Lisa Tataryn

Boosting neural activity in cortical motor areas through neurofeedback in Parkinson’s Disease


In Parkinson’s Disease (PD), functional changes in the cortico-striato-thalamo-cortical circuit secondary to dopaminergic neuronal degeneration in the substantia nigra lead to motor symptoms such as bradykinesia, rigidity and tremor (DeLong and Wichmann, 2007). Bradykinesia in PD mainly consists of slowness of voluntary movements and progressive deterioration over time of motor performance during sequential movements (i.e. the finger tapping task). Early movement studies in PD have demonstrated that when patients perform complex motor tasks consisting of simultaneous/sequential movements, motor execution deteriorates significantly over time owing to the “sequence effect”.

“Fumuro provides experimental evidence supporting NFB training as a new non-pharmacological strategies helpful for increasing neural activity in cortical motor areas responsible for motor symptoms of PD”

This entry was posted in Scientific Background and tagged Parkinson's, Neurofeedback on October 29, 2014 [http://pdneurotrainer.com/boosting-neural-activity-in-cortical-motor-areas-through-neurofeedback-in-parkinsons-disease/] by Lisa Tataryn.

EEG/ERP Analysis: Methods and Applications (2014 Pub) Chapter 11 on Neurofeedback

http://books.google.com/books?id=SpXaBAAAQBAJ&lpg=PP1&pg=PP1#v=onepage&q&f=false
Changes in the neurological functions of the human brain are often a precursor to numerous degenerative diseases. Advanced EEG systems and other monitoring systems used in preventive diagnostic procedures incorporate innovative features for brain monitoring functions such as real-time automated signal processing techniques and sophisticated amplifiers. Highlighting the US, Europe, Australia, New Zealand, Japan, Korea, China, and many other areas, EEG/ERP Analysis: Methods and Applications examines how researchers from various disciplines have started to work in the field of brain science, and explains the different techniques used for processing EEG/ERP data. Engineers can learn more about the clinical applications, while clinicians and biomedical scientists can familiarize themselves with the technical aspects and theoretical approaches.

This book explores the recent advances involved in EEG/ERP analysis for brain monitoring, details successful EEG and ERP applications, and presents the neurological aspects in a simplified way so that those with an engineering background can better design clinical instruments. It consists of 13 chapters and includes the advanced techniques used for signal enhancement, source localization, data fusion, classification, and quantitative EEG. In addition, some of the chapters are contributed by neurologists and neurosurgeons providing the clinical aspects of EEG/ERP analysis.

- Covers a wide range of EEG/ERP applications with state-of-the-art techniques for denoising, analysis, and classification
- Examines new applications related to 3D display devices
- Includes MATLAB® codes

EEG/ERP Analysis: Methods and Applications is a resource for biomedical and neuroscience scientists who are working on neural signal processing and interpretation, and biomedical engineers who are working on EEG/ERP signal analysis methods and developing clinical instrumentation. It can also assist neurosurgeons, psychiatrists, and postgraduate students doing research in neural engineering, as well as electronic engineers in neural signal processing and instrumentation.

This entry was posted in Scientific Background and tagged EEG, Neurofeedback, book, ERP on October 26, 2014 [http://pdneurotrainer.com/eegerp-analysis-methods-and-applications-2014-pub-chapter-11-on-neurofeedback/] by Lisa Tataryn.

Therapeutic effect of L-dopa improved in the SMR Neurofeedback trained monkeys.

http://www.geertlangereis.nl/Publications/Papers/abstract-BFE.pdf

As a standardized experimental setting may bridge the gap between non-validated empirical human research and standardized controlled research to control for erroneous variables such as placebo effects,
a controlled study with monkeys was performed to examine the therapeutic power of SMR neurofeedback in PD. Ten marmosets were provided with two epidural bioelectric bipolar electrodes above the sensorimotor cortex for telemetric EEG registration. Five monkeys were trained with positive reinforcement on SMR (12-16 Hz) measured by online analyses of 1.28 s EEG epochs in 30-minute sessions (sample frequency 125 Hz). Another group of 5 monkeys were trained on random EEG and served as a negative control group. After a training of 9-12 sessions PD was induced by repeated MPTP injections (total dose 6 mg/kg) in all monkeys, and the training continued for one session each week. Three weeks after PD induction a twice-daily treatment with L-dopa started (12.5 mg/kg po). During the whole study the monkeys were daily observed on parkinsonian signs, the body weight was measured and behavioral tests were performed once a week. SMR trained marmosets showed less progression of PD symptoms and less severe disease expression after PD induction compared to control monkeys under the same circumstances. SMR neuro-feedback also improved the therapeutic efficacy of L-dopa treatment, indicating that neurofeedback, as an adjunct therapy, may allow for lesser dosages of L-dopa limiting the L-dopa induced dyskinesia, one of the drawbacks of L-dopa treatment. These symptom controlling effects and synergistic effects in combination with L-dopa are an important indication of the therapeutic power of non-invasive SMR based neurofeedback in PD.

