Magnetic stimulation as therapy
Unlocking depression, chronic pain and more

Static magnets — the kind you might use to attach a photo to your refrigerator — have been used for centuries as attempted therapies for a wide variety of disorders.

But now, an exciting new era of magnetic therapy is under way. The therapy, called transcranial magnetic stimulation (TMS), involves using brief powerful electromagnetic pulses to alter brain activity.

The Food and Drug Administration (FDA) has already approved TMS therapy for those who have depression that isn’t responding to drug therapy. In addition, researchers are studying new uses of magnetic brain stimulation, such as controlling acute and chronic pain, reducing ringing in the ears, and stopping and preventing migraines.

There are still a lot of unknowns with TMS. But you’re likely to be hearing more about it in the future. So far, it appears to be a safe therapy for conditions in which more traditional therapy options have failed.
Targeted therapy

Stimulation of brain cells as therapy is nothing new. For example, electroconvulsive therapy — in which a small amount of electricity is used to cause a seizure in a person who is under anesthesia — has been an effective treatment for hard-to-treat depression for decades.

However, TMS is different from other forms of brain stimulation. First, it stimulates the brain with a magnetic field, rather than with electricity. In addition, it doesn’t involve any surgery or anesthesia. A typical TMS therapy appointment lasts about an hour. It involves sitting in a reclining chair as the magnetic coil is positioned — and then you remain awake and alert as the coil does its work.

Short-term side effects are usually mild, but may include:

- Discomfort at the treatment site during the treatment session.
- Tingling or twitching of facial muscles during treatment.
- Headaches during or after treatment.

Seizures during therapy can occur, but this is considered rare. However, people at risk of seizures are generally excluded from receiving TMS treatments.

One limitation of TMS therapy is that you can’t have it if you have a metal implant or medical device in the head or chest — such as a stent, aneurysm clip or coil, pacemaker, or implanted medication pump. Dental fillings are OK.

Used for depression

Depression is a disease that’s often successfully treated with antidepressant medications in combination with counseling. But for about 10 to 20 percent of those who have depression, medication and counseling aren’t enough to cause remission of the disease.

Before the development of TMS, the next step in therapy for those with depression found to be resistant to drug treatment was electroconvulsive therapy. However, TMS has since provided an important step between those two options. The FDA has approved TMS for use in those who have failed a single trial of an antidepressant drug.

When performed on appropriate candidates according to the most up-to-date specifications, total remission of depression symptoms is possible — and about a 50 percent improvement in depression symptoms is common.

A recent study compared TMS therapy in a group of people who had drug-resistant depression to a matched group of people who received an inactive (placebo) form of TMS therapy.

After four to six weeks of therapy, the TMS group was twice as likely to have remission of depression symptoms as was the group receiving the placebo therapy.

Not for everyone

Unfortunately, TMS doesn’t work for everyone. When it does work, it’s not known how long you can expect beneficial effects to last. However, it’s generally believed that most who receive successful TMS therapy will continue to require some sort of ongoing therapy for their depression, whether it’s medication, counseling, additional TMS sessions or some combination of these therapies.

So far, TMS appears fairly harmless, although the long-term effects — if any — aren’t well-defined. And it does require a time commitment. A typical treatment schedule involves five, one-hour sessions a week for at least four to six weeks.

Most people don’t experience much improvement in the first week or two of therapy, but sticking to the treatment schedule is critical, since the benefits of TMS therapy gradually emerge over several weeks.

Chronic pain

There’s no FDA-approved use of TMS for chronic pain, but research is showing promising results in dramatically reducing chronic pain in some people. TMS is being studied as a way to treat chronic pain such as fibromyalgia, chronic headaches, and neuropathic pain such as shingles (postherpetic neuralgia) or peripheral neuropathy.

Recent research at Mayo Clinic has focused on using magnetic pulses to the same areas of the brain that are targeted for treating depression. This takes advantage of the fact that neural pathways for pain and depression overlap.

Again, using TMS for chronic pain remains experimental. Research is in the early stages, and it remains to be seen which of the many variables of TMS therapy may be most effective for chronic pain.
Still, Mayo experts see future potential in using TMS for chronic pain. In a few small pilot studies, Mayo researchers found TMS could produce dramatic reductions in chronic pain in adults and adolescents with treatment-resistant illness.

**Future directions**

In addition to treating depression and chronic pain, very early research is probing additional applications of TMS therapy, including:

- **Quieting ringing in the ears (tinnitus)** — Several small studies have suggested that TMS can help calm the overly excited, hearing-related neurons that cause tinnitus.
- **Halting migraines** — For those who have an aura prior to developing a migraine, at least one study suggests that TMS can be used after the aura begins to block the abnormal wave of neuron excitation that eventually causes a migraine. Small studies have found that TMS also may be useful in preventing migraines from occurring.

**Not mainstream … yet**

With the exception of treatment for moderate drug-resistant depression, applications of TMS therapy are in the experimental stage and aren’t available for routine use.

Although TMS use for depression is available at select centers in the United States, Canada and Europe, it still may not be covered by insurance.

**Older brains are less receptive to TMS**

The depth of penetration of the magnetic field used in TMS therapy extends about a half-inch to three-quarters of an inch beneath your skull. This limited depth of penetration may help explain why standard transcranial magnetic stimulation (TMS) is often less effective in older adults than in younger adults.

That’s because as you age, your brain tissues shrink slightly. Thus, in older adults, there can be a larger gap between the inside of the skull and the brain than there is in younger people. As a result, penetration by the magnetic field into brain tissue may be shallower and less stimulating in older adults than younger adults.

