced.

Scientific Articles

Effect of Neurofeedback on Variables of Attention in a Large Multi-Center Trial
David A. Kaiser, Ph.D. and Siegfried Othmer, Ph.D.

Background. Neurofeedback studies have been criticized for including small numbers of subjects. The effect of SMR-beta neurofeedback training on the Test of Variables of Attention was evaluated in more than 1,000 subjects from thirty-two clinics.

Methods: 1089 subjects (726 children, 324 females, 186 with ADHD or ADD diagnoses) underwent twenty or more sessions of SMR-beta neurofeedback training for attentional and behavioral complaints at thirty-two clinical settings affiliated with EEG Spectrum, Inc. Subjects were evaluated prior to training and at training completion. One hundred and fifty-seven subjects who elected extensive training (forty sessions or more) were tested after both twenty and forty training sessions.

Results: Neurofeedback training produced significant improvement in attentiveness, impulse control, and response variability. Significant clinical improvement in one or more measures was seen in eighty-five percent of those subjects with moderate pre-training deficits.

Conclusions: Neurofeedback training is effective in remediating attentional dysfunction. Nevertheless, large-scale studies with greater control (e.g., wait-

Comparison of Alpha-Theta, Alpha and EMG Neurofeedback in the Production of Alpha-Theta Crossover and the Occurrence of Visualizations
John P. Moore, B.A., David L. Trudeau, M.D., Paul D. Thuras, Ph.D., Yael Rubin, M.A., Herbert Stockley, M.S.W., and Teri Dimond, M.S.W.

Background: Alpha-theta biofeedback training has been employed in clinical addictions treatment since the first reports of successful application by Peniston and Kulkosky. Several studies have questioned the theta crossover component of this feedback protocol as necessary to the training condition.

Methods: We observed theta and alpha amplitudes, percentage of theta/alpha crossover, and self-reports of visualization in 191 sessions of three different protocols of brain wave biofeedback. Feedback conditions studied were alpha only, alpha-theta, and a type of EMG training. Subjects with identical electrode placement in all conditions, and not informed as to the nature of the feedback received, were given the same induction and expectations. They were asked to describe imagery occurring during feedback.

Results: Visualization was found to be not exclusive to alpha-theta neurofeedback, but instead was present in all three modes of feedback. In addition, an inverse relationship was found to exist between the degree of theta-greater-than-alpha states and the presence of visual imagery. EMG sessions produced a greater percentage of time in theta/alpha crossover states than alpha training alone, but the differences were small.

Conclusions: Alpha only feedback, EMG feedback and alpha-theta feedback sessions were associated with similar amounts of average Theta/alpha ratio

list designs) are sorely needed.

KEYWORDS: Neurofeedback, EEG biofeedback, Attention, multi-center, outcome, TOVA

The Effects of Brief, Eyes-Open Alpha Brain Wave Training with Audio and Video Relaxation Induction on the EEG of 77 Army Reservists
John Putman, M.A.

Background: Recently, psychologist Barry Sterman of the UCLA School of Medicine became involved in measuring the brainwave activity of pilots engaged in a variety of tasks for the purpose of identifying the brainwave correlates of peak performance under different load conditions. Sterman found that during a manageable periodic challenge the brainwaves exhibited, in parietal areas, a consistent cycling between resting state alpha (when in the attentive readiness state) and an alpha desynchronized, elevated low beta state when engaged in the response mode. As the tasks came closer together, hence allowing for no alpha respite, there was deterioration in performance accompanied by an increase in theta activity. In this paper, the effects of brief, eyes-open alpha brainwave enhancement training will be examined for the general purpose of suggesting possible methods for increasing functional integrity and cortical flexibility through increased alpha brainwave production.

Method: The subjects were 77 U.S. Army reservists. The EEG biofeedback system used was the BioIntegrator manufactured by the Bio-Research Institute. Alpha enhancement training was employed with electrode placement at Pz.

Results: It was found that eyes-open alpha enhancement training resulted in substantial increases in activity in the feedback band (alpha) with smaller increases in low beta and decreases in theta. This is quite a different result than one would expect from general “relaxation” training that is usually accomplished with eyes closed and yields substantial increases both alpha and theta.

Conclusion: When engaged in this training, even for brief periods, the EEG moves in a direction quite different to that of Sterman’s burnout profile. It would be of interest to demonstrate rigorously that the training could, if administered preventatively, diminish poor performance in persons performing tasks that demand prolonged periods of external and percentage of Theta/alpha crossover across sessions. Neither alpha-theta biofeedback nor biofeedback associated Theta/alpha ratio increase is specific to the self-reported production of imagery.

