include clinical psychoneurophysiology and the QuickQ & BrainDryvr method. Dr. Swingle reviews in detail the initial brain assessments and treatment procedures for a wide spectrum of disorders including seizures, autistic spectrum disorders, attention and learning disorders, defiance disorders, as well as developmental delay, traumatic brain injury, and other trauma. He also presents preliminary findings from research in Canada on homogeneous groups in British Columbia.

Neurofeedback Training for Parkinson's Disease Is Not Monkey Business

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There is a growing interest in neurofeedback technologies as a treatment against neurological diseases. However, the field of neurofeedback has proceeded largely without validation due to the lack of control groups. For this reason, skepticism towards neurofeedback in the past has caused its delay as a new therapy. Therefore, from a translation point of view, it is recommended to perform neurofeedback research in a non-human primate model closely related to humans to rule out placebo effects and nonspecific factors, bridging the gap between non-validated empirical and standardized controlled research. Until now, all the present knowledge about the mechanistic aspects of neurofeedback training has been based on correlation studies of neurophysiology with real time fMRI. From these studies, it is known that neurofeedback training may influence the metabolic activity in the striatum. This can be very important because a decline in metabolic activity activates microglial cells that are involved in the maintenance of the neurodegenerative process found in Parkinson's disease (PD). Sensorimotor rhythm (SMR) training might also have advantages in counteracting the dyskinesia as found in PD by changing the thalamocortical circuits leading to a decrease of GABA release from the striatum to the thalamus as is described for patients suffering from ADHD. Indeed, there is a description of a PD patient who was able to control involuntary movements after SMR training (Thompson & Thompson, 2003). In our study, 10 marmoset monkeys were provided with two epidural bioelectric bipolar electrodes above the sensorimotor cortex for telemetric EEG registration. Half of these monkeys were trained with positive reinforcement on SMR (12–16 Hz) measured by online analyses of 1.28-s EEG epochs in 30-min sessions (sample frequency 125 Hz). Another group of 5 monkeys was trained using random EEG biofeedback and served as a negative control group. After 9–12 training sessions, the experimental phase of the study started. PD was induced by repeated MPTP injections (total dose 7 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 experimental phase, the monkeys were daily observed on Parkinsonian signs, body weight was measured, and behavioral tests were performed once a week. The preliminary results showed that the SMR-trained monkeys exhibited less decrease in body weight and a slower progression of the disease. Also, the severity of clinical signs was lower compared to the control monkeys. Finally, the therapeutic effect of L-dopa was improved in the SMR-trained monkeys. Remarkably, the ratio between the explorative body postures and the fear postures was increased compared to the control monkeys. These preliminary results demonstrated that neurofeedback may benefit a broad range of neurodegenerative disorders such as PD. It can be an elegant method to replace pharmaceutical intervention, limit possible side effects, and disease progression. This study is the first initial step for a much-needed scientific basis to neurofeedback in neurodegenerative diseases.

ORAL PRESENTATIONS

Alternative Presentations of HRV Feedback

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We take a design perspective, being interested in creating biofeedback systems which empower their users in matters of health and coping with stress. Taking a design perspective also means trying to understand the working of the full loop, which includes both the user and the biofeedback device(s). The form-giving of the feedback to the user is an important design issue, which is still largely unexplored. We will show some of our explorations, including a new representation called circle maps, based on Poincaré plots. Their usage for real-time feedback is new to the best of our knowledge. In our demonstration, we will show three structural designs for feedback, viz. (1) Representation of calculated HRV, (2) Representation of successive beat-to-beat intervals, and (3) Circle plot (modified Poincaré plot). We developed a form-giving in which all aspects are kept the same (in-as-far possible), except for the structural design. We will discuss the strong and weak points of the three designs on criteria such as outlier robustness, information richness, and narrative adaptability. It is also possible to combine several approaches or to even present all three types of information to the user. The resulting feedback loop then becomes like a PID controller (proportional-integrating-differentiating—often used for mechanical feedback control systems). The calculated HRV, with its cumulative effect is like the I (integrated signal). The representation of successive beat-to-beat intervals is like the P (proportional, direct, and untransformed signal). The representation by the circle plots is like the D (the differential of successive signals). We do not yet have proper quantitative tests to demonstrate which displays best teach HRV increase or control. Possibly, next year we will share such results or our preliminary experiences with the BFE community. In either case, we will demonstrate the prototype at work.

Blood Vessel Measurement and Blue Tooth HRV-Biofeedback

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New HRV-biofeedback devices have been developed in 2010. An overview of the new developments will be presented. From 2010 to 2020, we can expect a lot of interest by society in emotion, emotion management, and stress management. This is an opportunity for our Biofeedback Foundation of Europe to play a role in self-healing and self-management in society and in health organizations. Kees Blase will describe developments in Toyology, the science of gaming, in the development of smart phones and possibilities to develop HRV biofeedback for smart phones. How can biofeedback professionals stimulate the development of better devices? How can professionals use these new devices in their clinical practice? Can this development impact the way that our health system is organized? Two developments are new in biofeedback. Measuring blood vessel elasticity will be shown as well as new possibilities for measuring O2/CO2, which is relevant in the treatment of asthma, hyperventilation, and trauma.

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