This entry was posted in Scientific Background and tagged Parkinson’s, Neurofeedback, SMR, l-dopa, MPTP, primates, Placebo on October 23, 2014 [http://pdneurotrainer.com/neurofeedback-training-for-parkinsons-disease-is-not-monkey-business/] by Lisa Tataryn.

Biofeedback for Movement Disorders (Dystonia with Parkinson’s Disease): Theory and Preliminary Results

http://www.tandfonline.com/doi/abs/10.1300/J184v06n04_06?src=recsys#.VEhje_kViSo

Background. This paper presents a theoretical framework for using a combination of EEG biofeedback plus regular biofeedback with clients who have movement disorders.

Method. A case study is included that describes intervention and results with a 47-year-old woman with the dual diagnosis of Parkinsonapos;s disease and dystonia. The rational for adding biofeedback interventions to traditional medical treatment hinges on the fact that muscle spindles, which are involved in muscle movement and tone, have double innervations, cholinergic and sympathetic (Passatore, Grassi, & Filippi, 1985). Both of these systems can be operantly conditioned using biofeedback. There were two learning goals: (1) increase the production of 12 to 15 Hz activity since this sensor motor rhythm (SMR) is
associated with decreased firing of the red nucleus and the red nucleus, in turn, has links to the muscle spindles (Sterman, 2000); (2) train for calm, relaxed auto-nomic nervous system functioning (decreased sympathetic drive and parasympathetic ascendance) because this may also have a beneficial effect on muscle tone by means of influencing muscle spindle activity (Banks, Jacobs, Gevirtz, & Hubbard, 1998). Training for balanced autonomic system functioning is facilitated by diaphragmatic breathing at a rate of about six breaths per minute. Diaphragmatic breathing results in respiration and heart rate variability, presented as a line graph, following the same sinusoidal pattern when viewed on a biofeedback screen, a pattern termed respiratory sinus arrhythmia (RSA, Budzynski, 1989). This dual training of neurofeedback to enhance SMR activity and RSA biofeedback for relaxed autonomic nervous system (ANS) functioning was done for 30 sessions over a six-month period.

**Results.** Training was associated with significant reduction in dystonic movements. Additionally, the client became able to use diaphragmatic breathing to cue herself to turn on a mental state associated with increased SMR production and thus control incidents of freezing, a common problem in advanced Parkinson's disease. With twelve more sessions over the next 18 months, the improved quality of life has been maintained.

**Discussion.** This work is reported to put forth a theoretical model of why neurofeedback plus biofeedback is helpful in movement disorders and to encourage research in this area.

This entry was posted in Scientific Background and tagged Parkinson’s, Dystonia, EEG, Neurofeedback, Biofeedback, SMR on October 23, 2014 [http://pdneurotrainer.com/biofeedback-for-movement-disorders-dystonia-with-parkinsons-disease-theory-and-preliminary-results/] by Lisa Tataryn.

---

**Evaluation of Neurofeedback Training in the Treatment of Parkinson’s Disease: A Pilot Study**

http://www.tandfonline.com/doi/abs/10.1080/10874208.2012.650109#.VEhi6vkVISo

**Abstract**

We assess the effects of EEG biofeedback training on levodopa-induced dyskinesia (LID) in patients with Parkinson’s disease (PD) using a sham feedback controlled study design. Nine subjects were randomized into either a treatment group or control group and underwent 24 sessions of either active feedback training or sham feedback. The training protocol aimed at increasing 8–15 Hz activity while inhibiting excess 4–8 Hz and 23–34 Hz activity at the C3-C4 derivation. There were no statistically significant differences baseline to post-active neurofeedback training as compared to sham feedback training in primary outcome measures assessing change in dyskinesia severity, nor in secondary outcome measures assessing change in clinical features of PD. Nonsignificant trends were observed in subjects’ PD home
diaries indicating a decrease in the severity of motor fluctuations. Baseline to post-training comparisons of secondary outcome measures in quantitative EEG analysis showed significant interaction effects within and between frontal and posterior regions, accompanied by decreases in 25–30 Hz (high beta) relative power, cross spectral power and phase resets per second activity, and significant increases in 8–12 Hz (alpha) relative power, cross spectral power, and coherence activity. These results indicate that EEG biofeedback training can affect the spectral EEG topography of individuals with PD and LID and that training to increase 8–15 Hz activity and decrease 23–34 Hz activity may have been associated with a nonsignificant decrease in dyskinesia severity and an improved sense of well-being.

