



Transcranial Magnetic Stimulation (TMS) Therapy

Learn about TMS and how to choose the right type for you



When people think of treatment for brain disorders like depression, the first course of treatment that usually comes to mind is medication. But along with medication comes many unpleasant side effects and with each subsequent attempt at finding the most effective medication treatment plan the chances of remission decrease. Medication aims to stimulate the brain chemically, but the brain can also safely be stimulated electrically using magnetic fields with transcranial magnetic stimulation (TMS). You can learn about how TMS treatment works and how to choose between the two most common types – surface TMS and deep TMS.

What is Transcranial Magnetic Stimulation (TMS)?

Transcranial magnetic stimulation (TMS) is a type of brain stimulation therapy that has been successful in treating a variety of brain disorders but is most commonly used for major depression. TMS is medication-free but can also be used in conjunction with antidepressants when used to treat depression. In the U.S., there are two main options for TMS – NeuroStar’s surface TMS and BrainsWay’s deep TMS.

TMS improves neurological functioning by stimulating activity in underactive regions of the brain that are contributing to a particular brain condition. Both types of TMS use magnetic energy pulses aimed at specific regions of the brain believed to affect various brain disorders. Magnetic pulses going into your brain might sound scary, but actually they are

the same type and strength as the magnetic pulses used in MRI machines and are considered very safe. These magnetic pulses pass through the skull and stimulate brain cells which can improve communication between different parts of the brain.

Approved and promising uses for TMS

In the U.S., TMS is FDA approved to treat [major depressive disorder](https://www.mayoclinic.org/diseases-conditions/depression/symptoms-causes/syc-20356007) (<https://www.mayoclinic.org/diseases-conditions/depression/symptoms-causes/syc-20356007>) in adults.

In many European countries it is approved for a multitude of other common brain conditions including:

- ▶ Anxiety
- ▶ Post-Traumatic Stress Disorder
- ▶ Stroke after-effects
- ▶ Bipolar depression
- ▶ Schizophrenia
- ▶ Parkinson's Disease
- ▶ Alzheimer's Disease
- ▶ Chronic pain
- ▶ Nicotine addiction

TMS has even shown promise in treating more conditions such as, tinnitus, fibromyalgia, Tourette syndrome, autism spectrum disorder, multiple sclerosis and more. Currently in the U.S. TMS is being used off-label to treat many more conditions than it is FDA approved for and the studies are showing promising results.

Two different kinds of TMS

There are currently two main types of TMS available in the U.S., surface TMS by NeuroStar and deep TMS by BrainsWay. There are no studies showing a significant difference in the treatment outcomes between surface TMS and deep TMS at this time. And while the two options are essentially the same in that they both use repetitive magnetic pulses to achieve the same results, there are some key differences between them.

Surface Transcranial Magnetic Stimulation (surface TMS)

NeuroStar is the manufacturer of the older of the two TMS options, surface TMS. NeuroStar's system was FDA approved in 2008 and uses a special figure-of-8 magnetic coil which can penetrate 0.6 inches under the skull to reach specific brain regions. Surface TMS lends itself better to off-label uses because of the compact size of the coil which is easy to specifically position over particular brain regions.

Deep Transcranial Magnetic Stimulation (deep TMS)

BrainsWay is the younger of the two TMS options, having been FDA approved in 2013. Deep TMS uses a different kind of coil, than surface TMS. Instead of the small figure-8 coil, it uses a much larger H-coil which allows the magnetic energy to penetrate deeper into the brain. The goal with this larger coil is for the magnetic pulses to be able to penetrate deeper and with more focus than traditional surface TMS. BrainsWay's machine sends the magnetic pulses more than twice as far into the brain as traditional surface TMS, up to 1.6 inches below the skull.

What to expect during TMS treatment

TMS is a relatively short, noninvasive, outpatient treatment - there is no down time, and no sedation needed. A typical treatment course includes daily treatment (5 times per week), for 4 to 6 weeks – though some people find it helpful to receive “up-keep” treatments occasionally following the 4-6 week treatment course.

