

ISNR 2009 Conference

Oral Presentation Abstracts

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Please note: Authors are responsible for their submissions. The Student Scholarship abstracts are included in this section.

The category of presentations is indicated by “C” for Clinical Application or Clinical Experience, “R” for Research, and “T” for Theoretical.

The abstracts, learning objective and agenda are presented in order according to the conference schedule. Where possible, the oral presentations have been grouped by theme to facilitate the Continuing Education process. Note the number given to the presentation(s). Full information for obtaining continuing education credits and Biofeedback Certification Institute of America (BCIA) recertification credits is in your conference packet.

Thursday, September 3, 2009
Plenary Room 1

STUDENT SCHOLARSHIP PRESENTATION – STUDENT PAPER AWARD

Neuroplastic Effects of Endogenously Entrained Brain Rhythms: A TMS-EEG Study (R)

**Tomas Ros, MSc, Goldsmiths, University of London, t.ros@gold.ac.uk
Moniek A.M. Munneke, Diane Ruge, John H. Gruzelier, and John C. Rothwell**

Credits: 0.66

Abstract

Objective:

We investigated whether a standard 30-min session of EEG neurofeedback (NFB) at left motor cortex of 24 naive subjects modified corticomotor plasticity. Methods: Effects on corticospinal excitability as well as short intracortical inhibition (SICI) and facilitation (ICF) of either alpha (8-12 Hz) suppression or low beta (12-15Hz) enhancement NFB were assessed by single-pulse and paired-pulse transcranial magnetic stimulation (TMS) applied to right and left hemisphere motor cortex. Immediately before and twice after (up to 25 min) the NFB session, the motor evoked potential (MEP), SICI, and ICF parameters were measured. Results: Net corticospinal excitability of the left hemisphere (right FDI) was significantly increased >20 min after the end of alpha suppression (desynchronisation), as reflected in the average magnitude of the MEP (130% of baseline), together with a significant reduction of SICI (165% of baseline). Importantly, MEP change was inversely correlated ($R > -0.5$, $p < 0.05$) with percentage of alpha amplitude change during NFB, as well as with the ratio of pre to post alpha baseline at rest. Following low beta NFB training there was a significant enhancement of ICF, without reliable main effects in MEP amplitude, both seemingly a result of uneven entrainment. Nevertheless a significant ($R > -0.5$, $p < 0.05$) negative correlation was observed between the magnitude of low beta synchronisation and single-pulse MEP change. In contrast, no statistically significant alterations in TMS parameters were seen in the

untrained (right) hemisphere for either protocol. Conclusions: Prolonged desynchronisation of endogenous alpha rhythm, generally regarded as an indicator of cortical activation, is associated with potentiation of corticospinal excitability and reduced intracortical inhibition, while synchronised low beta rhythms, albeit suboptimally entrained, correlate with reductions in corticospinal excitability. The current study provides the first evidence for the 'missing link' between the historically-reported but inadequately recognized effects of cumulative neurofeedback training and direct validation of LTP-like neuroplastic change following a discrete training session. It furthermore supports an explicit and endogenous role for brain oscillations in the mediation of synaptic plasticity.

References

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Learning Objective

Discuss how transcranial magnetic stimulation is used to assess human neuroplasticity noninvasively.

Outline

Introduction to LTP: invasive (tetanic, HFS) and non-invasive neuroplasticity research (TMS) (5 mins.)
Presentation of results (30 mins.)
Implications of results (5 mins.)

Financial Interest: No financial interests.

STUDENT SCHOLARSHIP PRESENTATION

Incremental Gains in Self-Regulation Skills: Comparison After 20 and 40 Sessions of Neurofeedback (R,C)

**Andrea Reid, MA, ADD Centre, addcentre@gmail.com
Blair Aronovitch, BA**

Credits: 0.33

Abstract

Introduction

EEG biofeedback practitioners around the world have been publishing studies on the effectiveness of neurofeedback training on ADHD. Although as a whole, this research has demonstrated that neurofeedback is an efficacious treatment for ADHD, it has not clarified the number of neurofeedback training sessions that lead to optimal gains. Some practitioners have examined results after 20 sessions of feedback (Rossiter & LaVaque, 1995; Boyd et al, 1996), while other publications have presented data on results following 40 sessions of training (Thompson & Thompson, 1998; Lubar, 1995; Linden et al, 1996). This pilot project proposes to fill this void by analyzing the effect of the number of sessions of neurofeedback on attention, EEG, and short term memory (digit span). This study will compare client scores on these measures before neurofeedback training, after 20 sessions, and after 40 sessions of training.

Method

Participants

Client's range from age 6 to adult and all met the criteria for diagnosis of ADHD or Asperger's Syndrome according to the Diagnostic and Statistical Manual IV. All clients will have been tested using the Integrated Auditory and Visual Continuous performance test (IVA) at their initial assessment, after 20 sessions of training and after 40 sessions of training. A subset of the clients in this pilot project will also have data on EEG changes, Weschler Intelligence Scale IV (WISCIV) digit span subtest data and questionnaire data post

20 sessions and post 40 sessions of training. It is expected that there will be a minimum of 20 participants in this study.

Training sessions are 50 minutes and most clients attend 2 sessions per week. Training parameter bandwidths are set based on an initial assessment of EEG performed by Dr. Lynda Thompson. Most clients already in the study have been doing training at either CZ or C4, reference to the left ear. The aim for the majority of clients is to decrease slow wave activity (3-7Hz, 4-8Hz or 3-10Hz), increase sensorimotor rhythm (SMR) (12-15Hz or 13-15Hz) while decreasing any high frequency beta or spindling beta (23-35Hz). The EEG biofeedback training sessions are also combined with metacognitive strategies.

Materials

This study will include testing results from the IVA, Questionnaire data (Conners' Global Index for ADHD, ADD Centre's ADDQ, and DSMIV questionnaire for ADHD), and EEG data. The EEG ratios include: theta/beta power ratio (4-8Hz/13-21Hz), theta/beta ratio (4-8/16-20Hz) and theta/SMR (3-7/12-15Hz).

Procedure

Pre and post-treatment data will be collected for each client, and group measures for pre-post scores on all tests computed. T-tests will be performed on the differences between pre-post 20 and pre-post 40 mean scores and level of Significance will be computed as a p-value.

References

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Learning Objective

Describe the incremental gains that occur during 40 sessions of neurofeedback training.

Outline

Overview of the literature on neurofeedback training and ADHD (studies that have been published using 20 sessions, 40 sessions, 60 sessions+ (5mins.)

Explanation of the method involved in the present study (8mins.)

Presentation of results and future implications (7 mins.)

Financial Interest: No financial interests.

Perioperative Sensorimotor Mapping by Task-Related EEG Activation: A Method Validation Based on a Series of Ten Surgical Epilepsy Patients (R,C)

Helen Barkan, MD, PhD, SUNY, barkanh@upstate.edu

Terrance Darcey, PhD

Credits: 0.33

Abstract

Objective

The objective of this work was to demonstrate clinical utility for an adjuvant method for preoperative sensorimotor mapping in patients with intracranial grid implants for the localization of epileptic foci, and who are at risk for postoperative motor deficits.

Background

Task-related EEG activation has a wide range of potential uses, yet clinicians are still to be won over, possibly because of lack of validating studies showing clinical utility. Here we validate a clinical application of this method which relies on the analysis of task-related spectral changes after Pfurtschellers notion of event-related desynchronization of EEG (ERD).

Design/Methods

ERD of EEG in the beta (13-35 Hz) frequency band was quantified by using a statistical Z-score comparison of average beta power during and prior to sustained motor contraction. ERD maxima localized the hand and mouth areas in 10 patients with subdural grids with frontoparietal coverage, then the localization was compared to that of the gold standard, electrical stimulation (ES), and to clinically accepted adjuvant of median nerve somatosensory evoked potentials (SSEPs) obtained from the same grid electrodes.

Results

In 7 patients who had unequivocal sensory and/or motor hand-area findings on ES and SSEPs mapping, the maximum ERD was concordant. In 7 patients who had definitive mouth-area findings on ES, the maximum ERD was in agreement. In cases where the hand (N=2) or mouth (N=3) area was not localized with ES (due to prolonged seizures or lesions), ERD mapping was either in agreement with SSEPs for hand area, or localized to plausible anatomical locations for mouth area.

Conclusions/Relevance

The beta ERD method for preoperative sensorimotor mapping is at least as reliable as ES/SSEPs, and is superior to both in terms of efficiency and safety. We suggest that ERD mapping ought to be adopted as a technically simple and reliable adjuvant to standard-of-care clinical mapping with ES and SSEPs.

Learning Objective

Discuss the potential use of EEG/evoked responses for brain mapping in clinical situations, particularly in presurgical evaluation.

Financial Interest: I have nothing to disclose. The research which I would like to present was supported by NIH.

Neurofeedback Treatment in ADHD: A Meta-Analysis of the Efficacy of Neurofeedback in ADHD on Inattention, Impulsivity & Hyperactivity: Level 5 Efficacious & Specific

**Martijn Arns, MSc, Brainclinics Diagnostics, martijn@brainclinics.com
Sabine de Ridder, Ute Strehl, PhD, Marinus Breteler, Ton Coenen**

Credits: 0.33

Abstract

Since the first reports of Neurofeedback treatment in ADHD in 1976 many studies have been carried out investigating the effects of Neurofeedback on different symptoms of ADHD such as inattention, impulsivity and hyperactivity. This technique is also used by many practitioners, but the question as to the evidence-based level of this treatment is still unclear.

In this study selected research on Neurofeedback treatment for ADHD was collected and a meta-analysis was performed. In total 15 studies were incorporated with a total N=1194 subjects. For all studies means,

sample sizes and SD's for measures of inattention, impulsivity and hyperactivity were used to calculate the effect sizes (ES: Hedges' D). Forest plots were made and the grand-mean ES was calculated for all 3 measures.

Both prospective controlled studies and studies employing a pre-and post-design found large effect sizes (ES) for Neurofeedback on impulsivity and inattention and a medium ES for hyperactivity. Randomized studies demonstrated a lower ES for hyperactivity suggesting that hyperactivity is probably most sensitive to non-specific treatment factors.

Due to the inclusion of some very recent and sound methodological studies in this meta-analysis potential confounding factors such as small studies, lack of randomization in previous studies and a lack of adequate control groups have been addressed and the clinical effects of Neurofeedback in the treatment of ADHD can be regarded as clinically meaningful. Four randomized controlled trials have shown neurofeedback to be superior to a (semi-active) control group, whereby the requirements for Level 4: Efficacious are fulfilled (Criteria for evaluating the level of evidence for efficacy established by the AAPB and ISNR). Three studies have employed a semi-active control group which can be regarded as a credible sham control providing an equal level of cognitive training and client-therapist interaction.

Therefore, in line with the AAPB and ISNR guidelines for rating clinical efficacy, we conclude that neurofeedback treatment for ADHD can be considered 'Efficacious and Specific' (Level 5) with a large ES for inattention and impulsivity and a medium ES for hyperactivity.

Keywords: Neurofeedback, EEG Biofeedback, ADHD, meta-analysis, inattention, impulsivity, hyperactivity.

Acknowledgement

We wish to acknowledge the following people for providing us with additional information for the meta analysis: Hartmut Heinrich, Petra Studer, Jochen Kaiser, David Kaiser, Michael Linden, Johanne Lévesque, Martin Holtmann, Ulrike Leins, Domenic Greco, André Achim and Geneviève Moreau. We also wish to acknowledge the support of Desiree Spronk in the preparation of this manuscript.

References

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Learning Objective

Summarize the literature published on Neurofeedback in ADHD and evaluate the strengths and weaknesses of several studies.

Outline

Methods used (5 mins.)

Overview of included studies; showing the meta-analytical data for the domains of 1) Inattention 2) Hyperactivity and 3) Impulsivity. (10 mins.)

Discuss implications for current practice and future studies. (5 mins.)

Financial Interest: No financial interest.

INVITED PRESENTATION

Limbic Dysrhythmia (R,C)

Dirk De Ridder, MD, PhD, University Hospital Antwerp, dirk.de.ridder@neurosurgery.be

Credits: 0.75

Abstract

Recent studies indicate that multiple theta generators exist in the human brain (Asada, Fukuda et al. 1999; Aftanas and Golocheikine 2001; Steriade and McCarley 2005) permitting integration of the limbic system activity with activity of the brainstem, the hypothalamus, and the neocortex (Kirk and Mackay 2003).

Except for the well known link between theta and memory (Klimesch 1999; Schack, Vath et al. 2002; Babiloni, Babiloni et al. 2004; Buzsaki 2006) theta is generated in emotion processing in humans to both positive and negative stimuli (Krause, Viemero et al. 2000; Aftanas and Golocheikine 2001; Aftanas, Reva et al. 2004). Thus the main domain of theta activity seems to be memory and emotional regulation (Knyazev 2007).

In the resting awake state the dorsal anterior cingulate cortex oscillates at theta frequencies (Asada, Fukuda et al. 1999), driving the prefrontal cortex to oscillate at the same rate and vice versa (Asada, Fukuda et al. 1999). In a combined EEG-MEG study it was found that the frontal midline theta is generated in the dorsal ACC (alternating with the VMPFC) (Asada, Fukuda et al. 1999).

It has been suggested that this bidirectional coupling is influenced by the ventral tegmental area (VTA) (Bassant and Poindessous-Jazat 2001; Kocsis, Di Prisco et al. 2001). The mediodorsal nucleus of the thalamus and VTA exert a complex dopaminergic (D1, D2 and D4) gating action over PFC neural activity, either facilitating or inhibiting firing in the hippocampal-PFC pathway depending on the frequency and relative timing of the arrival of afferent input. The electrical stimulation of the lateral, parvocellular part of the mediodorsal thalamic nucleus only activates the anterior cingulate when the stimulus frequency is in the theta range (6 to 8 Hz) (Sikes and DeFrance 1985). Thus the midline theta might be under influence of the dopaminergic VTA.

