Rapid-Acting Personalized and Targeted Neuromodulation Approach - NeuroNavigation

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Technology description

The present invention is method utilizing a personalized neurostimulation approach that involves determination of the ideal cortical entry-point for the purpose of target engagement of a defined target pair (surface-deep or surface(entry)-surface(downstream)) followed by the use of specialized pulse sequences delivered over the defined functional target which is found within cytoarchitectonically defined structural brain region(s) of interest. The application of this optimized theta-burst form of repetitive transcranial magnetic stimulation (TMS) paired with personalized data driven targeting of the intended cortical target allows for a demonstration of stimulation effect by the assessment of the approach's ability to modulate brain activity/functional connectivity between the intended target pair along with the downstream target's connectivity to connected brain regions and networks. Given that several target pairs are components of tracts that exit the brain into cranial and spinal nerves, this approach allows for real time monitoring of the approach on the downstream target nerve (such as vagus nerve in the form of heart rate variability) as it defines the ideal tract to that end-point).

Stanford researchers have developed a highly effective and rapid-acting robust repetitive transcranial magnetic stimulation (TMS) approach to modulating neural networks (SAINT®). So far, by targeting only a single neural network the SAINT® approach has proven to be an effective treatment for highly treatment-resistant patients with depression. This two-prong approach is able to identify optimal brain areas to produce a network change using measures of brain activity. SAINT® can be applied to any neurological or psychiatric condition where there is a known neural circuit dysfunction. It is highly effective and efficient. For reference the current methods for treating depression require 4-6 weeks of treatment, only work 1/3 of the time, and are not based on any kind of individual measures of brain activity. Using the SAINT® approach >80% of patients who were otherwise unresponsive to current treatment methods achieved remission in 5 days or less. In cases of severe recurrent depression, SAINT® could be adapted into an epidurally implanted device targeted to a cortical target and use measured stimulation with the same frequency patterns as the established non-invasive approach. In cases of systemic diseases, SAINT® could be used in closed loop devices that allows for physiological normalization. For example TMS and/or closed loop devices could modulate heart rate variability that would further allow for reduction of a physiological abnormality (low HRV) that has been linked to all cause mortality and specific systemic diseases (such as CAD).

Application area

Depression and suicidality treatment Any targetable neuropsychiatric condition with a cortical access point (anxiety, OCD, PTSD, and others)

Advantages

More efficient and effective than conventional methods
Faster treatment than conventional methods
Acts as a planning/testing testing-ground for implanted devices

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