KEYWORDS: Biofeedback, EEG, EMG, Alpha-theta, Alpha, Addiction, Theta Crossover

Current Concepts in Neurotherapy

Streifel (The Role of Aspirational Ethics and Licensing Laws in the Practice of Neurofeedback.) discusses the ethics of client-centered care vs. the legalities of practice law. This expert discussion is important for all neurofeedback practitioners, whether or not they operate under state regulatory agencies.

Technical Notes

Gunkelman (Hjorth Montage) looks at the effect of montage on the appearance of brain maps that produce apparent CZ rhythms that are actually temporal in origin. The all-important implications for neurotherapy and neurometrics are discussed.

Hamilton and Barnes (Neurofeedback Equipment Study I- Focused Technology F- 1000 Main Board Investigation) present a model for independent evaluation of variance in brain wave biofeedback equipment. This is one of a series of studies they propose. Frank Deits, design engineer of the F-1000 comments.

News from Other Journals and Websites

David Kaiser, the new associate editor for this section, presents the best in topical reviews of current articles of interest. A wealth of web resources is reviewed in each issue. The January 2000 Issue of Clinical EEG, a review of EEG biofeed- back is discussed at some depth. Included is a discussion of Barry Sterman's review of neuro-therapy in seizure disorder, and Frank Duffy's critique of the state of the art today.

Clinical Corner

In this new feature, Associate Editor Cory Hammond calls upon experts Margaret Ayers, Marvin Sams, Barry Sterman and Joel Lubar to discuss protocols that employ inhibition only vs. protocols that employ both inhibit and reward. He then turns his attention to the question of what to tell patients who say there is no medical justification for neurotherapy treatment of ADHD.

focus under high load conditions.

KEYWORDS: Eyes-Open Alpha, PRS, Post Reinforcement Synchrony, Cortical Flexibility, Alpha Immersion

Volume 4, Number 2

Editorials

Lubar (Proper development of protocols for neurotherapy) comments on the need for appropriate validation of brain wave biofeedback protocols held out to the public. Trudeau encourages readers comments on the journal and other matters pertinent to neurotherapy. Cash award for student paper rules revised to be more inclusive.

Scientific Articles

Audio-Visual Entrainment Program as a Treatment for Behavior Disorders in a School Setting

Michael Joyce, M.A. and Dave Siever, C.E.T.

Introduction. It has been suggested that the behavioral manifestations of attention deficit hyperactivity disorder (ADHD) are secondary to neurological abnormalities and are characterized as low brain wave disorders. ADHD children produce higher amounts of theta (5-7 Hz) and less beta (13-21 Hz) brain wave activity than normals. Many researchers are testing the therapeutic effectiveness of Audio Visual Entrainment (AVE) as a treatment for a variety of low arousal brain disorders. AVE is the repetitive and intermittent presentation of light and sound. AVE affects electroencephalographic (EEG) output in that brain wave output can be suppressed or enhanced at specific frequencies.

Procedure. Thirty-four elementary students from twodifferent schools were given AVE over the course of seven weeks. Participants were given the Test of Variables of Attention (TOVA) before and after participation. A second group of eight participants were in a special reading (SPALDING) class. All of the students in this class received the Standardized Test for the Assessment of Reading (STAR) and were compared with a control group, n=12.

Results. Overall inattention, impulsivity and variability as rated by the TOVA improved significantly. The eight students from the SPALDING reading program who received AVE improved their reading scores more than their

Neurofeedback Treatment of Depression with the Roshi

D. Corydon Hammond, Ph.D

Introduction. A patient with severe, medication resistant depression was found to have the frontal alpha asymmetry described in Davidson's (1998a) research as demonstrating a predisposition to depression.

Treatment. Initial sessions of EEG neurofeedback using Rosenfeld's (1997) protocol for correcting the alpha asymmetry were discouraging, actually producing slight negative change. Therefore, treatment shifted to using the Roshi, a two channel unit combining neurofeedback and photic stimulation, doing primarily left hemisphere beta training.

Results. The very first Roshi session produced positive changes, and within five sessions the patient reported feeling less depressed and more energetic. At the conclusion of thirty training sessions, objective testing documented dramatic reductions in depression, somatic symptoms, overemotionality, anxiety, rumination, and fatigue. Discussion. In support of Henriques and Davidson's (1991) belief that hypoactivation of the left hemisphere results in an"approach deficit" and more withdrawal behavior, post-testing and interview data also documented that the patient had become less withdrawn, more active, sociable, and less distrustful. Eight and one-half month follow-up documented maintenance of changes. Continued exploration of left hemisphere beta protocols in treating depression, and of the combined use of neurofeedback with photic stimulation are encouraged.