Non-thalamic subcortical delta generators are found in all parts of the mesolimbic dopaminergic reward system, i.e. the VTA (Grace 1995), nucleus accumbens (Leung and Yim 1993), ventral pallidum (Lavin and Grace 1996), and PET/EEG studies indicate a positive correlation between waking delta and PET metabolism in the medial frontal cortex (Alper, John et al. 2006), also related to the mesolimbic dopaminergic reward system (Kauer and Malenka 2007). Therefore it has been suggested that awake delta activity is related to motivational drive for fulfilling basic needs such as food (Hoffman and Polich 1998) and sex (Cohen, Rosen et al. 1976; Cohen, Rosen et al. 1985). Thus delta oscillations activate brain motivational systems that signal salience and make the brain paying attention to biological relevant stimuli (Knyazev 2007).

Furthermore, it has been established that frontal midline theta oscillations are involved in attentional processes (Inanaga 1998), and that both sympathetic and parasympathetic indices are increased during the

appearance of frontal midline theta (Kubota, Sato et al. 2001). Theta band activities in the frontal area are correlated negatively with sympathetic activation (Kubota, Sato et al. 2001). A normative database of independent resting state EEG components has been developed by Congedo and John, in which 3 components are characterized by a theta spectrum, all anatomically located at the anterior cingulate, extending into the insula and amygdala and parahippocampal gyrus. The frontal midline theta corresponds to the activity of NICA component 1 (5 and 6) consisting of a functionally connected network of the amygdala, subgenual anterior cingulate, dorsal anterior cingulate and insula. The spectral analysis of NICA component 1 demonstrates this functional network oscillates at theta frequencies at rest. The amygdala -anterior cingulate -anterior insula network might relate to the emotional significance and salience of internal and external stimuli, by combining networks involved in arousal and intrinsic alertness, interoceptive awareness and motivation.

Analogous to thalamocortical dysrhythmia the authors present data suggesting that an absence of midline frontal theta with an associated increase of delta and/or beta activity might be an electrophysiological manifestation of a common pathophysiological mechanism underlying several distress and autonomic pathologies and propose to call this limbic dysrhythmia. Basically it is a dysrhythmia of component 1,5,6 in NICA. Based on data in pain and tinnitus patients and on a literature research the authors suggest that this mechanism could potentially be extended from 'distress' to include anxiety, major depression, PTSD, and autonomic dysregulation (irritable bowel, hypertension, syncope, etc). This group of clinical entities should be differentiated from motivational drive pathologies such as obsessive compulsive spectrum disorders and reward deficiency syndromes, which can be considered abnormal delta oscillation pathologies, in contrast to limbic dysrhythmia which is suggested to be a dysrhythmic theta pathology.

This heuristic concept argues that limbic dysrhythmia pathologies should be treated by normalization of this delta-beta coupling to its resting theta rhythm, either by neurobiofeedback, tDCS, TMS or implanted electrodes, whereas motivational drive pathologies should be treated with normalization to normal delta.

References

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Learning Objective

Explain how to apply the clinical implications of the newly developed normative database of resting state independent EEG components.

Outline

Description of theta and delta neural generators (10 mins.)

Description of normative database of resting state independent EEG components (NICA) (10 mins.)

Description of pathologies of NICA (10 mins.)

Description of treatments for NICA pathologies by neurofeedback, tDCS, TMS and implanted electrodes (15 mins.)

Financial Interest: I have no significant financial interest or relationship with commercial supporter(s) or manufacturer(s) of any commercial product or service that is discussed as part of my presentation.

KEYNOTE PRESENTATION

Improving Decision Making With Noninvasive Brain Stimulation (R,C)

Alvaro Pascual-Leone, MD, PhD,

Berenson-Allen Center for Noninvasive Brain Stimulation

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Credits: 0.00

In recent years, dual-process theories that contrast automated and controlled processes have been put forward to explain different areas of human cognition. In this context, will-power refers to goal-driven cognitive control or regulation of impulses, passions, cravings, and habits. Such regulation may be conceptualized as cognitive control over the balance between a “cool”, reflective mental system that effortfully represents rational and reasoned goals, such as long-term mental and physical health, and a “hot”, reflexic mental system that automatically guides quick, impulsive, and emotional responses to environmental stimuli.

In recent years, lesion and functional neuroimaging studies suggest that the prefrontal cortex is a critical component of the neural circuitry engaged when people voluntarily and consciously regulate their behavior. In addition to neuroimaging studies, lesion studies suggest that particularly the right prefrontal cortex plays a central role in behavioral regulation and the control of impulsive, reflexive tendencies.

Modulation of will-power and dual-process theories offer a valuable framework that can serve to guide translational insights from cognitive neuroscience into the clinic. Proof-of-principle studies reveal that noninvasive brain stimulation of the dorsolateral prefrontal cortex with repetitive transcranial magnetic stimulation or transcranial direct current stimulation can influence decision-making, enhance will-power and promote reflective processes in healthy subjects. The same type of noninvasive brain stimulation can suppress alcohol, cocaine, nicotine and even food craving in patients, who are known to have impaired decision-making behaviors. Modulation of decision making, and enhanced cognitive regulation of emotion, reward, and gratification could have widespread mental and physical health benefits, including mood disorders, anxiety, ADHD, PTSD, substance abuse, smoking, and obesity.

**Thursday, September 3, 2009
Plenary Room 2**

**Referenced EEG -Ready for Medication Implementation:
A Review of the Recent Research (R)**

Daniel Hoffman, MD, Neuro-Therapy Clinic, Daniel@hoffmanemail.com

Credits: 0.66

Abstract

Referenced EEG is a tool for personalized medicine which helps identify biomarkers for medication responses. By categorizing known medication responses to a patient's brainwaves, a clinician can be helped to identify the optimum individualized drugs for each patient.

This talk will present the latest data on several recent studies including use in Eating Disorders, SSRI's in Children, Substance Abuse, Medication Washout, and a pilot study which served as the prototype for a large blinded academic study. Finally, the most recent results from the multi-site controlled study will be discussed along with implications of use in clinical practice.

References

"Referenced-EEG® Guidance of Medications for Treatment Resistant Depressed Patients – A Pilot Study", C DeBattista, D Hoffman, M Schiller, et. al., Poster #228, US Psychiatric and Mental Health Congress, San Diego, CA., Oct. 08.

"First Do No Harm: Children and SSRI's", D Hoffman, M Schiller, Poster #229, US Psychiatric and Mental Health Congress, San Diego, CA., Oct. 08.

"Medication Washout: Imposing Discontinuation or a Diagnostic and Therapeutic Tool?", D Hoffman, C DeBattista, M Schiller, Poster #230, US Psychiatric and Mental Health Congress, San Diego, CA., Oct. 08.

"EEG Guided Medication Predictions in Treatment Refractory Eating Disorder Patients with Comorbid Depression: Opportunities for Personalized Medicine in Managed Healthcare", James Greenblatt, M.D, Craig Sussman, FNP, Mariko Jameson, BS, US Psychiatric and Mental Health Congress, San Diego, CA., Oct. 08.

“Referenced-EEG-Guided Pharmacotherapy of Dual Diagnosis Patients”, M. J. Schiller, J. H. Shaffer, J. E. Milner, US Psychiatric and Mental Health Congress, San Diego, CA., Oct. 08.
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Learning Objective

Discuss the research and clinical importance of choosing psychiatric medications based on the neuroelectrical physiology instead of symptoms clusters.

Outline

What is Referenced-EEG (rEEG)? (5 mins.)
Research in Referenced-EEG and other similar Medication Prediction models (10 mins.)
Uses of Referenced-EEG in Depression, Eating Disorders, Substance Abuse and Treatment Resistant patients (15 mins.)
The status of Referenced-EEG with Scientific acceptability, insurance carriers, NIMH, and the Public (5 mins.)
Role of ISNR and Referenced-EEG for Biomarking all therapies (5 mins.)

Financial Interest: I am the Chief Medical Officer of CNS Response.

Positive Subjective Experiences Related to Clarified Gamma Brainwave Neurofeedback from the Prefrontal Cortical Region of Meditators and Non-Meditators (R, C)

Jonathan Cowan, PhD, Peak Achievement Training, jon@peakace.com
Beverly Rubik, PhD

Credits: 0.33

Abstract

Previous studies showed that 25 to 42 Hz brainwaves from the prefrontal cortical region in advanced Tibetan Buddhist meditators were found to be correlated with heightened experiences of compassion and clarity. In the present study, subjects who were either advanced practitioners of Transcendental Meditation™ (TM) (n=6) or non-meditating controls (n=6) were engaged in a single session of neurofeedback in this same brainwave region using the Peak BrainHappiness Trainer (PBHT). The PBHT is a novel type of neurofeedback instrument that can assess and train various dimensions of mental processing, including the Clarified gamma experience, which Cowan (2007) hypothesizes to be related to the processing of new learning and its reinforcement by positive feelings. To create the Clarified gamma neurofeedback protocol, the PBHT clarifies the 40 Hz. band of gamma EEG production from the prefrontal region by filtering out signal artifact from muscle tension or movement.

Real-time unlabeled auditory and/or visual neurofeedback from this clarified gamma protocol was provided to the subjects in a controlled laboratory setting. They were asked to do the following sequential tasks: (1) to explore the Clarified gamma-related experience and to subsequently describe it in their own words;

(2) to engage for two minutes in each of 16 different emotional and cognitive states spoken to them as a sequence of descriptive words or phrases, and to decide, by comparing their momentary experience to that moment's clarified gamma neurofeedback, how strongly these states correlated with the clarified gamma neurofeedback; (3) to engage in a neutral state to measure baseline values of clarified gamma; and (4) to quickly produce their maximum value of clarified gamma neurofeedback.

Results show: (1) self-assessed descriptions of the clarified gamma experience were comparable for both groups; (2) the associations of 11 of the 16 descriptors with the clarified gamma neurofeedback were significantly positive, with the largest scores for "happiness" ($p < .0001$) and "loving" ($p < .0001$) and comparable for both groups (all p levels were $> .05$); (3) the associations of 3 of the 16 descriptors with the clarified gamma neurofeedback were significantly negative with the largest scores for "stressed" ($p < .0001$) and "disappointed" ($p < .0001$), and comparable for both groups (all p levels were $> .05$); (4) baseline measurements of the clarified gamma band were indistinguishable for the 2 groups ($p > .05$); (5) Although both groups were able to significantly increase clarified gamma neurofeedback values ($p < .002$), meditators were better able to quickly increase these gamma brainwaves from the prefrontal region than controls ($p = .02$).

We conclude that the clarified gamma experience appears to involve positive emotions of happiness and love, and lowered stress; and that TM practitioners have greater facility than controls in achieving it in a single neurofeedback session.

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Learning Objective

Discuss the subjective experiences associated with frontal clarified gamma training.

Outline

Experimental data establishing the subjective experiences related to frontal clarified gamma EEG Enhancement (10 mins.)

Background on the role of the 40 Hz. EEG rhythm in discovery, learning, memory, and motivation. (10 mins.)

Financial Interest: Dr. Jonathan Cowan is the CEO, Chief Technology Officer and principal owner of NeuroTek, LLC, d/b/a Peak Achievement Training.

Self, Other and Object Processing in the Addicted Brain (R,C)

Rex Cannon, MA, University of Tennessee, rcannon2@utk.edu

Debora Baldwin, PhD, Joel Lubar, PhD

Credits: 0.33

Abstract

Aims:

To investigate the neurophysiological differences between recovering substance abusers (RSA) and controls using quantitative electroencephalography (qEEG) and standardized low-resolution electromagnetic tomography (sLORETA) when evaluating photographic images of a hammer, another face and the self. **Methods:** This study was conducted with 38 total subjects; 18 recovering substance abusers and 20 non-clinical controls. EEG data were recorded in three experimental conditions; while viewing an image of a hammer; while viewing an image of another's face (a novel female face, the same for all participants) and while viewing an image of their own face. We performed voxel by voxel t-tests between groups for each condition. The subjective reports were rated by three independent raters; two were blind to experimental conditions.

Results:

The RSA group processes each of the images in different regions of the cortex in both alpha and beta frequencies as compared to controls. The specific regions of difference between groups occur within Brodmann Areas (BA) 24/32, 25, 9/10 and 47 in the anterior regions and BA 19, 7 and 31 in the posterior regions.

Conclusion:

The regions of significant difference are shown active during fMRI experiments during tasks related to self-recognition, autobiographical memory, and self-reference, as well as emotional, social, memory, visual-spatial and cognitive processes. The subjective reports provided by all subjects at the end of the sessions indicated RSA viewed the hammer more as a weapon rather than a tool and tended to focus on perceived negative attributes of the other and their own image, whereas the controls tended toward practical elements

of the hammer and rated the other and self in more neutral or positive ways. In this population of RSA the content of self report during the recordings while processing photographs of other, an object and self is more negative than controls. This may reflect negative perceptual and maladaptive self-referential cortical processes, alternatively, it may represent processing differences in general or substance related changes in perceptual processing. This is a topic for future study. Clinical implications will be discussed relative to alpha/theta training and Peniston's work.

Keywords: Negative perceptions, Addiction, Anterior cingulate, posterior cingulate, negative self concept

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Learning Objective

Discuss cortical regions involved in self evaluation in addicted persons.
Explain the importance of self in treatment and cortical regions implicated in behavioral problems.

