



# Transcranial Magnetic Stimulation (TMS) Therapy

## How it's Used in the Treatment of Depression and Other Mood Disorders



### What is transcranial magnetic stimulation (TMS)?

Transcranial magnetic stimulation (TMS) is a noninvasive, outpatient treatment that directs recurring magnetic energy pulses at the specific region (or area) of the brain involved in mood regulation. The painless magnetic pulses pass through the skull and stimulate brain cells which can improve communication between different parts of the brain. When these TMS pulses are delivered at regular intervals it is known as repetitive TMS (or rTMS). Exactly how TMS works is unclear, but the stimulation has a lasting effect on how the brain functions, which can ease depression symptoms and boost your mood.

Magnetic pulses going into your brain might sound scary or it may even may you think that TMS is similar to 'shock therapy'. However, the pulses used in TMS therapy are actually the same type and strength as the magnetic pulses used in MRI machines and are considered very safe. Unlike electroconvulsive therapy (ECT), TMS doesn't require any kind of sedation or post-therapy downtime, and comes without any memory or cognition side effects. In fact, for most people TMS has fewer side effects than antidepressant medications.



## **What is TMS used for?**

TMS therapy has been FDA-approved for the treatment of major depressive disorder (MDD), obsessive compulsive disorder (OCD), and smoking cessation. While depression is a treatable condition, TMS is typically used when standard treatments, such as medication and therapy, have not provided satisfactory relief, or when the side of medication are intolerable. TMS can be a safer treatment option for many patients because it does not cause any undesired systemic side effects like medications and brings remission to depression for most patients. In many European countries, TMS is approved for a multitude common conditions including:

- Anxiety disorders such as OCD
- Post-Traumatic Stress Disorder (PTSD)
- Stroke rehabilitation
- Schizophrenia
- Parkinson's disease
- Alzheimer's disease
- Chronic pain
- Nicotine addiction

TMS has even shown promise in off-label treatment (non FDA-approved) for conditions such as tinnitus, fibromyalgia, Tourette syndrome, autism spectrum disorder, early onset Alzheimer's disease, substance use disorders, personality disorders, cognitive enhancement, multiple sclerosis, and other conditions.

## **TMS for depression**

Depression can take a heavy toll on a person, changing how you think, feel, and function in your daily life. Many people are not able to gain relief through self-help, therapy, medication, or a combination of these treatments, and the sense of hopelessness never lets up. If you're suffering from major depression that's proven resistant to traditional forms of treatment, then transcranial magnetic stimulation (TMS) therapy may be the best treatment option. Just as antidepressant medications aim to stimulate your brain chemically, TMS treats your condition at the source using magnetic fields to restore the neurochemical balance and neural pathways in your brain.

## **Types of TMS devices**

A variety of TMS systems are available, including:

Surface transcranial magnetic stimulation (surface TMS) devices use a figure-of-8 magnetic coil which can penetrate 0.6 inches under the skull to reach specific brain regions.



Deep transcranial magnetic stimulation (dTMS) devices use a larger H-coil which allows the magnetic energy to penetrate deeper into the brain, up to 1.6 inches below the skull.

Rapid TBS (theta burst) therapy devices are considered just as safe and effective for the treatment of major depressive disorder as standard TMS, but these devices require sessions of just 3-6 minutes rather than the 20-40 minutes required by most TMS devices.

There are also simple brain stimulation devices that have been cleared by the FDA in the U.S. for use at home. However, these are not strictly TMS devices. Rather, they're classed as Cranial Electrotherapy Stimulation (CES) units which use electric currents instead of magnetic pulses to stimulate the brain. The effectiveness of these devices seems to be up for debate. As with any medical treatment for depression, it's important to discuss the best options with your doctor.

## **Effectiveness of TMS**

Most published trials have yielded results supporting the use of TMS to improve cases of treatment-resistant depression. For people with major depression that have not benefited from medication, nearly 70 percent experience significant improvement in their symptoms with TMS, while about one in three gain total remission from their depressive symptoms.

