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THE GREAT RESET: TRANSCRANIAL PULSE STIMULATION REDUCES GLOBAL EEG-ENTROPY IN ALZHEIMER'S DISEASE

Lars Wojtecki 1,2, Carlos Trenado 3, Celine Cont 1, Kristin M. Zimmermann 2, Nathalie Stute 2, Alfons Schnitzler 4. 1 Heinrich Heine University Düsseldorf, Düsseldorf, Germany; 2 Hospital zum Heiligen Geist, Kempen, Germany; 3 Saarland University, Saarbrücken, Germany; 4 Heinrich Heine University Duesseldorf, Germany

Abstract

Background: Transcranial Pulse Stimulation (TPS) is a new therapy that uses shockwaves for the treatment of Alzheimer's Disease (AD). In humans, there is first evidence for beneficial clinical effects after a series of six TPS sessions. Magnetic resonance imaging studies suggest up-regulation of memory networks as well as increased cortical thickness after stimulation. Effects on oscillatory electrical brain activity measured with resting state electroencephalography (EEG) have not been reported so far.

Methods: A consecutive number of four pilot TPS-treated AD-patients was examined. TPS-naïve resting EEGs were recorded before treatment and compared with EEG-recordings directly after first stimulation. All patients received 4Hz TPS of about 6000 pulses of 0.2 mJ/mm² (navigated bifrontally, biparietally, bitemporally and praecuneus) using the Neurolith System (Storz Medical). Frontal, parietal, central and temporal channel clusters were analyzed with regard to their alpha, theta delta and gamma power and for a measure of Tsallis entropy.

Results: The immediate effect after first TPS on grand-average EEG resting state showed an increase of power in all frequency bands and for total power, although a significant difference between pre- and post-stimulation was not revealed due to power variability. However, the grandaverage across patients and channels of Tsallis entropy showed a significant reduction after a single stimulation session.

Discussion / Conclusion: Limited due to a high variability (and possibly due to underpower) we found power increase across frequency bands and channels which failed significance. On the other hand Tsallis entropy was a more sensitive measure for change on EEG activity after stimulation. This might reflect a global reset of uncoordinated and thus pathological neural activity after TPS stimulation. More measurements should be added including longitudinal serial recordings over the treatment course of six sessions with correlations of clinical treatment effects.

Keywords: transcranial pulse stimulation, shock wave, Alzheimer, EEG

The great reset: Transcranial pulse stimulation reduces global EEG-entropy in Alzheimer's Disease

Lars Wojtecki^{1,2}, Carlos Trenado³, Celine Cont^{1,2}, Kristin M. Zimmermann^{1,4,5}, Nathalie Stute¹, Alfons Schnitzler²



¹Clinic for Neurology and Neurorehabilitation, Hospital zum Heiligen Geist, Academic Teaching Hospital of the Heinrich-Heine-University Duesseldorf, Kempen, Germany



²Institute of Clinical Neuroscience and Medical Psychology, Medical Faculty, Heinrich-Heine-University Düsseldorf, Germany

³Systems Neuroscience and Neurotechnology Unit, Faculty of Medicine, Saarland University and HTW Saarland, Homburg/Saar, Germany

⁴Laboratory for Multimodal Neuroimaging (LMN), Department of Psychiatry and Psychotherapy, University of Marburg, Marburg, Germany

⁵Center for Mind, Brain and Behavior (CMBB), University of Marburg and Justus Liebig University Giessen, Germany



Background

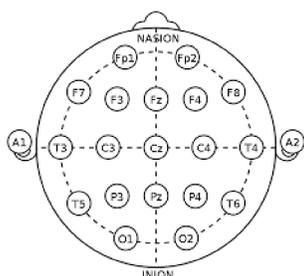
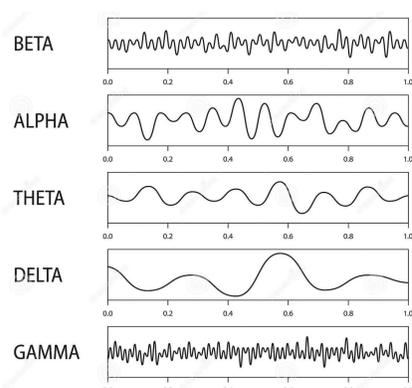
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Methods

- A consecutive number of 4 pilot TPS-treated AD-patients was examined.
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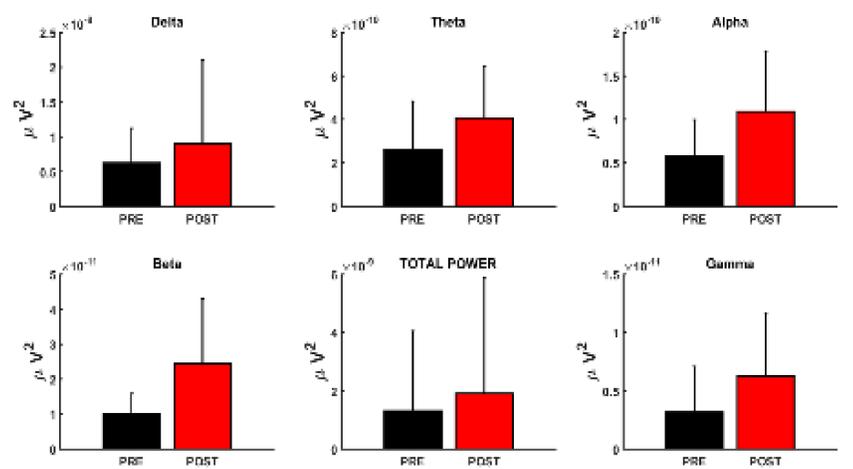
- TPS-naïve resting EEGs were recorded before treatment and compared with EEG-recordings directly after first stimulation.
- Frontal, parietal, central and temporal channel clusters were analyzed with regard to their alpha, beta, theta, delta and gamma power and for a measure of Tsallis entropy.



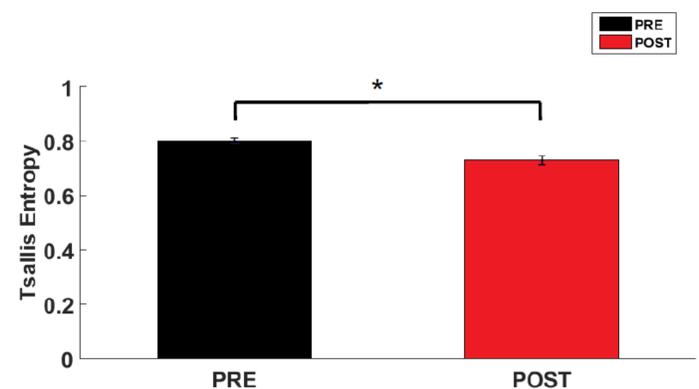
Results

The immediate effect after first TPS on grand-average EEG resting state showed **an increase of power (n.s.) in all frequency bands and for total power.**

A significant difference between pre- and post-stimulation was not revealed due to power variability.



However, the **grand-average across patients and channels of Tsallis entropy** showed a **significant** reduction after a single stimulation session.



* Significant difference between pre and post (GA Entropy) (t-test pairwise)

Discussion / Conclusion

Limited due to a high variability (and possibly due to underpower) we found power increase across frequency bands and channels which failed significance. On the other hand Tsallis entropy was a more sensitive measure for change on EEG activity after stimulation. This might reflect a global reset of uncoordinated and thus pathological neural activity after TPS stimulation. More measurements should be added including longitudinal serial recordings over the treatment course of six sessions with correlations of clinical treatment effects.