Outline

Self in Addiction (8 mins.)
Comparisons between groups (5 mins.)
Discussion and implications (5 mins.)
Questions (2 mins.)

Financial Interest: No financial interests.

Highly Significant Cognitive Improvements from Neurofeedback in Five Sessions: A Controlled Study (R,C)

**Jonathan Cowan, PhD, Peak Achievement Training, jon@peakace.com
Nada Pop-Jordanova, M.D., Irena Chakalaroska, MD**

Credits: 0.33

Abstract

A study of thirty 16-17 year old high school students found that the InAll Focus Training Protocol used in the Peak Achievement Trainer produced very substantial improvements in measures of concentration, attention, and memory in just five sessions. They were trained to focus their attention using this patented prefrontal wideband suppression protocol once a week for 30-45 minutes each.

Performance on one of the attention measures—The Trail Making Test (TMT) Part A from the Halstead-Reitan Test Battery--nearly tripled, while the group average on the more difficult TMT Part B doubled.

TMT Part A consists of encircled numbers from 1 to 25 randomly spread across a sheet of paper. The object of the test is for the subject to connect the numbers (follow the dots) in order, beginning with 1 and ending with 25, in as little time as possible. TMT Part B is more complex than A because it requires the subject to connect numbers and letters in an alternating pattern (1-A-2-B-3-C, etc.) in as little time as possible.

The improvements due to Peak Achievement Training were highly significant on both Part A (t-test = 8.302) and Part B (t-test = 5.137). The study also included control groups using the Freeze Framer (now EmWave PC) from HeartMath and the Inner Tuner Expert System, Ultra Mind International. Neither the heart rate variability feedback training (t-tests = 0.297, 0.104) or the electrodermal response feedback training (t-tests = 0.267, 1.302) produced significant gains on these tests in five sessions.

In addition, performance on both the Forward and Backward Digit Span Tests improved significantly with the In(hibit)All wideband suppression protocol. The number of digits remembered when quizzed in the forward direction increased from 7 to 8 (t-test = 3.521), while the number remembered while stating them in reverse order increased from 4 to 4.5 (t-test = 2.168). Of the other two biofeedback groups, the only one that showed a significant improvement on Digit Span was the heart rate variability feedback training in the forward direction (t-test = 2.323).

The study also showed that five sessions of wideband suppression training significantly enhanced the subjects' abilities to focus. This is indicated by how long they could keep their concentration going without a lapse, as measured by the InAll Protocol.

This finding confirmed the Csoka's unpublished pilot study, which showed substantial improvements in sustaining focus in five sessions.

To our knowledge, this data shows the most rapid improvements due to neurofeedback of any published study, and it compares favorably with the improvements shown over four sessions in an unpublished undergraduate thesis by Marcus Perman, using the Neureka! protocol of the Peak Achievement Trainer. Perman also found significant improvements in IVA scores with the same protocol in eight sessions.

These results are consistent with the idea that neurofeedback protocols that are easier to understand are more rapidly learned. Our clinical experience with the Concentration protocol and the newer Focus protocol indicate that almost everyone who tries one under proper guidance can understand it and begin to control it in less than two minutes.

Wideband suppression protocols are based on the concept of reinforcing a desynchronized EEG pattern, which actually indicates more underlying neuronal activity. The presentation will discuss the idea that the measurable EEG patterns are actually synchronized idling rhythms, based on what is known about the origin of thalamocortical EEG patterns. Feedback based on wideband desynchronization vs. synchronization is clearer than other types of feedback because it is based on a more robust phenomenon. Prefrontal feedback is more easily perceived because it is more closely related to conscious processes.

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Learning Objective

Explain why wideband prefrontal suppression is a very powerful neurofeedback method.

Outline

Data indicating that the wideband suppression protocol produced very rapid changes in the Trail Making Test and Digit Span, while the control groups showed fewer changes (10 mins.)

Background on desynchronization, thalamocortical activation, and the wideband suppression protocol (10 mins.)

Financial Interest: Dr. Jonathan Cowan is the CEO, Chief Technology Officer and principal owner of NeuroTek, LLC, d/b/a Peak Achievement Training.

Friday, September 4, 2009 Plenary Room 1

The Effects of Different Breakfasts on a Child: A Data Analysis of Three QEEGs (R,C)

**Ron Swatzyna, PhD, The Tarnow Center for Self Management, drron@tarnowcenter.com
Bianca Gonzalez**

Credits: 0.33

Abstract

Introduction

Many U.S. children have very poor eating habits, which have greatly contributed to a rise in their obesity and diabetes rates. Additionally, studies suggest poor nutrition diminishes mental functioning and exacerbates mental and behavioral disorders. Nutritional scientific investigation has run the gamut of study from malnutrition through a multitude of dietetic combinations. These studies have measured a variety of mental functioning including I.Q., cognitive abilities, processing speed and memory. Decades of research suggest that optimal brain functioning is proportional to a well-balanced nutritional diet that minimizes glycemic swings with calories adjusted to level of activity and metabolism of each individual. In a search of the literature, John Polich studied the effects of intake on Event Related Potentials. However, no investigation has assessed the effect of intake on QEEG data.

Objective

The goal of this study is identify any statistical differences in QEEG data under three typical breakfast choices of children: 1) no food for breakfast, 2) a breakfast made up of high sugars and high carbohydrates and 3) a nutritionally balanced breakfast.

Methods

The subject in this study was a 12 year-old (non-pathologic) female volunteer who came to me with a desire to do a brainwave study for her school's science fair. The variables that were controlled were time of

day, intake after breakfast and sleep. Each qEEG was done on the same subject, at noon on three different school days after the subject sleep approximately the same amount of hours with the subjects eyes closed. The rationale for doing the qEEGs at noon prior to lunch was to assess the expected differences in the qEEG data due to hypoglycemia from not eating breakfast and from the insulin response to high sugar high carbohydrate breakfast.

The three EEGs were recorded (Deymed Diagnostic, TruScan 32) from 19 scalp locations. The first qEEG was done after the subject skipped breakfast altogether. The second qEEG was done after eating a breakfast consisting of a “Pop-Tart” and a glass of orange juice. The third qEEG was done after she eating a nutritionally balanced breakfast consisting of a glass of milk, a half slice of whole-wheat toast, two eggs, one-half cup of a combination of strawberries, bananas, and apples and one-quarter cup of tomatoes.

Results

The results were extrapolated from the qEEG statistical data of relative power in the eyes closed condition from all three qEEGs. The most significant differences were found in the subject’s anterior lobes (F7, F3, FZ, F4, F8, C3, CZ, C4) in the 26 through 30-hertz range. In the 26 to 30-hertz range, QEEG 1 shows 15 data points above 2 SD and 5 data points between 1.5 and 1.99 SD. QEEG 2 shows seven data points above 2.0 SD and 10 data points between 1.5 and 1.99 SD. Lastly, QEEG 3 only shows two data points at 1.5 SD.

Discussion

The 26 to 30-hertz high beta activity are most clinically correlated with irritability and anxiety and this activity in the anterior lobes would affect brain functions such as executive function, working memory, motor control and so forth. This pilot study suggests that at least for this 12 year-old female subject, eating no breakfast greatly increases her 26 to 30-hertz activity especially in her anterior lobes. When she eats a breakfast consisting of high sugar high carbohydrates, her high beta activity is somewhat diminished but is still significant. Finally, eats a nutritionally balances breakfast her high beta activity comes very close to normalizing.

Limitations & Direction

The results of this study cannot be generalized for several reasons. The female subject is very lean with little body fat and those with excessively body fat may respond differently. Additionally, she is a very high scholastic achiever with no diagnosed psychological or learning disorders. Anxiety, mood and/or learning disorders may actually exacerbate the findings. The direction of future investigation should study larger numbers of children both with and without psychopathology and learning issues. It would also be interesting to track how changes toward nutritionally balanced diets affect scholastic achievement.

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Learning Objective

Explain how nutrition affects brainwaves in this case study.

Outline

- Brief literature review in regard to nutrition and the demands of the brain (4 mins.)
- Identify the research question and hypotheses (2 mins.)

Describe the methodology (3 mins.)
Discuss the findings (6 mins.)
Summarize the implications (4 mins.)
Identify the limitations of the study (1 min.)

Financial Interest: I have no financial interest in any commercial product or service.

STUDENT SCHOLARSHIP PRESENTATION – STUDENT TRAVEL AWARD

Relationship of Alpha-Theta Amplitude Crossover During Neurofeedback to Emergence of Spontaneous Imagery and Biographical Memories (R,C)

**Mark Johnson, MS, University of North Texas, markjohnson2@my.unt.edu
Eugenia Bodenhamer-Davis, PhD**

Credits: 0.33

Abstract

Background

Alpha-theta training is a brainwave biofeedback training protocol designed to facilitate a deeply relaxed state that is often associated with hypnagogic imagery. The clinical utility and effectiveness of alpha-theta training was demonstrated with military veterans treated for alcoholism and post-traumatic stress disorder (PTSD) (Peniston & Kulkoski, 1990, 1991). Eugene Peniston, who conducted these early experiments, identified an alpha-theta amplitude crossover state that usually occurred during the course of this therapy and that was thought to represent a state of consciousness in which the individual could access hypnagogic imagery symbolic of issues in his life. Peniston believed that alpha-theta brainwave training facilitated the emergence of repressed anxiety provoking events from a subject's past through this hypnagogic imagery, and he suggested that the emergence of these abreactive imageries and/or memories should be the target and goal of alpha-theta training (Peniston, Marrinan, Deming & Kulkoski, 1993). In a significant observation, Peniston posited that "increased theta and beta rhythms reflect a brain process which enables the patient to remember and/or relive the traumatic anxiety provoking event. He further postulated that the healing process of self-awareness is manifested in high amplitude beta waves occurring in conjunction with the aforementioned cross-over of theta waves over alpha. Since the development of Peniston's successful brainwave training protocol, there has been some controversy among researchers in the field about the clinical relevance of the alpha-theta crossover phenomenon (Moore, Trudeau, Thuras, Ruben, Stockley, & Dimond, 2000). This study is an attempt to clarify methodological and technical considerations related to alpha-theta crossovers during alpha-theta brainwave training in order to address controversial aspects of this biofeedback training protocol. This study attempts to answer the following research questions:

- 1) What constitutes a therapeutic alpha-theta crossover? Is the quality, in terms of degree of amplitude, of the theta-alpha crossover important to the emergence of spontaneous imagery and memory?
- 2) Are there relationships and ratios of specific bandwidths that are relevant to the type of imagery content that emerges?
- 3) Is a minimum amount of cognitive beta amplitude increase necessary to recall the content of imagery and memories evoked in alpha-theta training after a client returns to an alert state of consciousness?
- 4) Is there a relationship between delta brainwave activity and deeper states of consciousness?
- 5) Are higher amplitude crossovers related to better overall treatment outcomes?

Methods:

A total of 10-12 records of clients who received alpha-theta brainwave training as part of their neurofeedback treatment were obtained for analysis. A polynomial logistic regression analysis was performed to analyze the data for relationships among the variables of interest.

Conclusions:

A preliminary review of the data shows tentative conclusions that:

- 1) Imagery recall is dependent on higher amplitude and longer duration crossover variability and unrelated to very brief interactions of various bandwidth waveforms
- 2) lower frequencies (i.e. – theta to delta) correlate to deeper imagery experiences (i.e. – biographical to transpersonal)
- 3) during crossover patterns, imagery occurs with greater frequency when cognitive beta is observed to rise concurrently with theta and delta frequencies as well
- 4) delta activity correlates with deeper, transpersonal experiences
- 5) greater crossover activity correlates with positive treatment outcomes

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Learning Objective

Identify features associated with clinically significant crossovers states.

Outline

Therapeutic versus non-therapeutic alpha-theta amplitude crossovers (10 mins.)
Relationships and ratios of specific frequency bandwidths relevant to type of imagery content, as well as to content recall (10 mins.)

Financial Interest: No financial interest or products.

STUDENT SCHOLARSHIP PRESENTATION – STUDENT TRAVEL AWARD

sLORETA and Independent Component Analysis of EEG in Obsessive-Compulsive Disorder: Implications for Neurofeedback Intervention (R,C)

Jana Koprivova, MA, Prague Psychiatric Center & the Third Faculty of Medicine,
Charles University Prague, koprivova@pcp.lf3.cuni.cz
Marco Congedo, PhD, Jan Prasko, MD, Michael Raszka, MD,
Martin Brunovsky, MD, PhD, Jiri Horacek, MD, PhD

Credits: 0.33

Abstract

BACKGROUND

Despite of medical progress, there are still a high percentage of obsessive-compulsive patients not responding or not responding sufficiently to current treatment. Accumulating evidence indicates that obsessive-compulsive disorder (OCD) has a distinct biological background and is connected with dysfunctional fronto-striatal loops involving orbitofrontal and anterior cingulate cortex. It has been shown that the activity in deep cortical structures such as anterior cingulate can be modified through tomographic neurofeedback (Congedo et al., 2004) and possibly also through independent component neurofeedback (Congedo, 2006). In OCD, however, source localization EEG studies that are necessary to guide a potential neurofeedback intervention targeting anterior cingulate or orbitofrontal cortex are missing.

METHODS

To fill the gap, we analyzed EEG of 50 OCD patients (20 drug-free and 30 medicated with SSRIs) and 50 controls matched for age, sex and handedness using standardized low-resolution electromagnetic tomography (sLORETA) and independent component analysis (ICA). Analyses were performed between 2 and 45 Hz with frequency resolution of 1 Hz. ICA was computed in the control group and resulting weights and norms were used to compare EEG of OCD patients. Symptom severity in the patient group was assessed using the Yale-Brown Obsessive-Compulsive Scale (Goodman et al., 1989) and Hamilton Anxiety Scale (Hamilton, 1959).