During TMS treatment

During your TMS treatment you will be seated in a chair and a magnetic coil will be placed on your head.

Differences Between Surface TMS and Deep TMS

NeuroStar surface TMS treatment	BrainsWay deep TMS treatment
Seated in a special chair, very similar to a dental chair	Seated in a comfortable chair
Measurements are made using a soft measuring tape to determine where the small figure-8 coil device will be placed directly on the scalp	A soft cap is placed on the head and strapped under the chin. Measurements are made to determine the correct positioning of the H-coil helmet.
The figure-8 coil is easily positioned to target patient-specific regions of the brain for "off-label" uses.	Simply because it is more difficult to precisely position the large coil helmet, it is more difficult to target patient-specific areas of the brain for "off-label" uses.
Treatment lasts 37 minutes and includes many 30 second bursts of magnetic pulses	Treatment lasts 20 minutes and includes many bursts of magnetic pulses

After TMS treatment

After both varieties of TMS treatment are complete, the patient is able to go straight back into their day, drive back to work or home and continue on normally. Neither surface TMS or deep TMS cause effects on memory or mental clarity unlike the oldest brain stimulation therapy, electroconvulsive therapy (ECT). Nor do they have the negative side effects of sedation which is needed for ECT, but not TMS.

TMS risks and side effects

The most commonly occurring side effects are headaches and scalp discomfort. About half of TMS patients report headaches but these headaches are generally mild, respond well to over-the-counter pain medication and typically diminish over the course of treatment.

About a third of patients report painful scalp sensations or facial twitching during the magnetic pulses, which also tend to diminish over the course of the treatment. In addition, repositioning the coil and adjusting the stimulation settings can reduce these mild side effects.

The most serious risk of TMS is the possibility of producing a seizure – but the risk is very small at around .001%. For this reason, people who have a high risk of seizure - like those with epilepsy or who have a history of head injury are typically not candidates for TMS. There have been only a few documented cases of seizures occurring due to TMS treatment.

Long-term effects

TMS has been approved in the U.S. for about 10 years. So far, there are no reported lasting negative effects associated with TMS treatment.

However, it is important to remember that this treatment is relatively young at 10 years old, so there simply has not been enough time to study the long-term effects. With time and more research, understanding on the long-term effects will improve.

Who cannot get TMS

TMS uses magnetic energy, so people who have metal in their head or neck are not able to receive TMS, with the exception of braces or dental fillings.

Examples of metal objects that would prevent TMS treatment include:

- ▶ Aneurism clips
- ▶ Stents
- ▶ Deep brain stimulators
- ▶ Metallic ear/eye implants
- ▶ Shrapnel or bullet fragments
- ▶ Pacemakers

Next steps – how to choose

A 2015 study showed no significant difference in the outcomes of patients given either surface TMS or deep TMS. Both treatment groups experienced significant decreases in depression symptomology.

Deciding which type of TMS treatment to pursue may come down to a few different factors:

Time – Surface TMS takes 20 minutes per treatment and approximately 400-600 minutes total. Deep TMS takes about 37 minutes per treatment and approximately 740-1100 minutes total. While the overall treatment minutes for deep TMS is about half the time of surface TMS, both treatment courses are 5 times per week for 4-6 weeks.

Cost – There is not a significant difference in cost between the two TMS options – both run around \$300 to \$400 per session. In the U.S. most major insurance providers cover at least part, if not all, of the cost of TMS treatment.

Condition being treated – Deep TMS has been studied for more conditions than surface TMS, and therefore has shown a wider range of application – rather than major depression alone – even though the H-coil helmet positioning is less precise than the surface TMS figure-8 coil.

Experience – Patients report that the NeuroStar surface TMS coil is more comfortable than the BrainsWay deep TMS helmet coil. Additionally, surface TMS patients tend to experience less facial twitching and jaw pain during treatment than deep TMS patients.

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