Docket #: S20-065

Device and procedure that delivers neuromodulation triggered and modulated by neurofeedback

Stanford researchers have developed a safe and effective system that enables neurofeedback training in combination with neuromodulation for the treatment of brain disorders characterized by abnormal neuronal synchrony and synaptic connectivity. Typically, neuromodulation and neurofeedback serve different, complementary therapeutic purposes. Using neuromodulation as neurofeedback - instead of providing a simple reward signal - boosts the complimentary effects of both treatment approaches.

To this end, delivery of neuromodulation therapy is modulated/triggered by neurofeedback, where the amount of neuromodulation therapy (e.g. the stimulation duration) can be adapted to the performance of the neurofeedback (e.g. the extent of the sensorimotor rhythm (SMR) increase). The goal of this treatment is to mutually boost complementary therapeutic effects of neurofeedback training and neuromodulation, in this way inducing sustained, long-lasting therapeutic effects that outlast cessation of stimulation, so that a few hours of stimulation delivered regularly or occasionally may provide substantial relief.

Figure

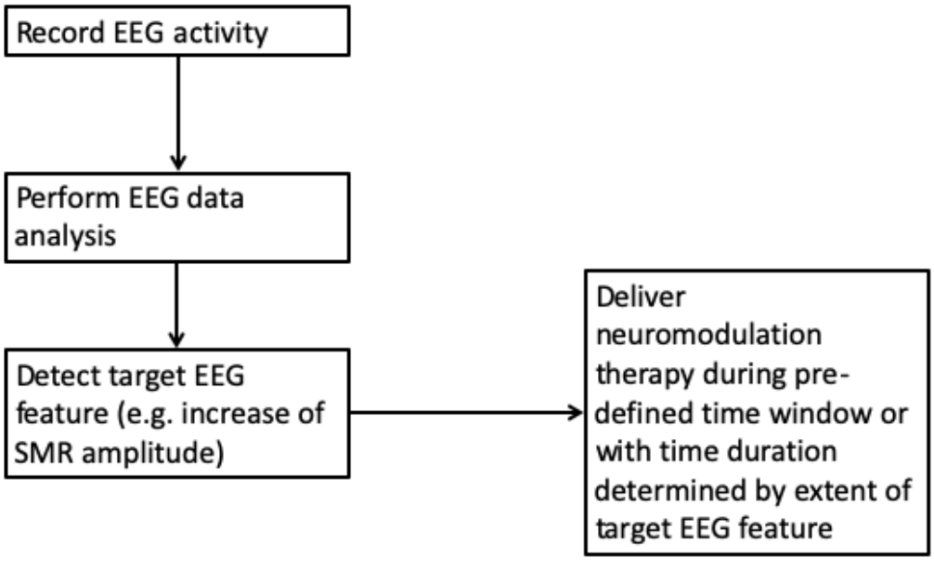


Figure description -

Schematic illustrating neuromodulation triggered and modulated by neurofeedback. Whenever a target EEG feature, e.g. increased SMR amplitude, is detected in a time window of pre-defined length, a neuromodulation therapy session is triggered. The neuromodulation session may have constant duration and stimulus parameters. Neuromodulation sessions may be adapted to the characteristics of the detected EEG feature, e.g. the integral super-threshold amount of the SMR amplitude with the analysis time window. Image credit: Tass Lab

Stage of Development

- Clinical trials

Applications

- Neurofeedback training in combination with neuromodulation for the **treatment of brain disorders characterized by abnormal neuronal synchrony and synaptic connectivity**
- Example brain disorders include but not limited to Parkinson's disease, movement disorders, essential tremor, ADHD, epilepsy, subjective tinnitus, schizophrenia, OCD, dystonia, chronic migraines, and different types of addiction

Advantages

- **Closed loop strategy** can leverage the brain's own ability to learn how to modulate itself, leading to a much more effective treatment in the long term
- **Boosts complementary effects** of two treatments
- Works with non-invasive (preferred embodiment) or invasive neuromodulation
- **Tunable** - stimulation parameters for the neuromodulation therapy can be specifically tuned to this reference state, e.g. a state defined by upregulated SMR
- **Self-regulating** - subject learns to self-regulate his/her brain activity (e.g. upregulate SMR), to evoke the neuromodulation-induced effects
- **Personalized** treatment

Patents

- Published Application: WO2021184019
- Published Application: 20230131710
- Issued: 12,702,618 (USA)

Innovators

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