RESULTS

sLORETA and ICA consistently showed an excess in power at low frequencies (2 – 6 Hz) localized primarily in the medial frontal cortex, including anterior cingulate and medial orbitofrontal cortex ($p < 0.05$, corrected). The only component abnormal in OCD compared with controls included signal also from insula (BA 13), superior temporal and parahippocampal gyri (BA 38) and lateral frontal cortex (BA 6, 8, 9). The pattern was present in drug-free as well as in SSRI medicated patients and was even more pronounced in medicated patients. Symptom severity was not related to the increased low-frequency power, however, the medicated group had higher compulsion score ($p = 0.04$).

DISCUSSION

Our results are consistent with previous findings of medial frontal hyperactivation and performance monitoring hypothesis in OCD (Fitzgerald et al., 2005; Maltby et al., 2005). Performance monitoring in OCD has been linked with anterior cingulate hyperactivation and with an enhanced error-related negativity (Endrass et al., 2008) that arises from ongoing theta generated in the medial frontal cortex (Luu et al., 2003). Moreover, elevated theta activity in SSRI medicated group and a high percentage of SSRI nonresponders in our sample are congruent with previous reports of high theta power in OCD patients not responding to SSRIs (Pritchep et al., 1993; Hansen et al., 2003). Our study is the first to apply sLORETA or ICA methods in OCD patients and has direct implications for neurofeedback intervention.

Acknowledgement: This work was supported by the grant of the Czech Neuropsychopharmacological Society and by the grants IGA NR 9751-3 and 9323-3 provided by the Ministry of Health of the Czech Republic.

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Learning Objective

Compare sLORETA (standardized low resolution electromagnetic tomography) and ICA (independent component analysis) findings in obsessive-compulsive disorder.

Outline

sLORETA and ICA analysis results in obsessive-compulsive disorder (15 mins.)
Implications for neurofeedback intervention (5 mins.)

Financial Interest: No commercial interests. This work was supported by the grant of the Czech Neuropsychopharmacological Society and by the grants IGA NR 9751-3 and 9323-3 provided by the Ministry of Health of the Czech Republic.

INVITED PRESENTATION

The Open-Vibe Software Platform for Neurofeedback (R)

**Marco Congedo, PhD, Centre National de la Recherche Scientifique, Marco.Congedo@gmail.com
Dirk De Ridder, MD, E. Roy John, PhD, Leslie Prichep, PhD, Robert Isenhardt, PhD**

Credits: 0.75

Abstract

The interest for brain function in resting state has recently gained considerable interest. On average the human brain extracts about 40% of available oxygen in the blood and disposes about 20% of the energy for the whole body. Still, it amounts to only 2% of the total body weight. The aim of this study is to extract eyes-closed resting EEG networks using group independent component analysis (ICA). We employ a test-retest strategy using two independent large sample normative databases (N=57 and N=84) and retain as many independent components as we can replicate. We characterize the cortical structures involved in each component by a distributed source localization of the spatial maps and their spectral profile. We also study their out-of-phase (lagged) coherence using recent advances on connectivity measures adapted to EEG data. We are able to replicate on the two databases seven components with nearly identical spatial and frequency distribution, explaining about 93% of the total EEG variance. Furthermore, we are able to replicate the organization of the extracted components in two networks, within which components oscillate coherently with a complex multiple-frequency dynamics, and exchange information at multiple time-lag rates.

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Learning Objective

Utilize group independent component analysis for the analysis of resting state EEG.

Outline

Cortical structures involved in group independent components and their spectral profile

The lagged coherence between those components: the formation of brain network

Financial Interest: No financial interests.

Autism and EEG Phase Reset: A Unified Theory of Deficient GABA Mediated Inhibition in Thalamo-Cortical Connections (R,C)

Robert Thatcher, PhD, Applied Neuroscience, Inc., rwthatcher@yahoo.com
Duane North, MS, Carl Biver, PhD, James Neubrandner, MD, Stuart Cutler, PhD,
Philip DeFina, PhD

Credits: 0.33

Abstract

Objectives

The purpose of this study was to explore the relationship between EEG phase reset in autistic spectrum disorder (ASD) subjects as compared to age matched normal subjects.

Methods

The electroencephalogram (EEG) was recorded from 19 scalp locations from 54 autistic subjects and 241 normal subjects ranging in age from 2.6 years to 11 years. Complex demodulation was used to compute instantaneous phase differences between all pairs of electrodes and the 1st & 2nd derivatives were used to measure phase reset by phase shift duration and phase lock duration.

Results

In both short (6 cm) and long (21 – 24 cm) inter-electrode distances phase shift duration in ASD subjects was significantly shorter in all frequency bands but especially in the alpha-1 frequency band (8 – 10 Hz) ($P < .0001$). Phase lock duration was significantly longer in the alpha-2 frequency band (10 – 12 Hz) in ASD subjects ($P < .0001$). An anatomical gradient was present with the occipital-parietal regions the most significant.

Conclusions

The findings in this study support the hypothesis that neural resource recruitment occurs in the lower frequency bands and especially the alpha-1 frequency band while neural resource allocation occurs in the alpha-2 frequency band. The results are consistent with a general GABA inhibitory neurotransmitter deficiency resulting in reduced number and/or strength of thalamo-cortical connections in autistic subjects.

Key Words: Autism, EEG phase reset, phase locking, phase shifting

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Learning Objective

Describe how thalamic mediated phase reset is related to autism.

Outline

- Methods of computing phase reset (5 mins.)
- Phase shift duration and autism (8 mins.)
- Phase lock duration and autism (7 mins.)

Financial Interest: No commercial product will be discussed.

INVITED PRESENTATION

The Complex Trial Protocol in Detection of Deception and Malingering (R)

J. Peter Rosenfeld, PhD, Northwestern University, jp-rosenfeld@northwestern.edu

Credits: 0.75

Abstract

The P300 event-related EEG potential (ERP) is an endogenous ERP, evoked by meaningful stimuli presented rarely in a sequence of meaningful and non-meaningful items. Rosenfeld et al. (1988, 1991) and Farwell & Donchin (1991) developed a “3-stimulus protocol” (3SP) for using P300 to detect deception and malingering. In this protocol, on each trial, either a probe(P), a target(T), or an irrelevant(I) item was presented. Ps and Ts each had a probability of about .15 and Is had a probability of .7. Ps were guilty knowledge items such as the amount of money stolen in a crime, such as \$500. Is and Ts were irrelevant to the crime but in the same category as Ps, e.g., other amounts of money such as \$100, \$200, \$1000, \$2000, \$5000. One of the Is was a designated T, say, \$200. It was incorrect but suspects were told to say “yes” when shown this T. They said “no” to all other amounts, including \$500, the P, thus lying. The items were presented randomly and it was expected that P would elicit a P300 since it was rare and meaningful. Is would not. Ts would because they elicited the unique “yes” response that made them meaningful as well as rare, however, the whole point of T was to force attention to all randomly presented stimuli. The test of guilty was guilty knowledge recognition, as provided by the fact that the P300 to the P would be greater than that to the I.

This 3SP was used successfully in dozens of reports to detect malingering by head injury simulators as well as deception and guilty knowledge possession by lab-simulated criminals--until we finally, successfully attempted to defeat it with countermeasures (CMs) in 2004, as replicated by Mertens & Allen (2008). It was thus necessary to come up with a new P300-based CM-resistant protocol, which we introduced in 2008. We hypothesized that the older 3SP was vulnerable to CMs because on each trial the subject was forced to do two simultaneous tasks that competed for attentional resources: the explicit target vs. non-target(NT) discrimination, plus the probe recognition task. The increased task demand produced by dual tasking is known to reduce P300. Thus Rosenfeld et al. (2008) separated the P-I recognition task in time from the T-NT discrimination. This modification allowed 90-100% accuracy in detection of guilty subjects—whether or not they used CMs—with 0-8% false positives. This protocol has now also been used in malingering related protocols with detection of concealed autobiographical information detection, as well as in mock crime scenarios with detection of concealed crime detail information. Most recently, we have developed an anti-terror scenario in which we can detect planned details of terrorists acts while in the planning stage and before the acts have been committed. We can even do this when we do not know in advance what the correct answers are.

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Learning Objective

Review the protocols that have been utilized to detect deception using the P300 event related EEG Potential (ERP) in forensic, malingering, and terrorism situations.

Outline

Review of the original (1988-1991) 3-stimulus protocol for P300-based detection of deception.

Critique of the original (1988-1991) 3-stimulus protocol for P300-based detection of deception in terms of vulnerability to countermeasures(CMs).

Description of novel (2006-2008) complex trial protocol (CTP) for P300-based detection of deception.

Review of recent application studies of CTP as utilized in forensic, malingering, and terrorism situations.

Financial Interest: None

KEYNOTE PRESENTATION

Out of Injury Comes a New Discovery of Neurofeedback for a Baseball All-Star

Sean Casey, Boston Red Sox

Wes Sime, PhD, Private Practice, wes.sime@gmail.com

Leslie Coates, PhD

Credits: 0.00

**Friday, September 4, 2009
Plenary Room 2**

"The Thoracic Pump" - Impetus for the Respiratory Arterial Pressure Wave and Breathing Induced Heart Rate Variability (R)

Stephen Elliott, BS, Coherence, L.L.C., steve.elliott@coherence.com

Credits: 0.33

Abstract

Human physiology is configured such that breathing serves to promote both blood flow and gas exchange. When we inhale, a significant volume of blood is ushered through the venous system into the lungs via the right heart. When we exhale an equal volume of blood exits the lungs via the left heart filling the arterial tree. This action gives rise to the well understood but little recognized phenomenon of the "respiratory arterial pressure wave" which can be observed in the arterial blood flow plethysmographically, oscillometrically, and via catheterization. A view of the respiratory arterial pressure as measured in the finger with the J & J Engineering Physio-Data PPG is presented. An understanding of the relationship between the thoracic pump and breathing induced heart rate variability is offered.

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Learning Objective

Discuss the physiology of the thoracic pump
Discuss the respiratory arterial pressure wave and its origin
Discuss the thoracic pump and its relationship to breathing induced heart rate variability

Outline

Basic physiology of the "thoracic pump" (6 mins.)
The respiratory arterial pressure wave (6 mins.)
Relationship of the thoracic pump to breathing induced heart rate variability (5 mins.)
Q&A (3 mins.)

Financial Interest: Stephen Elliott is the President of COHERENCE LLC, Allen, Texas, and a practitioner/facilitator of the method of Coherent Breathing method. COHERENCE LLC sells informational materials and products to promote Coherent Breathing.

**Infrared Images of Migraine, Head Injury, ADD, Depression, Anger,
Autism and Other Common Disorders**

(C)

Jeffrey Carmen, PhD., Private Practice, carmen5272@aol.com

Credits: 0.33

Abstract

PIR HEG as a clinical procedure has now been in use for 11 years. This presentation will review its development, along with clinical observations.

References

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Learning Objective

Explain the PIR process to a client who has no technical background.

Outline

- Background, physics, psychology (10 mins.)
Observations over 9,000 clinical hours (10 mins.)

Financial Interest: I am the manufacturer of this product and derive direct financial benefit from its sale.

Assessment of Mild TBI in Three Retired NFL Football Players (C)

Neil Bockian, PhD, Adler School of Professional Psychology, nbockian@adler.edu
Eliezer Schwartz, PhD

Credits: 0.33

Abstract

QEEG has been shown to be a useful component of a comprehensive evaluation for mild traumatic brain injuries such as concussions (Leon-Carrion et al., 2008; Pointinger, Sarahrudi, Poeschl & Munk, 2002; Thornton, 2003; Thornton, 1999; Voller et al., 1999). Three former NFL football players received comprehensive QEEG and neuropsychological assessment. The presenting complaints were fairly similar in all three cases, primarily involving problems with headaches, memory and concentration. All played receiver and/or special teams, and therefore received multiple blows to the head. The blows were mostly received from contact of the helmet to the ground, but some were from helmet-to-helmet contact. QEEG was sensitive to damage, even though it had occurred about 3 to 10 years prior. In these cases, QEEG revealed diffuse delta in large areas of the brain which was especially concentrated in the left temporal and temporo-parietal regions, as well as in either or both frontal lobes. Neuropsychological evaluation confirmed functional impairments in memory, auditory and/or visual processing, and attention. The integration of QEEG and neuropsychological testing was synergistic in all cases, with information from one complementing and augmenting the other. Neurofeedback was recommended in all three cases, since research supports neurofeedback as an intervention for the concerns they mentioned (Ayers, 2006; Packard & Ham, 1997; Thornton, 2003; Tinius & Tinius, 2000; Vysochin, Denisenko & Gordeev, 2005; Walker, Norman, & Weber, 2002). Biological, psychological, and social implications will be discussed.

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Learning Objective

Discuss the impact of multiple minor traumatic events, such as blows leading to concussions, on professional football players.

Outline

Overview: the exposure of NFL football players to traumatic injury (2 mins.) Dr. Bockian.

Three case studies

Neuropsychological findings, and links to functional impairments, emphasizing common themes across the three cases (8 mins.) Dr. Schwartz

QEEG Findings, emphasizing common themes in the QEEG across the three cases, and the connection to the functional impairments noted in the neuropsychological evaluations (8 mins.) Dr.

Bockian

Q & A (2 mins.)

Financial Interest: Neither Dr. Eliezer Schwartz nor myself (Dr. Neil Bockian) have a financial interest in any areas related to this talk.