That doesn't mean that TMS is a cure for depression and that your depression symptoms won't return, though. In fact, the positive results from TMS tend to last for an average of about a year after treatment. However, it's important to remember that depression is not just the result of a chemical imbalance but is caused by a combination of biological, psychological, and social factors. In other words, your lifestyle choices, control over negative thoughts and behaviors, and your coping skills also contribute to your depression. Therefore, you can use the improvements in your energy and drive following TMS therapy to begin making lifestyle changes—such as improving your diet, exercising, and building your support network—that can help preserve your state of remission from depression. We encourage you to use the Mind Your Mental Health Therapy Tools while you are engaged in your TMS treatment sessions. This will be beneficial to your outcome and the longevity of your remission.

## **What to expect during TMS treatment**

TMS is a relatively short, noninvasive, non-drug, brief treatment typically done in the convenience of the doctors office or clinic setting. That means it doesn't involve surgery, sedation, or anesthesia, and no down time is needed afterwards. You stay awake and alert throughout the treatment. TMS therapy is also non-systemic, which means that it has no effect on other areas of your body or cause any systemic side effects, like most antidepressant medications.



A typical TMS treatment course includes daily sessions (5 times per week) for approximately 6 weeks, followed by a taper of six additional treatment sessions over a period of 3 weeks. Some people find it helpful to occasionally return for maintenance treatments following the initial treatment course to help maintain their state of remission. A TMS session generally lasts about 20 minutes. Some treatment devices or TMS systems allow for the treatment to be done in as little as 3 minutes (instead of a 19-minute treatment).

## **During TMS treatment**

During your TMS treatment, the clinician will seat you in a comfortable chair, provide you with earplugs, and then place a magnetic coil on your head, near the area of the brain to be treated. In the case of depression, this area is called the left dorsolateral prefrontal cortex just above the left eyebrow. If being treated for other conditions, the treatment location may be different and is determined by the doctor or nurse practitioner in the initial treatment session, referred to as the 'mapping' session. During a typical treatment session:

Short electromagnetic pulses are administered through the coil. The magnetic pulses easily pass through your skull and cause small electrical currents that stimulate nerve cells.

- You'll hear clicking sounds and feel a tapping or tingling sensation on your head during each treatment
- You may feel some scalp discomfort during the treatment and for a short time afterward, but this typically subsides after the first few treatments as the scalp desensitizes.

## **After TMS treatment**

Upon completion of your treatment, you're able to go straight back into your day, drive back to work or home, and continue on as normal.

## **TMS risks and side effects**

Unlike the oldest brain stimulation therapy, electroconvulsive therapy (ECT), TMS has no effect on memory or mental clarity, and does not cause muscle aches or spasms or other undesired side effects. It also avoids the negative side effects of sedation required for ECT. The only side effects associated with TMS include temporary scalp discomfort and headaches. While about 1 in 15 TMS patients report a slight headache, it is typically relieved with over-the-counter medications and tends to diminish over the course of treatment.

About 1 in 15 patients report painful scalp sensations or facial twitching during the magnetic pulses, which also tend to diminish over the course of the treatment.



Repositioning the coil and adjusting the stimulation settings can also help to 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%. There have only been a few documented cases of seizures occurring due to TMS treatment, which is generally due to a person having a low seizure threshold. If you have a high risk of seizure, such as with epilepsy, head injury, anorexia, or alcohol use disorder for example—then you're unlikely to be a candidate for TMS.

### **Long-term effects**

TMS was FDA approved in the U.S. in 2008, and so far, there are no reported lasting negative effects associated with the treatment.

With time and continued research, TMS researchers will gain a better understanding on the long-term effects of TMS therapy.

### **Who cannot get TMS**

In addition to those with epilepsy, TMS is not suitable for several other types of patients. Since TMS uses magnetic energy, people who have metal in or within 30 centimeters of the head 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 (a patient with a pacemaker should seek medical clearance)

Other factors that may preclude you from receiving TMS therapy include:

- A history of other mental health disorders, such as substance misuse or psychosis.
- Brain damage from illness or injury, such as a brain tumor, traumatic brain injury, or stroke.