Low-Intensity Transcranial Current Stimulation for Depression / Insomnia

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Treatment Resistant Depression (TRD):

"...inadequate response to at least one antidepressant trial of adequate doses and duration. TRD is a relatively common occurrence in clinical practice."

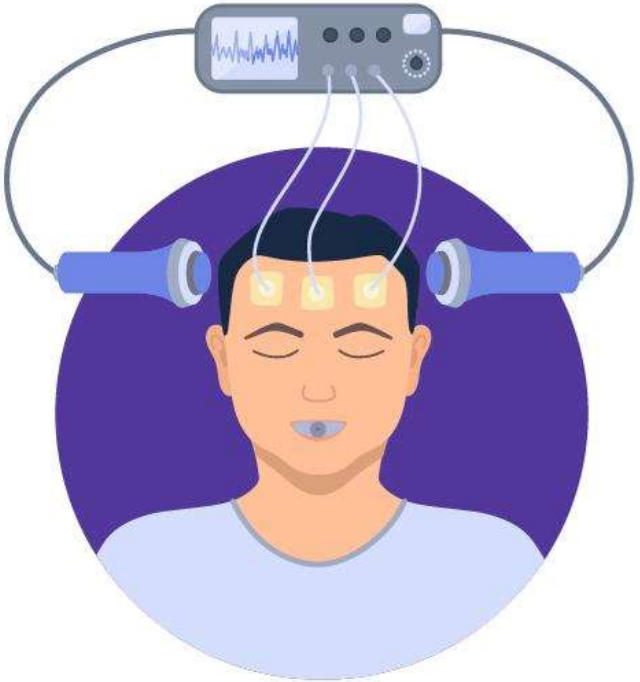
30%

of people diagnosed with Major Depressive Disorder (MDD) will have TRD

Electrical Stimulation Therapy

- Electroconvulsive therapy (ECT)
- Transcranial magnetic stimulation therapy (TMS)
- Deep -brain stimulation (DBS)
- Transcranial Current Stimulation (TCS)

TMS Therapy vs ECT



TMS

- Noninvasive
- Targets certain areas of the brain
- Does not require anesthesia
- Anyone with certification can perform the procedure
- Less severe side effects
- No recovery needed

ECT

- Invasive and induces seizures
- Doesn't target a certain area of the brain
- Requires anesthesia
- Medical professionals must be present
- More disruptive side effects
- Recovery for at least one day

TMS vs. Deep Brain Stimulation

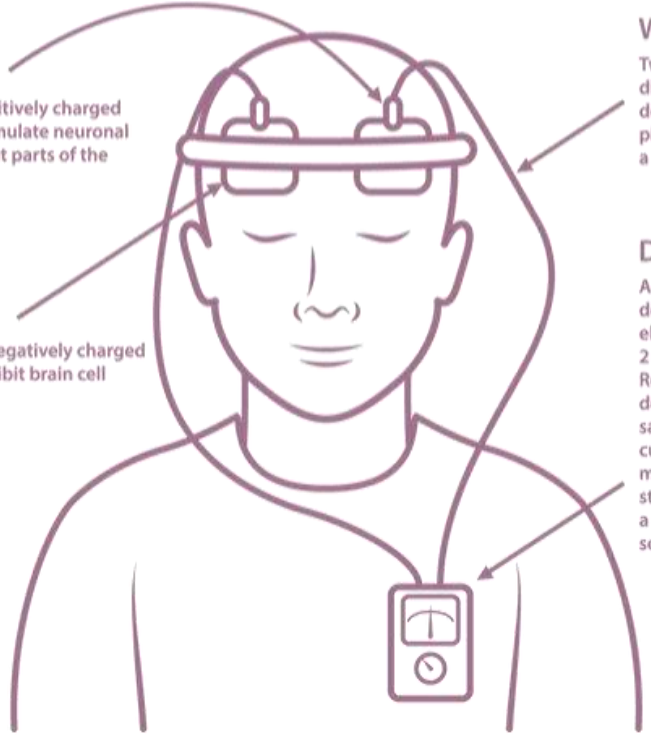
Transcranial Current Stimulation (TCS)