Effects of Neurofeedback-based Behavioral Therapy on ERP Measures of Executive Functions in Drug Abuse (R,C)

Estate Sokhadze, PhD, University of Louisville, tato.sokhadze@louisville.edu

Christopher Stewart, MD, Guela Sokhadze, Margaret Husk MD, Allan Tasman, MD

Credits: 0.33

Abstract

Introduction

Neurofeedback training integrated with other behavioral techniques could be one of the potentially efficacious intervention options for cocaine addiction treatment. Our study combined SMR neurofeedback treatment with motivation enhancement therapy for the treatment of outpatients with cocaine addiction. EEG changes in beta and theta power are typical for withdrawal from cocaine. Executive prefrontal functional deficits have been reported for both active users and recovering addicts. We proposed that cocaine abusers may benefit from SMR and SMR/Theta neurofeedback protocol. Motivational interviewing techniques were employed to engage outpatient subjects in neurofeedback and retain them during 12-session long neurofeedback training course. Cognitive test based on Eriksen flanker task with dense-array event-related potential (ERP) recording was used to assess intervention effects on such executive functions

as cortical inhibition, motor response conflict detection, and error monitoring along with more traditional clinical outcome measures. We report immediate post-treatment effects in 14 subjects and 6 months follow-up effects in 11 subjects.

Method

ERPs were acquired with a 128 channel Electrical Geodesics Inc Net Station EEG device prior and following 4 week long bio-behavioral intervention using a speeded forced-choice reaction time task (Eriksen flanker tests) with NoGo trials. Follow-up test was conducted after 6 months. Beside behavioral and ERP measures during flanker test, the treatment outcomes included cocaine and marijuana use rate (urine and saliva screens), maintaining treatment retention, and psychiatric status (PTSD, depression). From 20 outpatient subjects with cocaine addiction initially enrolled in the study 14 subjects completed whole course of neurofeedback, motivational interviewing sessions, and pre-and post treatment ERP tests and clinical evaluations. Only 11 of them were available for 6 months follow-up tests and evaluations. Most subjects tested positive both on cocaine and marijuana use on the intake stage. Each of these SUD subject participated in 12 sessions of SMR up /Theta down training (30 min, twice a week) and up to 3 sessions of MI. The neurofeedback session included 2 blocks with “SMR increase”, and single blocks of “SMR increase and Theta decrease”, and “SMR/Theta” ratio increase.

Results

Most of the subjects successfully learned to increase SMR rhythm (mean increase per session 11%) at C3 site, but were less successful in simultaneous SMR-up/Theta-down blocks. Subjects who completed whole course of combined neurofeedback and MI intervention showed improvement on behavioral and ERP measures of executive functions in post-treatment flanker test. Frontal N200 latency indicative of motor interference detection functionality increased from 289 to 319 ms, $F=4.9$, $p=0.04$; while frontocentral P300 amplitude indexing cortical inhibition function in NoGo trials increased from 1.39 to 3.4 μV , $F=7.1$, $p=0.016$. Frontal P300 latency in Go trials also increased from 371 to 431 ms, $F=4.7$, $p=0.04$. Error-Related negativity (ERN) amplitude at the fronto-central area increased from -2.52 to -4.99 μV , $F=6.64$, $p=0.024$ pointing at an enhanced error monitoring functionality in the post-treatment period. Follow-up flanker test showed that positive changes in frontal N200 and P300 components were still maintained, whereas the ERN measure did not show significant difference from the intake level. Among the clinical outcome measures the most significant was a decrease of depression scores (BDI-II, $t=2.49$, $p=0.013$) and a decrease of PTSD scores ($p=0.02$). Depression scores on follow-up remained lower than at the pre-treatment level (pre – 25.8; post-14.7; follow-up – 12.5, follow-up vs. pre-treatment, $p<0.05$). The drug screens did not show significant decrease in cocaine use post-treatment, however number of positive tests for marijuana use decreased significantly (post-vs. pre-NFB urine drug screens: cocaine use – non-significantly decreased by 14 %, $F=1.42$, $p=0.16$, n.s.; marijuana use rate decreased by 71%, $F=3.87$, $p=0.008$). Lower rate of marijuana use was confirmed at follow-up tests. Cocaine use rate at follow-up assessment was lower than at intake, however still did not reach significance level.

Conclusions

The results of this pilot study support our suggestion that a combination of motivational interviewing with neurofeedback might be a promising approach to biobehavioral intervention for addictive disorders, and specifically for treatment of cocaine addiction co-occurring with marijuana use in outpatient population. Project showed feasibility of such biobehavioral intervention in both active users and recovering outpatient cocaine addicts. Application of cognitive neuroscience techniques in a form of cognitive ERPs to test executive functions can significantly improve methodology of post-treatment assessment of cognitive and electrocortical outcomes of neurotherapy.

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Learning Objective

Explain how ERP measures can be used for post-treatment assessment of executive functions in neurofeedback trials.

Outline

Introduction (4 mins.)
Short background (3 mins.)
Methods (5 mins.)
Results (4 mins.)
Summary and Discussion (4 mins.)

Financial Interest: The study was partially supported by NIH/NIDA R03 grant and ISNR Research Committee research grant to Dr Sokhadze. The authors do not have any financial interest in any company or organization outside of University of Louisville.

**Saturday, September 5, 2009
Plenary Room 1**

Intensive Neurotherapy Facilitates Recovery from Severe Brain Injury and Seizures (R,C)

**Denise Malkowicz, MD, The Institutes for the Advancement of Human Potential,
denisedmmd2@aol.com**

Diana Martinez, MD, Jorge Leon Morales, MD, M. Barry Serman, PhD, David Kaiser, PhD

Credits: 0.33

Abstract

Introduction

Patients with severe brain injury and refractory seizures often have poor recovery. Intensive neurotherapy reinforcing Sensory Motor Rhythm (SMR) may promote neuroplasticity in thalamo-cortical circuits, significantly improving outcome.

Methodology

A 29 year old man had a severe traumatic brain injury after a motor vehicle accident ten years ago. He had spastic quadriplegia, uncoordination, dysphasia, aphasia, and sleep disruption and refractory secondary generalized seizures with postictal impairment lasting up to ten days. All previous therapies failed to improve his condition.

Twenty-four-channel EEG recordings (NeuroNavigator) were analyzed using SKIL software. It showed excessive diffuse delta and theta (+12 z-score) compared to healthy adults, with little SMR or alpha activity.

Daily neurotherapy aimed to progressively reinforce SMR in central regions and 8.6 to 10.6 Hz activity in other brain regions. Therapy sessions continued to increase in length and complexity as he improved. He underwent three 30-days periods of neurotherapy with the same protocols, separated by 5 months each.

Results

After the first session his sleep integration increased from 2 hours to 8 hours per night. Seizures decreased in frequency, intensity and duration without postictal impairment. Speech, swallowing, coordination, and motor control in trunk and extremities improved by at least 50% significantly increasing his abilities. Post training QEEG showed more normalized delta and theta (+2 z-score), and SMR and alpha activity were present. Despite stopping neurotherapy for 5 months he continued to improve in all areas including seizure control, allowing him to be independent in his daily life. His post-training QEEG revealed more SMR and alpha activity.

Conclusion

Intensive neurotherapy facilitated recovery from brain injury and seizures 10 years after injury and despite failure of other therapies. Neurophysiological and clinical changes were robust, durable and self-regenerating. We believe that this intensive neurotherapy protocol normalized thalamocortical circuits by facilitating Long Term Potentiation (LTP). LTP increases neural protein synthesis, growth and remodeling.

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Learning Objective

Discuss the possibilities of effecting neurorecovery in severely brain injured individuals and individuals with refractory seizures using an intensive neurotherapy protocol which emphasizes SMR training and the possibilities of affecting long term potentiation in thalamocortical circuits.

Outline

Severely brain injured individuals or persons with refractory epilepsy often have poor prognosis for recovery (5 mins.)

We have developed an intensive neurotherapy protocol which appears to promote rapid recovery with reintegration of thalamocortical circuits. This protocol emphasizes SMR training and normalization of other brain rhythms, probably resulting in long term potentiation which promotes robust, durable and self regenerating changes in their neuro-circuitry. We explore the possible mechanisms involve in neuroplasticity resulting in normalizing neurophysiology (15 mins.)

Financial Interest: No interests with commercial supporters.

Quantitative EEG in Children with Early Histories of Abuse, Trauma and Neglect (R,C)

Jack Johnstone, Q-Metrx, Inc., jack@q-metrx.com

Edward Hamlin, PhD, Jeff Atkinson, Andrea Meckley, MA, Michael Vendetti

Credits: 0.33

Abstract

Background

In the present study we examine whether there is a pattern of quantitative EEG features that is consistent across individuals in the two groups of children diagnosed with reactive attachment disorder, all of whom have documented histories of abuse and/or neglect. Specific findings of cortical dysfunction would allow for a better understanding of the mechanism of this disorder and potentially assist in the development of more precise and effective treatment regimes.

Subjects

This research used a two-cohort design allowing for independent replication of findings. All participants were seen in clinical consultation at one of two clinics specializing in treatment of behavioral disorders collaborating in this study. All participants were seen either at the Pisgah Institute, Asheville, North Carolina (Cohort 1, N=42) or the Attachment and Bonding Center of Atlanta, Georgia (Cohort 2, N=23). Demographic and related clinical information is shown in Table 1. All individuals had a primary diagnosis of Reactive Attachment Disorder (ICD10: F94.1, F94.2; DSM-IV-TR: 313.89).

Results

Z-score analyses comparing each individual to an age-appropriate reference database showed a consistent group effect for relative power measures. There is significantly less relative delta power over frontal cortex in this population of children diagnosed with Reactive Attachment Disorder. In Cohort 1, the largest single deviation was for the F4-F8 sequential pair where the group average z-score was -2.10 ($p < .05$ two-tailed). Frequency distributions confirm that these findings are not the result of a small number of extreme cases. Z-Score deviations approach a normal distribution in this relatively small sample, 1-sample Kolmogorov-Smirnov $Z = .681$, $p = .742$. The prediction that a comparable cohort of subjects, with the same diagnosis, referred for clinical evaluation in a similar manner, and with data recorded and analyzed in an identical fashion would also show reduced frontal relative delta power was confirmed. In Cohort 2, the largest deviation was for relative delta power over the frontal regions (Fp2F4, $z=1.69$, $p < .04$ one-tailed). Similar findings were seen with respect to effects of age and medication as in Cohort 1, above. Findings again were not correlated with age and were seen in the absence of medications.

Discussion

It should be emphasized that the relative power measures for different frequency bands are interdependent. Relative power is a proportion of each frequency band compared to the whole frequency spectrum, in this study defined as 1.5 – 25.0 Hz. This measure is sensitive to the shape of the frequency spectrum but not overall power or amplitude. It is notable that relative delta power was decreased but no other single band was increased. In addition, there were no significant effects for absolute power measures, or coherence and symmetry measures. A mild increase in mean delta frequency was observed in anterior leads. These results speak to the specificity of the findings.

Results document decreased relative delta power recorded over anterior cortex in a population of children diagnosed with Reactive Attachment Disorder. These changes represent aberrant neurophysiological activity and are largely independent of age and medications used. This suggests that medications are used largely to ameliorate symptoms associated with relative attachment disorder, but do not appear to affect the persistent finding of low relative delta power anteriorly.

Further studies should be directed toward the specific psychological correlates of low frontal delta power. In addition, techniques such as EEG biofeedback could be employed to modulate phase relationships in the frontal EEG in order to modify effects of neglect and behavioral disturbances seen in reactive attachment disorder.

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Learning Objective

Evaluate recent qEEG findings in children with histories of psychological abuse and trauma.

Outline

Introduction to the problem of neuropsychiatric status in children with histories of abuse and trauma (5 mins.)

qEEG findings consistent over two cohorts of children (5 mins.)

Meaning of reduced relative delta power (5 mins.)

Summary, directions for future research (5 mins.)

Financial Interest: Dr. Johnstone is the CEO and owner of Q-Metrx, Inc., the organization that analyzed and compiled the results.

STUDENT SCHOLARSHIP PRESENTATION – STUDENT TRAVEL AWARD

EEG Source Localization of Object Processing (R)

Jessica Paskwietz, BA, University of Tennessee, jpaskwieA@utk.edu

Kyle Dean, B.A.; Michelle Bledsoe, B.A.; Jeffery Inman, B.A.;

Sempanghi Jones, B.A., Amanda Barbera, B.A., Jecolia White, B.A.,

Rex Cannon, M.A., Debora Baldwin, PhD

Credits: 0.33

Abstract

Introduction

This study investigated the neurophysiology of object processing in a population of normal university students. We utilized standardized low-resolution electromagnetic tomography (sLORETA) to map sources of the EEG recorded at the scalp.

Methods

We obtained one-hundred university students (60 female) with a mean age of 21. EEG data were recorded for four minutes while participants viewed an image of a hammer. We performed EEG source localization using sLORETA. We compared the image condition to baseline using all voxel by voxel t-tests. Significant voxels of difference were mapped onto an MNI atlas containing 6,329, 5mm voxels. The phenomenology of the recording was obtained at the end of the EEG recordings.

Results

The contrasts between baseline and object processing show specific differences in regions in the left hemisphere in delta, theta and alpha frequency domains, while alpha and beta activity show significant increase in right anterior cingulate (BA 24) and prefrontal regions in addition to right parietotemporal areas.

Discussion

The left hemisphere appears to play an important role in object processing. The increase is related to the evaluation, categorization and experiential memories utilized while focusing on the image. The right anterior regions may also play a role in the identification of the object, but may also be important to the meaning of the object and its known function in social and intrapersonal contexts. The subjective reports of mental processes and experiences of the participants offer evidence for the patterns of significant increase in these regions.