KEYWORDS: Neurofeedback, Biofeedback, EEG, Hypnosis, Alternative medicine, Complementary medicine, EEG biofeedback

News from Other Journals and Websites

Kaiser reviews two important papers in depth, one dealing with test retest reliability of task EEG, and one dealing with thalamocortical dysrythmias as

classmates who served as controls. The results included normalization as recorded on the TOVA, substantial improvements in reading as recorded on the STAR, and improvements in general behavior as noted by teachers and parents.

Discussion. The data suggests AVE was a useful experience for the participants. The results met or exceeded our expectations.

KEY WORDS: Audio-visual entrainment (AVE), audio-visual stimulation (AVS), attention deficit disorder (ADD), learning difficulties (LD), tests of variables of attention (TOVA), academic performance

Changes after EEG Biofeedback and Cognitive Retraining in Adults with Mild Traumatic Brain Injury and Attention Deficit Hyperactivity Disorder

Timothy P. Tinius, Ph.D. and Kathleen A. Tinius, M.S.W

Introduction. Adults diagnosed with mild traumatic brain injury (mTBI) or Attention Deficit Hyperactivity Disorder (ADHD) were treated with EEG Biofeedback and cognitive retraining.

Methods. Psychological and neuropsychological tests were completed at pre treatment and post treatment and compared to a normal control group that did not receive training, but tested on two occasions.

Results. The results found significant improvement on full scale attention and full scale response accuracy of a continuous performance task in the mTBI and ADHD groups compared to the control group. A self report showed a significant decline in symptoms in the mTBI and ADHD groups compared to the control group. Errors on a problem solving task decreased only in the mTBI group.

Discussion. The treatment model used in this study showed significant improvement in the sustained attention of individuals diagnosed with mTBI and ADHD after twenty treatment sessions.

KEYWORDS: EEG Biofeedback, Neurofeedback, Neurotherapy, Cognitive Retraining, Cognitive Rehabilitation

seen by MEG. Thumbnails are given of recent papers relating to EEG theory and practice. An updated listing of online resources.

Current Concepts in Neurotherapy

Kaiser (QEEG: state of the art or state of confusion) reviews and critiques the classic literature on spectral analysis of human EEG and discusses methodology issues inherent in these studies, proposing standards for neurofeedback use of QEEG.

Technical Notes

Rosenfeld (Theoretical implications of EEG reference choice and related methodology issues) offers an elegant discussion of reference electrode issues, with clear recommendations for reporting methodologies in clinical research.

Clinical Corner

Hammond reviews the literature regarding What we know about 40 Hz. Activity and the function it serves. Clinicians Brown and Brown and Sams tackle the issues of 40 Hz. reward without increasing EMG and discuss their unique approaches using 40 Hz. training in clinical protocols.

Correspondence

As a follow up to their report in Vol. 4 No. 1 of this journal, Hamilton and Barnes report briefly on further findings with F-1000 and Deits comments on software corrections to eliminate problems at start up.

Volume 4, Number 3

Editorial

The value of observational studies in neurotherapy

Discussion: The mechanism through which Performance Enhancement Training simultaneously

is emphasized, based on several recent reports that suggest observational studies may be equally valid as randomized studies.

Scientific Articles

EEG Biofeedback Training and Attention-Deficit/Hyperactivity Disorder In an Elementary School Setting
Dennis P. Carmody, PhD, Diane C. Radvanski, BS, Sonia Wadhwani, BS, Mary Jo Sabo, PhD, Linda Vergara, MS

Background: EEG biofeedback was conducted on site in an elementary school.

Method: An experimental group of eight children ages 8-10 completed 35-47 sessions of EEG biofeedback training over a six-month period. Four participants in the experimental group were diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) and four were not diagnosed with ADHD. Eight children in the waitlist control group were matched to the experimental group on age, grade, teacher, and diagnosis. None of the 16 participants were medicated for ADHD.

Results: Attention abilities as measured by the Test of Variables of Attention showed the experimental group of children with ADHD reduced errors of commission and anticipation, indicating a reduction in impulsivity. Teacher reports using the McCarney Scale indicated improvements in attention but no changes in impulsivity and hyperactivity.

Discussion: Several confounds require exploration before attribution of changes are assigned to neurofeedback. Whether the effects are due to the neurofeedback protocols, attendance at individual sessions away from the classroom, the attention of the technician, or the excitement of a special program cannot be determined with this study. It will be necessary to have a placebo group in order to separate systematically the variables in the training program.

