present EEG study ($N = 8$) applies this approach to a more realistic setting. In a forced choice task, subjects had to rate whether a given word was of maximal quality or degraded. Stimuli were presented either in wideband quality (60%) or were impaired by four progressive levels of bit rate reduction, using a standard telecommunication codec [2]. The ERP analysis allowed qualifying those trials where subjects correctly indicated a loss of quality: The higher 'neural uncertainty' involved in detecting more subtle degradations is reflected in a decreased amplitude of the P3 component. Additionally, we used a linear classifier to single out trials where quality impairment was not reported, but still evoked an ERP pattern similar to when it was processed consciously (three subjects). Thus, the approach demonstrates that even if no quality impairment is noted consciously, the degradation can still be processed in the cortex. Concluding, the ERP paradigm previously developed for noisy phonemes can be transferred successfully to full words degraded by realistic broadcast limitations. This supports the potential of ERP analysis combined with machine learning not only to complement conventional methods of audio quality assessment, but also to extend their sensitivity to sub-threshold stimuli.

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Use of small inhibitory RNAs to recover the structural plasticity in the adult nervous system

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Visual deafferentiation carried out in early postnatal stages is followed by elongation of axons from afferents to the superior colliculus that grow tangentially to the collicular surface or ascend to invade more superficial layers. This structural plasticity facilitates the recruitment of neurons devoid of visual information to elaborate behaviorally relevant responses that emerge from the deep collicular layers. When the nervous system maturates (after 6–8 postnatal weeks in rodents) no axonal growth after visual deafferentiation is observed. We set out to promote postlesional axonal sprouting in adults by administration of specific small inhibitory RNAs (siRNAs) to knock down the expression of Nogo-r (receptor of the Nogo system) or RhoA (small molecule that keeps the stability of the presynaptic actin mesh-work. A 7 days siRNAs delivery from an osmotic pump inserted into the visual cortex of deafferented adult rats elicited in cortical afferents an axonal growth of 800–1200 microns, which is significant, taking into account the short period of siRNAs application. Encapsulating siRNAs in nanoparticles of biodegradable polymers like poly-lactide glycolide (PLGA), a longer siRNAs administration was achieved. Spermidine coupled siRNAs were suspended in PLGA and then sonicated to generate nanoparticles (nanosiRNAs) of 50 nm size. From these nanoparticles, siRNAs are slowly released at least during 2 weeks. 5 microliter aliquots of nanosiRNAs were injected together with the anterograde tracer biotin dextran amine into the visual areas of adult animals shortly after visual deafferentiation. Cortical fibers that arrived to the superior colliculus showed a more extensive growth than after shorter osmotic pump applications. Results described here are encouraging enough to translate the applicability of nanosiRNAs to treat human pathologies in order to enhance the postlesional recovery of nervous pathways. We are going next to assay different polymers at different concentrations aimed to obtain more efficient and sustained siRNAs release.

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Spike engineering with Channelrhodopsin-2

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Photostimulation technology that combines optics and genetics to interface with neural circuits is developing into one of the most important tools in neural stimulation. Using genetically encoded agents such as Channelrhodopsin-2 (ChR2), light sensitivity can be imparted onto otherwise 'blind' neuronal cells and an external light source can be used to remotely generate the action potentials. Design of various mutants of ChR2 and other light sensitive ion channels and pumps is now well within the reach of modern molecular biology. Despite the increase use of the optogenetics technique, the underlying dynamics of the ChR2-evoked spikes are still not yet fully understood. In contrary to conventional electrical stimulations, the ChR2 evoked currents are sensitive to the neural it drives. ChR2 behaves as a complex light-controlled, voltage-dependent current driver coupled to a dynamic-threshold voltage-oscillator (neuron). We developed a model that describes the response of ChR2-expressing neurons to light stimuli and use the model to explore the light-to-spike process. We show that an optimal stimulation yield is achieved when the optical energies are delivered in short pulses. The model allows us to theoretically examine the effects of using various types of ChR2 mutants. We show that while increasing the lifetime and shuttering speed of ChR2 have limited effect, reducing the threshold irradiance by increased conductance will eliminate adaptation and allow constant dynamic range. The model and the conclusions presented in this study can help to interpret experimental results, design illumination protocols and seek improvement strategies in the nascent optogenetic field.

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Signal analysis of the effects of microlesions in the medial septal area on the dominant hippocampal rhythm in anesthetized rats

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The theta-rhythm in the rat has been implicated in attention, motivation, learning and memory. The aim of the present experiment was to establish whether electrical stimulation in the acutely lesioned medial septal area (MSA) could have an effect on the hippocampal rhythm in anesthetized animals. Adult male Wistar rats ($n = 6$) were anesthetized with 0.5 g/kg chloral hydrate. Two Pt bipolar twisted pair electrodes were implanted in MSA (AP 0.5 ML 1.2 SD 6.2 mm 10°) and the hippocampus (AP −3.3 ML 2.2 SD 2.6 mm 10°). Local field potentials (LFPs) were recorded in the band 0.1 Hz–3k Hz and digitized at 10 kHz using Spike2 (CED). Voltage-controlled stimulation (pulse width 1 ms) in the MSA site was performed in the range of 5–10 V at frequencies between 4 and