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Learning Objective

Discuss the neurophysiology of the self in object processing.
Measure psychological constructs with neurophysiological methods.

Outline

EEG Source Localization of Object Processing (10 mins.)
Methods (5 mins.)
Questions and discussion (5 mins.)

Financial Interest: No financial interest.

Attention Deficit Hyperactivity Disorder: The New Approach in Diagnostics with Neuropsychological and Electrophysiological Endophenotypes (R,C)

**Andreas Mueller, PhD, Brain and Trauma Foundation, andreas_mueller@swissonline.ch
Gian Candrian, MA**

Credits: 0.33

Abstract

DHD is one of the most prevalent dysfunctions in children and more and more in adults. ADHD people poorly perform in school and in work, have a low self-esteem, deficient social skills and are at high risk for drug abuse. Till recently, the only diagnostic criteria for ADHD were behavioral symptoms while the only officially accepted medicine was stimulant treatment. With new DSM 5 criteria, diagnoses have to be done on the base of endophenotypes.

The brain and trauma foundation in Switzerland performed a big study in ADHD in adults. Behavioral, neuropsychological and neurophysiological data of the whole sample (178 subjects) is analyzed and is compared with a control group (same size).

Multidimensional Analyses of the dataset shows very surprising results. The prominent biomarkers, which we used before (fore ex. Theta/beta ratio, spectra) are not longer valid and have to be redefined. The view of the working brain, measured with ERP's, shows much better results. The authors propose a new method of diagnoses ADHD based on ICA ERP-components in a multidimensional space. The space is defined by several dynamics of neurobiology. This brings the diagnose cloth to effective treatment.

The oral presentation will show the results of the adults ADHD study. We will demonstrate that ERP's of executive System taken in visual, auditory and emotional continuous performance GO/NOGO tasks give significant results between ADHD and controls. Furthermore we will discuss during talk, which elements of Diagnosis (Questionnaires, Interview, neuropsychological testing, QEEG/ERP's) are helpful for treatment.

Take home messages:

ADHD in adults/comorbidities

Significant Questions in questionnaires

Neuropsychological testing of ADHD is relevant

Diagnostic process needs information of working brain

Spectral analyses of QEEG is a problematic tool for differentiating ADHD from norms

ICA-ERP's components of executive System have a high discrimination potential between the groups and give many implications for treatment (Medication, Stimulation or relaxation techniques)

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Learning Objective

Discuss the neurobiology of ADHD.

Outline

Multidimensional statistical analyses in diagnostics (20 mins.)

Financial Interest: The study was supported by Brain and Trauma Foundation Grison, Switzerland with grants from foundation for innovation of district and from Switzerland. I am chairman of the board of HBImed.

INVITED PRESENTATION

Transcranial Direct Current Stimulation (tDCS): Putative Mechanisms of Action and Clinical Effects of a Simple and Powerful Method of Cortical Electrical Stimulation (R, C)

Felipe Fregni, MD, PhD, Harvard University, ffregni@bidmc.harvard.edu

Credits: 0.75

Abstract

Transcranial direct current stimulation (tDCS) is a noninvasive method of brain stimulation that has been increasingly tested for the treatment of neuropsychiatric disorders. It has useful characteristics, such as low cost, ease of use, reliable sham methodology, and relatively powerful effects on cortical excitability. Because of its potential to modulate cortical excitability noninvasively, tDCS has been tested for the treatment of neuropsychiatric disorders for several decades. In this presentation we will review the mechanisms of action, the main characteristics and the evidence on the use of tDCS for major neuropsychiatric disorders. We will also compare tDCS with other techniques of neuromodulation, especially transcranial magnetic stimulation; and suggest future directions for the use of tDCS in neuropsychiatry. Recent clinical studies on tDCS using novel approaches, such as different parameters of stimulation, have improved its neuromodulatory effect thus resulting in larger clinical effects.

Findings to date encourage further studies in this area that should explore novel parameters of stimulation. It appears that current methods of tDCS might not be fully optimized and, in fact, (1) individualized parameters of stimulation, (2) longer stimulation sessions, and (3) methods to focalize tDCS might be useful strategies to provide greater clinical benefits. Finally tDCS as compared to TMS might provide additional clinical benefits in specific situations such as when used to enhance learning.

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Learning Objective

Outline the basics of the mechanisms of action of tDCS
Identify the main areas of tDCS research
Cite the challenges of tDCS as tool for clinical practice

Outline

Brief introduction (5 mins.)
Mechanisms of tDCS (10 mins.)
Landmark studies of tDCS (20 mins.)
Future challenges (5 mins.)

Financial Interest: No financial conflicts of interest.

Group Independent Component Analysis of Brain Resting-state Networks: Nearly Identical Findings on Two EEG Databases (R,T)

Marco Congedo, PhD, Centre National de la Recherche Scientifique, Marco.Congedo@gmail.com
Dirk De Ridder, MD, PhD. E. Roy John, PhD, Leslie Prichep, PhD, Robert Isenhardt, PhD

Credits: 0.33

Abstract

The interest for brain function in resting state has recently gained considerable interest. On average the human brain extracts about 40% of available oxygen in the blood and disposes about 20% of the energy for the whole body. Still, it amounts to only 2% of the total body weight. The aim of this study is to extract eyes-closed resting EEG networks using group independent component analysis (ICA). We employ a test-retest strategy using two independent large sample normative databases (N=57 and N=84) and retain as many independent components as we can replicate. We characterize the cortical structures involved in each component by a distributed source localization of the spatial maps and their spectral profile. We also study their out-of-phase (lagged) coherence using recent advances on connectivity measures adapted to EEG data. We are able to replicate on the two databases seven components with nearly identical spatial and frequency distribution, explaining about 93% of the total EEG variance. Furthermore, we are able to replicate the organization of the extracted components in two networks, within which components oscillate

coherently with a complex multiple-frequency dynamics, and exchange information at multiple time-lag rates.

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Learning Objective

Evaluate the use of group independent component analysis for the analysis of resting state EEG.

Outline

Cortical structures involved in group independent components and their spectral profile (10 mins.)
The lagged coherence between those components: the formation of brain network (10 mins.)

Financial Interest: No financial interest.

INVITED PRESENTATION

Self-Control Strategies for Modulation of Chronic Pain: Clinical and Research Implications (R,C)

Mark Jensen, PhD, University of Washington, mjensen@u.washington.edu

Credits: 0.75

Abstract

Although there remains much to be learned, a great deal is now known about the neurophysiological processes involved in the experience of pain. Research confirms that there is no single focal “center” in the brain responsible for the experience of pain. Rather, pain is the end product of a number of integrated networks that involve activity at multiple cortical and subcortical sites. Our current knowledge about the neurophysiological processes that subserve pain has important implications for understanding the mechanisms underlying the effects of various self-control strategies for chronic pain management, including self-hypnosis and neurofeedback training. For example, hypnotic analgesia interventions have demonstrated specific effects on activity in various cortical structures and EEG measures of brain activity, and these effects appear to differ as a function of the specific hypnotic suggestions used. Fewer studies have examined the effects of neurofeedback on cortical activity, although the research that has been performed suggests that training individuals to alter activity in specific bandwidths may decrease the

experience of pain. The research findings support the need for additional studies to (1) examine the effects and mechanisms of training patients in self-control strategies for pain management, (2) study the effects of these interventions on different measures of cortical activity, and (3) develop self-management training interventions that produce the most benefit for individuals suffering from chronic pain.

References

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Learning Objective

Discuss the neurophysiological processes that underlie the experience of pain, as well as the effects of pain control strategies on these processes.

Outline

Cortical sites and processes involved in the experience of pain (10 mins.)
EEG correlates of pain experience (5 mins.)
Hypnotic analgesia effects on cortical sites and EEG (5 mins.)
NF effects on pain (5 mins.)
Clinical implications (5 mins.)
Research implications (5 mins.)
Questions and discussion (10 mins.)

Financial Interest: No financial or competing interests.

KEYNOTE PRESENTATION

Internally Generated Cell Assembly Sequences in the Service of Cognition (R)

György Buzsáki, MD, PhD, Rutgers University, buzsaki@axon.rutgers.edu

Credits: 0.00

**Saturday, September 5, 2009
Plenary Room 2**

Examining Neurological Basis for Effective Leadership (R,C)

Jeffrey Fannin, PhD, Center for Cognitive Enhancement, jfannin@enhanceyourbrain.com

Credits: 0.33

Abstract

In this paper, three different research studies will be examined to establish the link between the potential neurological basis and effective leadership qualities. The first study used quantitative electroencephalographic procedures (qEEG), the brain activity of 46 senior leaders was recorded while at rest and when engaged in a visionary communication task. The findings support our expectation of frontal right-brain differences between leaders who engage in socialized, versus more personalized, visionary communication. Socialized visionary communication, in turn, predicts follower perceptions of charismatic

leadership. We will discuss brain plasticity and the potential to use neurological information for the purpose of leader development.

In the second research study we examined, hope, optimism, confidence, and resiliency are instrumental capacities for effective leadership. These capacities have generated interest among leadership researchers and practitioners primarily because they are considered to be open to development and have an impact on performance. We summarize some new and groundbreaking evidence that suggests the brain activity of leaders who are hopeful, optimistic, and resilient differs from those who are not.

The third research study examines Complex Adaptive Leadership, and its core component of self-complexity, is an emerging conceptualization of leadership that is based on the premise that complex operating environments require leaders to be highly adaptive in adjusting their behavioral responses to meet diverse role demands. We demonstrate that quantitative electroencephalogram (qEEG) technology can provide valuable information about the neural correlates of various cognitive processes underlying leader self-complexity. With each research study we will compare and contrast the correlations of leadership and EEG in the 40 Hz gamma band.

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Learning Objective

Compare three groundbreaking research efforts related to the potential neurological basis for effective leadership qualities using quantitative electroencephalographic procedures (qEEG).

In the first study discussed, findings will show support for the expectation of frontal right-brain differences between leaders who engage in socialized, versus more personalized, visionary communication. Socialized visionary communication, in turn, predicts follower perceptions of charismatic leadership.

The second research study will provide participants' with insight from research done that summarizes some new evidence that suggests the brain activity of leaders who are hopeful, optimistic, and resilient differs from those who are not. In addition, participants' will be provided with exciting new ideas for the assessment and development of important leadership characteristics by examining this research focused on uncovering the neuroscientific origins of effective leadership.

Data from the third research study shown will present findings from research conducted at and in conjunction with the United States Military Academy at West Point related to Complex Adaptive Leadership. Leadership researchers have long attempted to understand the individual differences in cognition and affect that underlie leader performance. To this end, results of this study presents findings that demonstrate that quantitative electroencephalogram (qEEG) technology can provide valuable information about the neural correlates of various cognitive processes underlying leader self-complexity. Showing how the use of qEEG may lead to a better understanding of the latent and dynamic neurological mechanisms that are central to the cognitive affective processing of leaders and their performance. Results of this study conclude by considering how additional research could lead to the application of neurofeedback protocols for leadership development.

Outline

Study #1: Linking Neuroscience and Charismatic Leadership Behavior (6 mins.)

Study #2: Neuroscientific Implications of Psychological Capital: Are the brains of optimistic, hopeful, confident and resilient leaders different? (6 mins.)

Study #3: Neurological Basis for Leader Complexity (6 mins.)

Closing remarks (2 mins.)

Financial Interest: Presently there are no financial interests involved. The initial research was funded by a grant from Arizona State University. That grant money has been exhausted and no more grant money is currently available. The second set of research money was a combination funds from ASU and a small amount of money to cover expenses provided by the United States Military Academy at West Point. That grant money has also been exhausted. There are NO commercial supporters, commercial products or commercial services involved with this project.

Efficacy of Neurofeedback as a Treatment for Children and Adolescents with a History of Early Relationship Trauma (R,C)

Alexis Meinhold, MC, Private Practice, lexi.meinhold@cox.net

Alberto Texidor, PhD, Sarah Wyckoff, MA

Credits: 0.33

Abstract

This study addresses the long term efficacy of neurofeedback as a treatment for children and adolescents with a history of early relationship trauma. Pre-treatment, post-treatment and longitudinal data using the Vanderbilt Assessment Scale (child and adolescent version) has been collected. Initial assessment of the data indicates 80% of clients do not meet diagnostic criteria for attention deficit disorder, oppositional defiant disorder or depression/anxiety at the end of treatment. Longitudinal data, collected six months to three years following termination of treatment, indicates that 80% of clients continue to maintain behavioral gains. Data collection is ongoing at this time and a complete statistical analysis will be made available at a later date.

References

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Learning Objective

Identify the impact of early relationship trauma on the brain's regulatory system.
Summarize outcome data of 20+ children and adolescents with a history of early relationship trauma using the Vanderbilt Behavior Checklist pre-and post neurofeedback.
Articulate longitudinal outcome data for 10+ children and adolescents with early relationship trauma pre and post neurofeedback as well as six months to three years post treatment.

Outline

Review impact of early relationship trauma on the developing brain's regulatory system (10 mins.)
Review pre-, post and longitudinal data for children and adolescents with a history of early relationship trauma following treatment with neurofeedback (10 mins.)

Financial Interest: No significant financial or commercial support.