- Different variants available:
  - **Direct Current:** delivers constant, “direct” waveform
  - **Alternating Current**: alternating sine waves
  - **Electrical Stimulation**: fluctuating proprietary waveforms
  - **Broadband Noise:** random currents

- Adequate voltage determined by the current’s resistance through the patient’s brain tissue

TRANSCRANIAL DIRECT CURRENT STIMULATION

Some studies show that stimulating the brain with electricity can immediately boost memory, focus, energy, and vigilance.Researchers say that it also shows promise as a means of treating drug-resistant mental illness like depression, as well as conditions like epilepsy and chronic pain. Here's how it works:



ANODE

The anode, or positively charged electrode, can stimulate neuronal activity in different parts of the brain.

CATHODE

The Cathode, or negatively charged electrode, can inhibit brain cell activity.

WIRES

Two electrodes can provide different types of stimulation, depending on where they are placed. Together, they make a complete circuit.

DEVICE

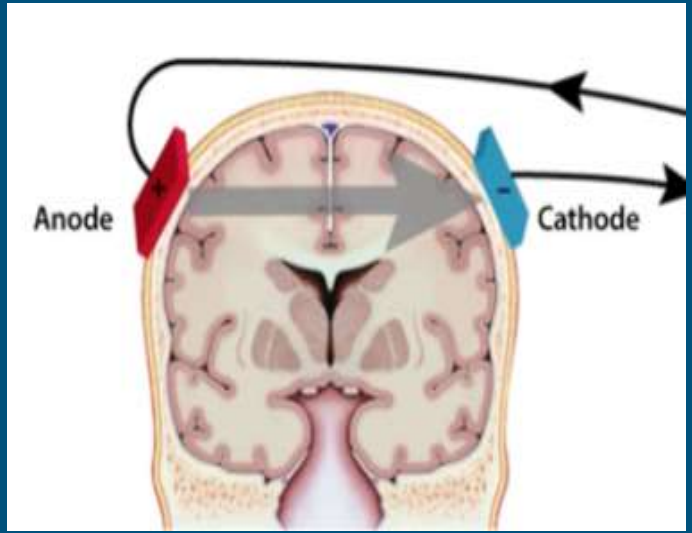
A battery-powered device delivers a constant electrical current of up to 2 mA (milliamperes). Researchers have demonstrated that it's safe to apply this much current for up to 30 minutes a day. DIY brain stimulators frequently use a 9-volt battery as a power source.

Spatial Targeting in TCS

- Electrodes placed on the ears, face, or elsewhere below the head / neck
- Like antennae, neurons must be positioned so they are aligned with the direction of an electrical field
- This creates a change in the voltage across the neuron’s membrane
- Identifying the correct target area(s) for therapeutic stimulation is an ongoing challenge

Theorized Neurophysiologic Effects of TCS

- “**Anodal TCS**” excites brain activity
- “**Cathodal TCS**” inhibits activity
- Data comes from studies of the motor cortex, not prefrontal cortex
- Can result in varied effects if applied to different regions



Risks of TCS

- Seizure generation
- Contraindicated in patients with head or neck metal
- Skin burns
- Reduced cognitive reserve and hypomania in some cases
- Worsened working memory

Current Efficacy of TCS in Medicine

- Under-studied (limited data)
- Lacking FDA approval for Psychiatric conditions
- TCS has only shown positive effects for MDD
- Risk of cognitive reduction or hypomania in certain cases

Future Directions for TCS

- Altering disturbed brain oscillations on an individual scale
  - Improving behavioral outcomes
  - Requires individualized stimulation protocol
  - Promising for select EEG profiles
- High safety profile
- Non-invasive, low-risk alternative to ECT


ANY
QUESTIONS
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References

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