KEYWORDS. control group, McCarney Scale, neurofeedback, variables of attention

The Effects of Performance Enhancement Training on Hypertension, Human Attention, Stress and Brain Wave Patterns: A Case Study
S. Louise Norris, PhD, Ching-tse Lee, PhD, Dmitry

affects blood pressure, reaction time (RT), and variability needs further investigation. However, the positive changes in the measured variables appear to be a function of enhanced self-awareness that leads to the improved self-regulation.

KEYWORDS. Neurofeedback, hypertension, stress, human attention.

Electrophysiology of Auditory Memory of Paragraphs Towards a Projection/Activation Theory of the Mind
Kirtley E. Thornton, PhD

Introduction: An investigation into the QEEG parameters of effective auditory memory for paragraphs was conducted employing sixty normal right-handed subjects.

Method: Four stories were read to the subjects. The subjects engaged in an immediate thirty-second quiet recall period, which was followed by the subjects recalling the stories out loud. A delayed recalled assessment (about forty-five minutes) followed the same methodology.

Results: The recall performances were correlated with the QEEG variables. For the input period the absolute levels of the Alpha coherence and phase generators from the left temporal lobe (T3), as well as the coherence Alpha (C3, P3, F7) were the predominant determinants of success in addition to F7 coherence Beta1 (13-32 Hz) and phase Beta1 from F8. Immediate recall was determined by the absolute levels of the projections from T3 (coherence and phase Alpha, symmetry Beta2 (32-64 Hz) at T3 and peak frequency of Beta1 at T5. Long-term recall was determined by the T3 generators (phase and coherence Alpha), F7 projections (phase Theta, coherence and phase Alpha, phase Beta1, coherence Beta2), Fp1 and F3 projections (coherence Beta2), and Fp1 phase Beta1. Degree of activation (from eyes closed) revealed additional variables relevant to success.

Discussion: These research results are integrated into previous neuroscience research and implications for theories of brain function and neurotherapy applications are discussed.

KEYWORDS. auditory memory, QEEG, memory, effective memory

Current Concepts in Neurotherapy

Burshteyn, PhD, Juan Cea-Aravena

Background: The purpose of this study was to evaluate the effects of alpha-increase neurofeedback training (Performance Enhancement Training) on blood pressure, stress reduction, attention, and observe changes in brainwave patterns. A forty-nine-year-old male college student diagnosed with essential hypertension controlled by medication had undergone twenty-six sessions of alpha-increase biofeedback (8-13 Hz) at PZ electrode site for a period of 15 weeks.

Method: Pre- and post-blood pressure measurements were taken for every session. At the beginning of week number eight, the participant discontinued his medication as advised by his physician. Pre-and post-visual TOVA CPT test was administered to assess the changes in accuracy, reaction time (RT), and RT variability. Osterkamp and Press Self-Assessment Stress inventory was administered before and after training to assess the level of stress. QEEG evaluation was conducted prior, as well as upon completion of the study.

Results: Mean Arterial Blood pressure (MAP) yielded statistically significant results between pre and post sessions within participant blood pressure measurements. The participant's systolic and diastolic blood pressures during the first thirteen sessions were not significantly different from those of the last thirteen sessions when his medication was discontinued, suggesting his ability to control his blood pressure within normal limits without the use of medication. The results of the TOVA test clearly indicate an improvement in individuals' reaction time and the reaction time variability. The results of the Osterkamp and Press Self-Assessment Stress Inventory indicated an improvement in two of the scales: Work and Social Life. Statistical analysis showed that before and after QEEG evaluations were within normal limits.

Comodulation: A New QEEG Analysis Metric for Assessment of Structural and Functional Disorders of the Central Nervous System
M. Barry Sterman, PhD, David Kaiser, PhD

A new quantitative EEG metric is described here that examines the temporal correspondence of magnitude modulation between cortical recording sites. It is termed "comodulation", and is applied as a cross-correlation analysis either within-subject or statistically between subject and a control database. Analysis can be performed for any selected frequency band between 1 and 23 Hz and for each of four basic functional states, including eyes closed, eyes open, and two task engagement conditions. The metric is tested here by application to clinical cases where structural alterations and functional disturbances of the brain are documented.