QEEG Subtypes of Autistic Spectrum Disorder – Why Are They Important? (R,C)

Michael Linden, PhD, ADD Treatment Centers, drmike49@aol.com

Credits: 0.33

Abstract

This oral presentation will review the QEEG subtypes of Autism and Asperger's reported by other clinicians and based on 9 years of approximately 300 clinical case studies that were evaluated in our clinical practices and reviewed by Jack Johnson, Ph.D., Jay Gunkelman, QEEGT, and several neurologists. The cases were qualitatively evaluated for patterns in both EEG and QEEG measures. These observable patterns (subtypes) allowed the following benefits:

1. Clearer diagnoses and exploration of possible etiologies for Autism and Asperger's.
2. Rule out abnormal EEG and possible seizures.
3. Easier explanations of Autism (High Functioning) and Asperger's to parents, physicians and educators.
4. Improved selection of Neurofeedback protocols.
5. Increased ability to individualize and predict medication response.
6. Greater ability to monitor & measure the results of Neurofeedback treatment.

References

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Learning Objective

Discuss the eight subtypes of ASD and how they lead to different treatments and Neurofeedback protocols.

Outline

Explain the different QEEG subtypes of Autism and Asperger's.
Discuss the uses of these QEEG subtypes of ASD for medication prediction, Neurofeedback protocol selection and measurement of Neurofeedback treatment results.

Financial Interest: I have no financial interest or relationship.

**Sunday, September 6, 2009
Plenary Room 1**

STUDENT SCHOLARSHIP PRESENTATION - STUDENT TRAVEL AWARD

**Neurofeedback for Children and Adolescents with
Tourette's Syndrome: A Case Review (R)**

Blair Aronovitch, BA, The ADD Centre, blair.aronovitch@gmail.com
Andrea Reid, MA

Credits: 0.33

Abstract

Gilles de la Tourette Syndrome is characterized by a pattern of motor and vocal tics that persist several times per day for one year or more (American Psychiatric Association, 1994). Current research suggests that neurofeedback (NFB), or EEG biofeedback training, is an effective treatment for attentional deficits (Monastra, et al., 2005; Fuchs et al., 2003) and seizure disorders (Serman & Egner, 2006), and may also be helpful for movement disorders (Thompson & Thompson, 2002). Research on neurofeedback and tic disorders including Tourette Syndrome has produced positive results (Dopfner & Rothenberger, 2007; Poncin, et al., 2007; Tansey, 1986). The purpose of this case review is to investigate whether 40 sessions of neurofeedback focused on sensorimotor rhythm (SMR) training, often in combination with biofeedback and metacognitive strategies, may be an efficacious intervention for the reduction of symptoms associated with Tourette Syndrome. This paper will present the results from a chart review of data collected before and after neurofeedback training conducted with children and adolescents with a diagnosis of Tourette Syndrome.

Method

Participants

This study will consist of approximately 15 subjects whose ages range from 8 to 18. All subjects met the DSM-IV criteria for Tourette Syndrome, namely:

- i. Both multiple motor and one or more vocal tics have been present at some time during the illness, although not necessarily concurrently
- ii. The tics occur many times a day (usually in bouts) nearly every day or intermittently throughout a period of more than 1 year, and during this period there was never a tic-free period of more than 3 consecutive months
- iii. The onset is before age 18
- iv. The disturbance is not due to the direct physiological effects of a substance (e.g. stimulants) or a general medical condition (e.g. Huntington's disease or post-viral encephalitis)

Subjects who received an initial assessment but did not proceed with neurofeedback training will serve as a control group.

All training was done over the sensorimotor strip at CZ, C4, or C3 to increase sensorimotor rhythm (SMR). SMR range was either 12-15 Hz or 13-15 Hz. Theta was decreased, with ranges determined based on Dr. Lynda Thompson's individual assessment, as well as the presence of any comorbid disorders. The broadest range for theta was 3-10 Hz. All client ranges fell between these values.

Materials

Initial assessment data will be compared with data collected following a minimum of 40 treatment sessions. In some cases, participants will have completed more sessions (up to 100 sessions). Metacognitive strategies were taught when feedback indicated that client was relaxed, calm, and focused. Data will be reported according to which tests were administered at baseline and after training (pre-and post-). For each client it will include at least one of the following: IVA (Intermediate Visual and Auditory Continuous Performance Test), TOVA (Tests of Variables of Attention), Wechsler Intelligence Scales, Wide Range

Achievement Test (WRAT), EEG data (such as theta/beta power ratios), as well as questionnaires and self-reports. Symptom severity will be collected through self-report measures before and after neurofeedback. Change in presence of tics as well as change in medication would be discussed in initial assessment and follow-up appointments with Dr. Thompson. Success will be defined in terms of symptom reduction.

Subjects who received an initial assessment but did not receive neurofeedback will be contacted for self-report updates in regards to their symptoms. Change in symptoms including reduction in frequency and severity will be taken into account, as well as any medications taken after initial assessment.

Procedure

A chart review of pre and post-treatment data will be conducted. Paired t-tests will be used to determine differences between pre and post-treatment mean scores. Significance will be computed as a p-value.

Discussion

Due to the small number of subjects and multiple interventions (neurofeedback, biofeedback, metacognitive strategies), no definitive conclusions will be drawn about efficacy of neurofeedback from this chart review. It will, however, provide a case review which, if outcomes are favourable, be used to encourage further controlled studies. It will also indicate which of the various measures used are the most sensitive for tracking change.

References

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Learning Objective

Evaluate neurofeedback training as a possible treatment option for those with Tourette's Syndrome.
Discuss comorbidity and medication issues associated with Tourette's Syndrome.

Outline

Discuss the use of neurofeedback training as a tool for symptom reduction in children and adolescents with Tourette's Syndrome.

Discuss comorbidity with ADHD, Asperger's and autism. The issue of medication will also be addressed. Participants, method, and results will also be covered.

Financial Interest: I do not have any significant financial interest/relationship with any commercial supporters/manufacturers of any commercial product/service that will be discussed as part of my presentation.

QEEG-Guided Neurofeedback for Remediation

of Migraine Headaches (R,C)

Jonathan Walker, MD, Neurotherapy Center of Dallas, admin@neurotherapydallas.com

Credits: 0.33

Abstract

Seventy-one patients with recurrent migraine headaches in a neurological practice were evaluated with a quantitative EEG. Forty-six of them elected to do neurofeedback training to remediate their headaches. Each patient had five 30-minute sessions of neurofeedback. Twenty-five of them (54%) experienced cessation of their headaches for a period of one year or longer. Another 18 patients experienced a 50% or greater reduction in headache frequency over the following year. Two patients (4%) experienced a reduction in frequency, but less than 50%. One patient did not improve. None experienced an increased frequency.

In comparison, of the 25 patients who elected not to do neurofeedback, all continued to have frequent migraine headaches (greater than or equal to 3/month). Seventeen (68%) maintained a similar frequency over one year's time. Six (24%) experienced a reduction in frequency (less than 50%). Two (8%) experienced a greater than 50% decrease in frequency.

The only abnormalities on QEEG which significantly correlated with recurrent migraine were excesses of high frequency beta (21-30 Hz). All sites with excessive high frequency beta were down-trained for 5 sessions each. The effective sites included P3(16), P4(13), FP2(8) PZ(7), CZ(7), FZ(6), FP1(6), C3(6), F4(5), C4(5), T3(4), T4(3), F8(3), O1(2), F7(2), and OZ(1). The patient who did not improve had down-training of excessive 2130 Hz at F8 and O1.

References

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Bjork, M.H. & Sand, T. Quantitative EEG power and asymmetry increase 36 h before a migraine attack, *Cephalalgia*, *Bol* 28 Issue 9, Pages 960-968. Published Online: 8 Jul 2008, International Headache Society.

Clemens, Bela & Bank, Jozsef, et al "Three-dimensional Localization of Abnormal EEG Activity in Migraine," *Brain Topography*, New York: Springer, Vol. 21, No 1, September 2008, Pages 36-42.

Learning Objective

Explain how to remediate migraine headaches in patients.

Outline

QEEG findings in migraine patients (10 mins.)

Results of QEEG-guided neurofeedback in migraine patients (10 mins.)

Financial Interest: No financial interests.

Multi-Channel Z Score EEG Biofeedback: Laplacian, Average Reference, Phase Reset and Discriminant Functions (R,C)

Robert Thatcher, PhD, Applied Neuroscience, Inc., rwthatcher@yahoo.com
Carl J Biver, PhD, Duane M North, MS, Carl J Biver, PhD, Duane M North, MS

Credits: 0.33

Abstract

Currently, there are no 19 channel Z score biofeedback capabilities. One advantage of age matched 19 or more channels of Z score biofeedback is the real-time biofeedback of Laplacian and average reference Z scores as well as discriminant functions and phase reset. The purpose of this presentation is to show the methods and steps involved in overcoming technical and scientific challenges. One challenge was to

minimize time delays using a large array of channels. A second challenge was organizing the thousands of possible EEG features that arise from 19 channels or more. Adequate speed of processing and display is accomplished by the use of the real-time Hilbert transform implemented as Complex Demodulation. The selection and organization of Z score biofeedback is accomplished using a symptom check list that generates hypotheses and links to specific surface scalp regions according to the scientific literature. A clinician can veto the symptom check list links and create their own selections of EEG features. The ability to inhibit and reinforce specific EEG features at specific locations is accomplished by the use of the real-time Z scores themselves since the goal is to reinforce movement of the EEG measures toward $Z = 0$. This allows for simultaneous inhibition and reinforcement. Another method to minimize the large universe of possible EEG features is to link the Z scores derived from a quantitative EEG (QEEG) analysis to the patient symptom check list and further refine hypotheses that best match the patient's symptoms and complaints. The step by step mathematical details and computational details will be presented and the results of 19 channel Z score EEG biofeedback on a selected group of patients will be presented.

References

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Learning Objective

Explain how 19 channel Z score biofeedback is made possible, including methods of testing.

Outline

- Methods of computing real-time Z scores (5 mins.)
- Use of a symptom check list to design a biofeedback protocol (5 mins.)
- Methods of integrating QEEG Z scores with the symptom check list to further refine the biofeedback protocol (5 mins.)
- Pre vs. post treatment statistical evaluations (5 mins.)

Financial Interest: I am the President of Applied Neuroscience, Inc. and the research and development is supported by Applied Neuroscience, Inc.

INVITED PRESENTATION

Brain Oscillatory Correlates of Visual Attention and Short-Term Memory (R,C)

Paul Sauseng, PhD, University of Salzburg, paul.sauseng@sbg.ac.at

Credits: 0.75

Abstract

As we are continuously bombarded with visual information we have to select relevant from irrelevant visual input. Based on a recent hypothesis on the functional meaning of electroencephalographic (EEG) alpha activity [1,2], local 10-Hz oscillations will be discussed as a correlate of efficient suppression of irrelevant visual information. It will be demonstrated that local alpha activity is increased at posterior brain sites during processing of irrelevant visual input in visuospatial attention tasks [3] as well as during short-term memory retention. Thereby, cognitive processing of relevant information will be increased in efficiency, a mechanism which can be supported (as prove of principle) by repetitive transcranial magnetic

stimulation (rTMS). In addition, evidence will be presented indicating interregional alpha activity to be relevant for the control of visual attention and selection mechanisms [3,4]. Finally, the role of theta activity (around 5 Hz) during processing of relevant information in visual short-term memory tasks will be discussed. Data will be presented suggesting theta to be important for encoding of relevant information into short-term memory and indicating phase synchronization between theta and fast oscillations to be a correlate of short-term memory retention of relevant information.

References

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- Sauseng, P., Klimesch, W., Doppelmayr, M., Pecherstorfer, T., Freunberger, R., & Hanslmayr, S. (2005). EEG alpha synchronization and functional coupling during top-down processing in a working memory task. *Human Brain Mapping*, 26, 148-155.

Learning Objective

Summarize recent research on the role of human slow brain oscillations during higher visual cognition. Discuss the contribution of local and interregional alpha and theta oscillations and cross-frequency interaction between theta and fast brain rhythms to visual short-term memory and visual attention.

Outline

- Alpha Oscillations and the suppression of irrelevant visual information in attention and short-term memory tasks (15 mins.)
- Altering oscillatory activity in visual attention and short-term memory processes by neurostimulation (10 mins.)
- Theta oscillation and their interaction with fast brain rhythms during short-term memory processes (15 mins.)
- Question and answers (5 mins.)

Financial Interest: No financial interest.

EEG Coherences Validated by MRI Diffusion Tensor Imaging: An Autistic Case Series (R,T)

Robert Coben, PhD, Private Practice, robcohen@optonline.net

Credits: 0.75

Abstract

Normal brain functioning depends on synchronization within distributed brain networks (He, Shulman, Snyder, & Corbetta, 2007). Breakdown of such connectivity correlates with behavioral and cognitive deficits (Wolters & Raffone, 2008). EEG coherence is the clearest indicator of this synchronization and coherence anomalies have been associated with such diverse conditions as autism, traumatic brain injury and childhood sexual abuse (Coben & Hudspeth, 2008). However, there are different methods to assess coherence that provide disparate information (Kus, Kaminski, & Blinowska, 2004) and coherence is not considered to be necessarily equivalent with physical neural connectivity that can be measured in other ways (Teipel et al., 2008).

MRI Diffusion Tensor Imaging (DTI) (Mori, 2007; Mori, Wakana, Nagae-Poetscher, & Van Zijl, 2005) has emerged as the premiere measurement of physical and functional neural connectivity. MRI-DTI measures

the diffusion of water molecules in 3-dimensions across the fiber tracts of the brain. As such, it is considered a measurement of how information flows within and across the white matter tracts of the brain.

Autistic disorders have been conceptualized as dysfunctions in neural connectivity (Coben & Myers, 2008; Rippon, Brock, Brown, & Boucher, 2007). In a case series of children with autism, data will be presented including both MRI-DTI and EEG data. EEG data was acquired with a high-density array of 64 cephalic electrodes all digitized with a 3-dimensional tracking system. This enables localization of electrode sites for precise matching of spatial localization of activity across EEG and MRI platforms. Data will be presented including multiple forms of coherence (pair-wise, multivariate, source coherence) and their relation to MRI-DTI findings in these patients. Such analyses allow a comparison of the functional and neurophysiological significance of such coherence measurements such as has never been available previously. Implications for assessment and intervention will be discussed.