This entry was posted in Scientific Background and tagged Parkinson's, EEG, Neurofeedback, Dyskinesias on October 23, 2014 [http://pdneurotrainer.com/evaluation-of-neurofeedback-training-in-the-treatment-of-parkinsons-disease-a-pilot-study/] by Lisa Tataryn.

Brain Control – Developments in Therapy and Implications for Society

http://tinyurl.com/ltt7dw

With the burden of brain disorders increasing worldwide, there has been a resurgence of interest in techniques to control the brain and thereby improve its function. Yet how realistic are these expectations and what are the ethical implications? This book reviews the main techniques that can enable patients to use their brains for communication and control and doctors to modify brain function. It explains how paralysed patients may be helped through brain reading, how brain stimulation can help to improve Parkinson's disease and certain mental disorders, and how patients can be trained to regulate their own brain activity through neurofeedback. Brain Control situates the application of these techniques within ethical and legal debates on the principles of autonomy and fairness, and suggests ethical standards for their future development.

This entry was posted in Scientific Background and tagged DBS, Parkinson's, Neurofeedback, brain control, david linden on October 14, 2014 [http://pdneurotrainer.com/brain-control-developments-in-therapy-and-implications-for-society/] by Lisa Tataryn.
Neurofeedback and physical balance in Parkinson's patients


Abstract

The primary goal of the present research is to study the effect of a neurofeedback training (NFT) period on balance problems associated with Parkinson's disease. Sixteen patients were selected through purposive sampling and were randomly divided into experimental and control groups. The research procedure included eight sessions. Prior to and after training, pre-tests and post-tests of static and dynamic balance were administered using “limit of stability” for the Biodex as well as the Berg scale. The results revealed that, after neurofeedback training, a statistically significant improvement in both static and dynamic balance in the experimental group was achieved. The means of the Biodex and Berg scores in the experimental group increased from 18.87 to 42.87 and 17.62 to 46.37, respectively. The means of the Biodex and Berg scores in the control group in the pretest were 18.25 and 17.75 and increased to 20.00 and 20.50, respectively. The results suggest that NFT can improve static and dynamic balance in PD patients.

This entry was posted in Scientific Background and tagged Parkinson's, EEG, Neurofeedback, Balance on October 11, 2014 [http://pdneurotrainer.com/neurofeedback-and-physical-balance-in-parkinsons-patients/] by Lisa Tataryn.

ISNR 2014 Presenter

I am excited to be presenting at the International Society of Neuronal Regulation's 22nd annual conference in San Diego, CA on September 17, 2014. I have an information packed presentation. See below for abstract of the presentation. If you will be there, stop by and say hello.

Unlocking Parkinsonian Resting Tremor with Neurofeedback

Parkinson's disease is the second most common progressive degenerative disease affecting as many as one million individuals in the US and four million worldwide. Approximately four percent of people with Parkinson's are diagnosed before the age of 50 and the incidence increases with age. Currently there is no cure for Parkinson's disease and finding the right treatment as symptoms change over time is important and requires the expertise of specialized health care professionals.

http://pdneurotrainer.com/tag/neurofeedback/
Resting tremor, the most common symptom of Parkinson's disease, is treated with dopamine replacement therapy, surgical ablation or with electrode implantation called Deep Brain stimulation. Innovative studies have discovered that tremor-correlated cortical activity can be detected by electroencephalography (Hellwig 2000, Muthuraman 2008). The findings underline that the motor areas of the cerebral cortex are involved in the neuronal network generating resting tremor in Parkinson's disease. Further studies have confirmed the pathological neural network for Parkinsonian resting tremor (Brown 2003, Timmerman 2003, 2011, Helmich 2012, Brittain 2014), Understanding the cortical representation and localization of tremors makes it possible to develop Neurofeedback training protocols to decrease resting tremor.

This presentation will review scientific literature outlining the pathological network activity of Parkinsonian resting tremor. Case studies will be presented to demonstrate the decrease of Parkinsonian rest tremor during Neurofeedback training. The resting tremor is measured by Digitrac, a triaxial accelerometer which calculates and displays movement frequency and amplitude using Fast Fourier Transform (FFT). The tremor frequency and its three harmonics will be discussed. One case study of sham Neurofeedback for resting tremor with accelerometer recordings will be presented and discussed. Accelerometer recordings will also be provided to show the starting and stopping of rest tremors in a single session. Easily accessible tools for measuring resting tremor will be provided so that a clinician can monitor progress within a session and between sessions.

This entry was posted in Events and tagged Parkinson's, Tremor, Neurofeedback on October 11, 2014 [http://pdneurotrainer.com/isnr-2014-presenter/] by espiusa.