KEYWORDS. QEEG, imaging, comodulation, anterior temporal lobectomy, callosotomy, depression

Technical Notes
Kaiser and Sterman Automatic Artifact Detection, Overlapping Windows, and State Transitions describe features of a new QEEG analysis program that employs techniques to minimize artifacts from eye movement, FFT related spectral leakage, and mental state changes. These techniques are discussed as important in the creation of a database and implementing it in clinical analysis.

Clinical Corner
Hammond queries Lubar regarding rationales for using sequential ("bipolar") versus referential ("unipolar") EEG biofeedback paradigms. Lubar cites his twenty-five year academic based practice experience in tackling this issue.

News from Other Journals and Websites
Barabasz reviews a special issue of Child Study Journal that is devoted to ADHD, neurotherapy, QEEG and hypnosis.

Volume 4, Number 4

Editorials
Plasticity and Neurotherapy
David L. Trudeau, MD
What Became of the "Decade of the Brain"
David A. Kaiser, PhD

Method. A right parieto-temporo hypothesis for delusions of space is tested by use of single case study design of a male patient with closed head injury who specifically believed that he was from "another place" with someone forcing him through space to remain in a "box" (another body). Discussion. Results from neuropsychological

Scientific Articles

Clinical Use of an Alpha Asymmetry Neurofeedback Protocol in the Treatment of Mood Disorders: Follow-Up Study One to Five Years Post-Therapy
Elsa Baehr, PhD, J. Peter Rosenfeld, PhD, Rufus Baehr, PhD

Background: This study reports on three of six patients who have completed an average of 27 neurofeedback sessions using a patented alpha asymmetry protocol for the treatment of depression.
Method: The follow-up data, from one to five years post therapy, were derived from a single session re-test using the same alpha asymmetry protocol and the Beck Depression Inventory.
Results: The three patients originally diagnosed as having unipolar depression reached the training criteria for the non-depressed range by the end of their initial training, and they have maintained their normal scores for right hemisphere alpha asymmetry training over time. The follow-up Beck Depression Inventory scores were also within the normal range.
Discussion: This finding is contrary to the previously held demonstrations by Davidson and Henriques regarding the stability of decreased left anterior cortical activation in remitted depression. While some patients have reported mood changes with life's vicissitudes, none have experienced clinical depression since they have terminated therapy.
Keywords: Affective disorders, biofeedback, electroencephalography, alpha asymmetry

Delusions" of Space: A Case Study Utilizing Topographical Brain Mapping and QEEG
D. Erik Everhart, PhD, Heath A. Demaree, PhD, David W. Harrison, PhD, John B. Williamson, MS

Introduction. Delusions have received increased attention within the neuropsychological literature. However, there has been a relative lack of information published concerning delusions of "space". More specifically, the belief that one is moving through space from "another world", "planet", or location, has infrequently been studied with respect to localization of dysfunction in cerebral structures. Given that other types of delusions often occur as a result of right hemisphere lesions, it is hypothesized that delusions of space occur with lesion to similar structures, and particularly the right parieto-temporal region. Several lines of converging evidence, which support evaluation and topographical brain mapping with QEEG lend support to this theory, with findings of right parieto-temporo dysfunction and relative asymmetry in beta (13-20Hz) activity when left and right hemispheres were compared.
Conclusions. The results provide case study evidence supporting the inclusion of QEEG as part of a neuropsychological evaluation. This approach lends itself both to double dissociation techniques in syndrome analysis and in apriori predictions using nomothetic comparisons.
Keywords: Hemispheric asymmetry, delusions, closed-head injury, psychosis, QEEG, right hemisphere

Technical Notes

Low Resolution Brain Electromagnetic Tomography (LORETA): The Technique, its Validation, and Methods of Analysis
Roberto D. Pascual-Marqui, PhD

Functional Localization and Functional Connectivity with LORETA: Comparison of Normal Controls and "Pure" Schizophrenics
Roberto D. Pascual-Marqui, PhD,
M. Koukkou, MD, D. Lehmann, MD,
K. Kochi, PhD

Open Source Method of Graphical QEEG Analysis Using PERL and Visual Basic
Jon A. Frederick, MS
The software described in this article is now available to download.
Keywords: Coherence, phase, asymmetry, statistics, software, graphics, EEG

News from Other Journals and Websites
David A. Kaiser, PhD, Editor

Clinical Corner
D. Corydon Hammond, PhD, Editor
Adverse Reactions and Potential Iatrogenic Effects in Neurofeedback Training
Steve Stockdale, PhD and Daniel Hoffman, MD, Margaret E. Ayers, MA, John Nash, PhD

2000 Society for Neuronal Regulation 8th Annual Conference
Summaries and Abstracts of Scientific Papers

this theory, are discussed.	