References

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- Rippon G., Brock J., Brown C., & Boucher J. (2007). Disordered connectivity in the autistic brain: challenges for the "new psychophysiology". *Int J Psychophysiol.*, 63(2), 164-72.
- Teipel, S.J. et al. (2008). Regional networks underlying interhemispheric connectivity: An EEG and DTI study in healthy ageing and amnesic mild cognitive impairment. *Human Brain Mapping*, Sep 9 [Epub ahead of print].
- Wolters, G., & Raffone, A. (2008). Coherence and recurrency: Maintenance, control and integration in working memory. *Cognitive Processes*, 9(1), 1-17.

Learning Objective

- Describe MRI diffusion tensor imaging and what it measures.
- Explain different EEG coherence measurements.
- Explain how comparing DTI and coherence can inform us of what coherence is measuring.

Outline

- Introduction to MRI diffusion tensor imaging (15 mins.)
- EEG coherence measurements and their definitions (10 mins.)
- Method and findings for the comparison of DTI and coherence values in autistic children (15 mins.)
- Discussion (10 mins.)

Financial Interest: No financial conflict.

INVITED PRESENTATION

QEEG and Event Related Potentials (ERPs) Endophenotypes: Applications for Diagnosis, Neurofeedback and Transcranial Direct Current Stimulation (tDCS) (R,C)

Juri Kropotov, PhD, Institute of the Human Brain, jdkropotov@yahoo.com

Credits: 0.75

Abstract

Spontaneous resting state EEG and cortical potentials in response to tasks provide two relatively independent windows to the human brain functioning. The spontaneous EEG is assessed by conventional spectral (power vs. frequency, coherence vs. frequency). The EEG responses to tasks are assessed by ERPs (averaged potential vs. time). This paper describes results of application of Independent Component Analysis (ICA) for 1) decomposing spontaneous EEG into spatially separated components associated with different types of oscillations (such as parietal, occipital and central alpha oscillations, frontal midline theta rhythm and beta activities) in the human brain, and for 2) decomposing ERPs into independent components associated with different psychological operations (such processing in dorsal and ventral visual streams, orienting response, engagement, motor suppression and monitoring operations). More than 1000 healthy subjects and more than 1000 patients with different brain disorders (ADHD, dyslexia, depression, schizophrenia, OCD, stroke and TBI) participated in the study. The results of application of the EEG/ERP ICA for diagnosis (discrimination) different brain dysfunctions will be presented. In the final part of the paper I am going to present a methodology for constructing protocols of neurofeedback and tDCS on the basis of comparison the individual QEEG/ERP parameters with normative data (HBI reference data base). Recently developed methods of neurotherapy such as sLORETA, ERP-based neurofeedback and local source tDCS are introduced.

References

Kropotov J.D. Quantitative EEG, event-related potentials and neurotherapy, 2009, Academic Press, Elsevier, 600 p.

Learning Objective

Describe the methodology of applying Independent Component Analysis for EEG/ERPs data in diagnosing different brain disorders.

Compare new methods of neurotherapy such as sLORETA, ERP-based neurofeedback and local source tDCS.

Outline

results of application of Independent Component Analysis (ICA) decomposing spontaneous EEG into spatially separated components associated with different types of oscillations and results of application of ICA for decomposing ERPs into independent components associated with different psychological operations (20 min); 2) the results of application of the EEG/ERP ICA for diagnosis different brain dysfunctions will be presented (10 min); 3) methodology for constructing protocols of neurofeedback and tDCS (5 min) and recently developed methods of neurotherapy such as sLORETA, ERP-based neurofeedback and local source tDCS (10 mins.)

Financial Interest: I am a scientific consultant of Mitsar, Ltd (Russia), one of the owners of "HBI-med" company (Switzerland), as well of Q-Pro company (USA).

KEYNOTE PRESENTATION

The Role of EPA/DHA (Omega-3s) in Mental Health: Implications for Practitioners (R)

Daniel Johnston, MD, PhD, NaturalMedInfo, danjohnston@healthcasts.com

Credits: 1.00

Abstract

The critical role of omega-3s in mental health and cardiovascular disease is poorly appreciated by most clinicians and many patients are left confused when confronted with a myriad of fish oil product formulations on the market. This presentation will focus on detailed discussion of both epidemiologic and clinical trials of omega-3s in the realm of neuropsychiatry and why both EPA and DHA are important to ensure overall improved treatment outcomes as well as long term maintenance of healthy mental function

and mood states. From nutritional and dietary perspectives on a population level to biochemical pathways, this presentation will help provide the attendee with a strong foundation in the neurochemistry behind omega-3s and how to help equip your patients from cradle to grave with nutrients that can optimize your desired practice outcomes. Lastly, a new area of interest where combining specific, powerful natural antioxidants with omega-3s for enhancing benefits will be mentioned.

References

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- Laugharne, J.O., et al., "Fatty Acids and Schizophrenia," *Lipids* 1996; 31 (Supp):S163-S165. Bressa, G.M., "SAM-e as Antidepressant: Meta-analysis of Clinical Studies," *Acta Scandinavica Neurologica* 1994;89(154): 7-14.

Learning Objective

Discuss the role of EPA/DHA Omega-3s in the mental health of their patients.

Describe how incorporating the use of these fish oils into their treatment protocols can improve their treatment outcomes.

Outline

Introduction (10 mins.)

Body (45 mins.)

Conclusion and questions (5 mins.)

Financial Interest: The presenter is a co-owner of Neurotopia, a neurofeedback practice in California.

**Sunday, September 6, 2009
Plenary Room 2**

**Characterization of Impedance and Current Flow In The Human Body
As A Function of Connectedness to Earth Ground (R)**

Stephen Elliott, BS, Coherence L.L.C., steve.elliott@coherence.com

Credits: 0.33

Abstract

The human organism has an electrical relationship to Earth "ground". While certain to be infinitely more complex than presently understood, initial findings are in themselves somewhat surprising. Impedance and resultant current flow in the human organism are a function of connectedness to Earth ground. As such, impedance and current flow can be modified by modifying the resistance between human and earth. Characteristic impedance as measured across multiple adults and children will be presented. Implications to electrically coupled biofeedback methods, i.e. EEG and EMG are offered.

References

Elliott, S., Method and System for Electrically Connecting The Human Organism To Earth So As To Facilitate A Current Flow Between The Human Biopotential And Earth For The Purpose of Promoting Health Well Being and Performance, U.S. Patent # 7349194. Issued March, 2008.

Elliott, S., Edmonson, D., The New Science of Breath – 2nd Edition, Coherence Press, 2006.

Elliott, S., Edmonson, D., Coherent Breathing – The Definitive Method, Coherence Press, 2008.

Learning Objective

Discuss the concept of characteristic impedance as it applies to the human organism.

Describe how impedance and current flow in the human organism change as a function of "connectedness" to earth.

Discuss potential implications to electroencephalography and electromyography.

Outline

The concept of characteristic impedance and current flow between humans and earth ground (6 mins.)

Characterization of how impedance and current flow in the human body change as a function of connectedness to ground (6 mins.)

Discuss potential implications to EEG and EMG (5 mins.)

Q&A (3 mins.)

Financial Interest: Stephen Elliott is the President of COHERENCE LLC, Allen, Texas, and a practitioner/facilitator of the method of Coherent Breathing method. COHERENCE LLC sells informational materials and products to promote Coherent Breathing.

More Words Than No:

Two Cases of Juvenile Autism Treated with the LENS (C)

**H. Stephen Larsen, PhD, SUNY, Stone Mountain Center, stephenlarsen@earthlink.net
Nicholas Dogris, PhD**

Credits: 0.33

Abstract

In this unique clinical comparison, two advanced clinical practitioners of the LENS from opposite sides of the country present two little girls: ZG and ES, both diagnosed as severely autistic, and with only one word

each at the beginning of treatment: "No!!" Both were 4 years old at the beginning of treatment, ZG on multiple meds, diagnosed by conventional practitioners as hopelessly autistic, with very little hope for progress. A regional center challenged the legitimacy of the neurofeedback treatment, but the treatment led to big and obvious improvements in school and an independent evaluation of remarkable progress. ES was an amazingly cute little ball of negativity observed by many professionals but whose parents refused drug treatments. Both were almost impossible to get to sit still for the sensors to be attached at the beginning. At the current stage of treatment each is far more functional and pliable, and has many more words than "No!". ES is beginning to speak in sentences and spell and read aloud as well as play interactively with other children.

These cases are dramatic because of the thoroughness in which their disorders--and their remediation is documented: With multiple reports from therapists and teachers, multiple brain maps done over two years, and in the case of ZG, a record of e-mails marking progress from the little girl's mother, and with ES comments from professionals astonished at the big improvements the little girl showed, and wondering what possible method could produce them (the LENS seems to empower other therapeutic modalities such as OT and LT.). With movie clips and images as well as maps--an unforgettable glimpse into the rescue of the Autistic child from solipsism and isolation.

References

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Learning Objective

Discuss a new theory of autism that suggests symptoms or the disorder may be reversible.

Outline

The case of child ZG (10 mins.)

The case of child ES (10 mins.)

Financial Interest: No financial advantage or commercial support.

EEG Suppression: A Theoretical/Clinical Talk on an Important New Variable in Neurofeedback and Neuroscience (R,C)

Len Ochs, PhD, Private Practice, lochs@earthlink.net

Credits: 0.33

Abstract

This presentation introduces a new concept of EEG suppression that differs from its appearance in the neurology/anesthesia literature. This definition of EEG suppression show the importance of standard deviation and amplitude reductions in the EEG, how to assess them, and how this can help the clients in neurofeedback. The presentation will cover its definition, early signs of its significance, its calculation as the coefficient of variation, its interaction with EEG amplitudes, and its influence on the recovery of human functioning. The ability to predict the course of EEG amplitude fluctuations has ramifications for evaluating the success in neurofeedback and understanding the making and breaking of connectivity. It also

has ramifications for providing clients with a context for the changes in their EEGs. The presentation is supported by case histories accompanied by EEG topographic map series as well as charts showing changes in symptom ratings. Attendees will be shown how to make their own suppression reports if the appropriate data is present in their neurofeedback systems. Implications for research will be addressed.

References

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- Larsen, S., Larsen, R., Hammond, D. C., Sheppard, S., Ochs, L., Johnson, S., Adinaro, C., & Chapman, C. (2006). The LENS neurofeedback with animals. *Journal of Neurotherapy*, 10(2-3), 89-104.
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Learning Objective

Define EEG suppression, its importance, its consequences, how it manifests itself over the course of neurofeedback treatment, and its ramifications for the return of client functioning..

List the limitations of examining the raw EEG, and how to use it as a guide for treatment.

Outline

Definition of EEG suppression: A characteristic of the EEG signal that reflects the degree of smoothing of the signal by the brain, from none to complete. It is expressed as the normally-distributed coefficient of variability, the ratio of the standard deviation of the signal at any site to its amplitude. (5 mins.)

The function of EEG suppression: Hypersuppression may be one of the primary neuronal defenses the function of which is to manage brain trauma. Hypersuppression appears to operate autonomously in some people regardless of its original reason for being. The restoration of variability appears to be one of the fastest ways to return function. Using site sorts to optimize the approach path will be demonstrated. The degree of suppression has important consequences for helping speed or slow treatment. (5 mins.)

Demonstration of Suppression Maps and courses of treatment as reflected in sequences of maps demonstrating numeric differences among varying kinds of EEG suppression. If their systems provide the appropriate data for export, participants will be taught to use spreadsheets to provide their own suppression maps. (10 mins.)

Financial Interest: I am a consultant to OchsLabs, Inc: I do writing and training for them. I am not an officer or owner.

Integrating Cognitive Rehabilitation and Neurofeedback: A Review of the Research (R,C)

Joseph Sandford, PhD, BrainTrain, jas@braintrain.com

Credits: 0.75

Abstract

The clinical efficacy and effectiveness of cognitive rehabilitation has been recognized and accepted by the general scientific community based on numerous controlled research studies (Cicerone et. al, 2000, 2005). Neurofeedback training has often been implemented simultaneously with educational and learning skill tasks (Lubar, 1999). This cognitive-educational training methodology constitutes a “push-pull” technique that fosters both the generalization of neurofeedback and the development of divided attention. The application of specific computerized attention training exercises in conjunction with neurofeedback has been shown to significantly improve attentional functioning for both mTBI and adult ADHD populations in only 20 training sessions (Tinius & Tinius, 2000). In addition, cognitive training provides an ethically appropriate control treatment for neurofeedback research (Gevensleben, 2009; Fine, Goldman & Sandford,

1994). These studies and additional research incorporating meta-cognition training (Thompson & Thompson, 1998) in identifying effective means for the integration of cognitive rehabilitation and neurofeedback will be reviewed in this paper.

References

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- Thompson, L., & Thompson, M. (1998). Neurofeedback combined with training in metacognitive strategies: Effectiveness in students with ADD. *Applied Psychophysiology & Biofeedback*, 23(4), 243-263.

Learning Objective

Cite the theoretical and clinical reasons as to why it is advantageous to combine neurofeedback training with cognitive training.

Outline

Review the theoretical basis and research that pertains to combining neurofeedback and cognitive training. (10 mins.)

Examine practical variations and protocols for different clinical models that can be used for integrating neurofeedback and cognitive training. (10 mins.)

Financial Interest: President of BrainTrain, Inc. which owns the computerized cognitive training software called Captain's Log ®.