Experimental Brain Stimulation Therapies for PTSD, TBI

In recent decades, multiple forms of brain stimulation have been tested to treat mental disorders that do not respond to other treatments. These therapeutic effects of which are non-invasive, involve activating or reducing neural activity by utilizing electrical, magnetic, or optical stimuli. The Food and Drug Administration (FDA) has approved certain kinds of brain stimulation to treat such disorders as anxiety, depression, and pain. The FDA hasn’t approved brain stimulation techniques for the treatment of traumatic brain injury (TBI) and PTSD. Here are some techniques that VA researchers are experimenting with to treat these two conditions:

Transcranial直流 current stimulation (tDCS) or transcranial alternating current stimulation (tACS)

How it works: A small amount of electrical current is applied to the scalp via two or more electrodes—usually one negative and one positive. It is directed at the electrodes based on the desired outcome of the stimulation. Positive and negative electrical currents are transmitted to the brain, making neurons either more or less active as the electrical charge is applied.

Potential side effects: Most commonly are tingling or itching sensation during stimulation and redness at the site of the electrodes. Headache, a metallic taste, and mild changes can also occur. The most severe is skin irritation or a small skin burn under the electrodes, but that is rare.

Example of tDCS trial: Transcranial direct current stimulation may modulate extinction memory in posttraumatic stress disorder

Transcranial alternating current stimulation (tACS)

How it works: The charge by which the alternating current of the tACS varies the voltage across the brain, modulating the activity of neurons.

Potential side effects: Similar to those of tDCS/IES, namely slight pain or a burning, tingling, and itching sensation under the electrodes.

Example of tACS trial: Transcranial direct current stimulation may modulate extinction memory in posttraumatic stress disorder

Deep brain stimulation (DBS)

How it works: In this invasive technique, two electrodes are implanted in the brain and are regulated by a generator that is placed in the chest. The electrical stimulation is continuous, and it can help treat conditions such as Parkinson’s disease, tremor, and some types of pain.

Potential side effects: Most common are facial twitching and scalp discomfort at the site of the electrodes. The most severe side effect is a seizure, which is rare.

Example of clinical trial: Deep Brain Stimulation of the Amygdala for Combat Post-Traumatic Stress Disorder

Transcranial magnetic stimulation (TMS)

How it works: The magnetic field of the TMS coil changes direction in microseconds. This creates “repulsive” electromagnetic pulses that produce a temporary magnetic field in the area of stimulation.

Potential side effects: Most common are scalp sensations and headaches. The most severe side effect of TMS is a seizure, which is rare.

Example of clinical trial: Transcranial Magnetic Stimulation (TMS) to Treat mTBI and PTSD

Repetitive transcranial magnetic stimulation (rTMS)

How it works: The number and timing of the rTMS pulses are adjusted to achieve the desired number of electromagnetic pulses. rTMS is a non-invasive technique that uses a large magnetic coil to stimulate the brain.

Potential side effects: Most common are scalp sensations and headaches. The most severe side effect of rTMS is a seizure, which is rare.

Example of clinical trial: Transcranial Magnetic Stimulation (TMS) to Treat mTBI and PTSD

Inhibitory or chronic theta burst (rTMS or TBS)

How it works: Instead of delivering a single magnetic pulse, rTMS delivers a burst of magnetic pulses. These pulses produce a magnetic field that changes direction to stimulate neurons.

Potential side effects: Most common are facial twitching and scalp discomfort at the site of the electrodes. The most severe side effect is a seizure, which is rare.

Example of clinical trial: Theta-Burst Neuromodulation for PTSD (TBS)

Transcranial light-emitting diodes (LEDs) or LED light therapy

How it works: Large magnetic coils are placed on the scalp over the desired stimulation area. A LED light is used to deliver light to the brain, which can reduce symptoms.

Potential side effects: Most common are facial twitching and scalp discomfort at the site of the electrodes. The most severe side effect is a seizure, which is rare.

Example of clinical trial: Transcranial light-emitting diodes (LEDs) or LED light therapy

Low-intensity, pulsed-based transcranial electrical stimulation (LIP-IES)

How it works: This procedure induces stimulation techniques such as tDCS, tACS, and tTMS. The electrical stimulation is delivered to the brain through electrodes by inducing a small current.

Potential side effects: Most common are scalp sensations and headaches. The most severe side effect of LIP-IES is a seizure, which is rare.

Example of clinical trial: Low-intensity, pulsed-based transcranial electrical stimulation (LIP-IES)

Sources

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