50 Hz. Electrolytic lesions were made by 200 μA DC current for 15 s. Post lesion stimulation was performed with the same protocol. The stimulation in MSA in the range 10–25 Hz was able to elicit time-locked rhythm in the hippocampus (i.e. rhythm driving). The threshold for driving was 6.03 V. The LFPs were analyzed with the Chronux package (1); and Ensemble Empirical Mode Decomposition/Independent Component Analysis (EEMD-ICA) (1). The driving was characterized by marked peaks in the multi-taper spectrum around 10, 20 and 30 Hz. EEMD-ICA could objectively isolate the driven rhythm and reconstruct it successfully in the presence of stimulation. Components characteristic of driving were observed only during stimulation and were not part of the stimulation artifact (reconstructed by the same procedure). In such way one could determine the influence of an isolated component of interest across a wider frequency band. Preliminary results demonstrate that at the driving threshold, in 4 cases the lesions increased the component at 10 Hz, in 1 case had no effect and in 1 case there was no appreciable difference between pre and post-lesion state.

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EEG-Neurofeedback and psychodynamic psychotherapy in adolescent anhedonia with substance misuse: A single case study

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There is substantial evidence confirming Neurofeedback as an effective training-method with applications in clinical, educational and optimal performance domains. However, a psychodynamically informed NF-approach has not been examined. A 19 year-old adolescent male, whose first college year was evidently upset after severe, 18-month, polydrug misuse, was treated with 10 sessions with a one month follow-up. Sessions consisted of an hour-long session of Short-Tem Psychodynamic Psychotherapy and after an interval Sensory Motor Rhythm (SMR) training followed by the Alpha/Theta (A/T) protocol. At the end of each psychotherapy session the therapist completed the Brief Psychiatric Rating Scale and the Montgomery Asberg Depression Rating Scale. The student was also characterized with the Brief Symptom Inventory, the Beck Depression Inventory, the Schizotypal Personality Questionnaire, the Big Five personality Inventory and the Multidimensional Inventory for Religious/Spiritual Well-Being. Pre/Post-treatment and Follow-up assessment confirmed that levels of psychopathology dropped almost completely to zero, and this was in concert with EEG learning curves. Correlations between symptoms and EEG bands disclosed high correlations between symptoms and SMR/theta ratio with a striking contribution from theta. This was in the direction of the greater the symptoms the higher was the amplitude of theta. This relation with theta, recorded (Cz) with eyes open, was not found with theta recorded (Pz) with eyes closed in the A/T paradigm. In conclusion the combined treatment was found to be highly effective. The student learned to deal with feelings of anhedonia and alienation. Furthermore, he did not relapse during the Follow-up phase. Further randomized-controlled trial research is recommended. The relation between eyes open theta and symptoms provides a caution for training up theta amplitude.

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The effects of neurofeedback in autism: Results of a blinded randomized trial using a skin conductance biofeedback control group

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Objective: The results of a study investigating the effects of neurofeedback in autism spectrum disorders (ASD) will be presented. A blinded and randomized trial using skin conductance (SC) biofeedback as a control group was performed to prevent the outcomes of the study from attention and expectancy biases.

Method: The present study included three research groups: an EEG-biofeedback group, a SC-biofeedback group, and a waiting list control group. All participants ($n = 41$) were pre-tested with 19-channel EEG and executive function tasks and parents and teachers filled out behavior questionnaires measuring ASD symptoms. Then, the EEG- and SC-biofeedback groups had identical sessions of EEG- or SC-biofeedback and were blinded for the type of feedback they received. The EEG-biofeedback group inhibited delta and theta power at centro-frontal scalp locations while SC was recorded. Participants in the SC-biofeedback group inhibited SC while theta power was recorded. After 40 biofeedback sessions, all participants were re-tested with 19-channel EEG and executive function tasks and parents and teachers filled out behavior questionnaires again. Six months later, a final collection of data was completed in order to investigate long term effects of the treatment.

Results: Seven out of 13 participants of the EEG-biofeedback group successfully reduced delta and theta power and were named as EEG-responders. Six out of 13 participants showed no effect in EEG, the so-called EEG-non-responders. In the SC-biofeedback group, eight out of 12 participants reduced SC and were named SC-responders. Four participants showed no reduction of SC and were called SC-non-responders. EEG-responders furthermore showed a long term improvement in cognitive flexibility, whereas no such improvement was found in other participants. No effects were found in ASD symptoms as rated by parents or teachers. The 19-channel EEG recordings of EEG-responders showed a reduction of delta power at Pz immediately after treatment ended but not after six months.

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Remote training/Tele-Neurofeedback, realtime *Z*-score-training, and special disorders – state of minimal consciousness – SMC and autism spectrum disorders – ASD – Case reports

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Background: Special symptoms do need special treatments, which are often not locally available – so with Neurofeedback-therapist and treatment of patients in state of minimal consciousness (SMC – term to be disputed) and autism spectrum disorders (ASD). Tele-Neurofeedback in a setting with quality control can overcome geographical and time barriers and counterbalance the lack of a differentiated network of qualified Neurofeedback therapists.

Methods: Two adult patients with SMC and 3 children with ASD are treated in a Tele-Neurofeedback setting. The training was done with 4 channel *Z*-scores – to be described – in order to fulfill requirements of quality management and to have the security to not training dysfunctional options. All patients had an initial QEEG and initial Neurofeedback-treatments done by the practician – the SMC patients in their clinics, the children with ASD in the clinic of practician. Co-trainer were trained (varying from 6 h to several workshops), equipment was provided, and the Tele-Setting