At least one study has attempted to increase the intensity of TMS magnetic therapy to adjust for brain shrinkage in a group of older adults — with promising results. More study is needed, but Mayo Clinic experts believe that adjusting the magnetic field to account for brain shrinkage will eventually lead to better response to treatment in older adults.

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**Health tips**

**Hand hygiene**

Washing your hands with soap and water or rubbing them with an alcohol-based sanitizer are the two most effective ways to prevent the spread of bacterial or viral infections to yourself and to others.

Hand sanitizers are convenient to use throughout the day and are actually more effective than washing when it comes to killing germs on unsoiled hands. Use an adequate amount of alcohol-based sanitizer to cover all the surfaces of your hands, wrists, cuticles, fingernails, and between your fingers and thumbs.

It remains important to wash before eating, after going to the bathroom and when your hands are dirty. Wash your hands properly by:

- **Working up a lather** — Using warm water and soap, lather your hands, wrists, cuticle area, and between your fingers and thumbs. Continue to lather for at least 15 seconds.
- **Focusing on your fingertips and around your fingernails** — Thoroughly clean this often-neglected area whether washing your hands or using a sanitizer. Press the fingertips of one hand into the cupped palm of your other hand. Rotate your fingertips in a circle. Do this for each hand.
- **Not touching the faucet with clean hands** — Dry your hands with a paper towel or hand towel and use the towel to turn off the water. Or, try turning off the faucet with your elbow or top of your wrist.
News and our views

Acetaminophen is safe when used correctly

Acetaminophen has been a mainstay for pain relief for years. And when used correctly and within safe dosage guidelines — it’s still the safest nonprescription pain reliever available.

But taking more than the recommended dose — even just a little more — can result in serious or even fatal liver damage.

Should you stop taking acetaminophen for pain? Should you switch to a nonprescription nonsteroidal anti-inflammatory drug (NSAID) such as ibuprofen (Advil, Motrin IB, others) or aspirin? In most cases, Mayo Clinic doctors say the answer to both questions is no. Even at recommended doses, NSAIDs aren’t without risks, including bleeding or ulcers in the stomach and impaired kidney function or damage, which can aggravate high blood pressure and heart failure.

A critical piece to acetaminophen’s safe use is to carefully track how much acetaminophen is in the medications you take. The current recommended maximum dose for adults per 24 hours, in doses taken four to six hours apart, is 4,000 milligrams (mg). That’s the equivalent of eight extra-strength tablets. Some people — including those who have liver problems, regularly consume alcohol or are elderly — may be told by their doctors to take no more than 3,250 mg daily.

One factor contributing to acetaminophen overdose is lack of awareness that a number of products contain it. Acetaminophen is the active ingredient in nonprescription products such as TYLENOL, and it’s found in combination with drugs used for colds, flus and allergies. It’s also paired up with certain prescription pain relievers, such as hydrocodone (Vicodin) and oxycodone (Percocet).

A prostate cancer ‘vaccine’ under development

The prostate cancer vaccines that are in development don’t fit the traditional definition of a vaccine — namely, one that aims to prevent disease in an otherwise healthy person. Rather, they’re therapeutic vaccines designed to train the immune system to attack cancer cells in men who already have prostate cancer.

One vaccine — Provenge — is being developed as a treatment option for men who have advanced cancer that’s no longer responding to testosterone-reduction therapy.

In a recent study involving 512 men, vaccination with Provenge added an average of about four months to the lives of those who received it compared with those who didn’t.

That may not sound like much, but it’s on par with the benefits of chemotherapy for advanced prostate cancer. And, in contrast to some forms of chemotherapy, the vaccine causes only modest side effects for most men.

It’s possible that Provenge will be approved by the Food and Drug Administration in the near future. If it is, Mayo Clinic experts say that this vaccine will add support to the concept of harnessing the immune system to improve treatment of advanced prostate cancer.

Service dogs

Providing greater safety and independence

You probably don’t think much about being able to open a door, pick up a dropped set of keys, hear a knock at the door — and you probably don’t fear going out in public because you might have a seizure or panic attack.

But for those with certain disabilities, the inability to perform basic tasks of daily living can at the very least be frustrating — and can even be dangerous or lead to social isolation, feelings of insecurity, overdependence on others and dissatisfaction with life. A growing number of people with disabilities are turning to service dogs to help manage their disabilities.

As with any dog, caring for a service dog can take a bit of work. In return, service dogs usually provide a major positive impact on the lives of those who acquire them.

Roles they play

The training of service dogs came into the modern era after World War I, when dogs were trained to guide blind war veterans. Since then, service dogs have been trained to help make life more independent for those with a wide variety of disabilities. In addition to helping those who are visually impaired, service dogs may be trained in one or more specialties, including:

■ Skilled assistance dogs — These are trained to help those who are physically disabled. They can perform a variety of tasks, such as opening doors, pulling wheelchairs, turning on lights, retrieving the telephone, summoning help and helping with aspects of shopping.

■ Hearing dogs — These alert their handlers to important sounds, such as alarm clocks, doorbells,
smoke alarms, someone calling their name or approaching vehicles.

- **Seizure response dogs** — These remain next to a person during the course of a seizure, or they can fetch help. Dogs can also learn to predict when a seizure is about to occur hours or minutes beforehand, allowing the handler to take steps in preparation.

- **Diabetes response dogs** — For people with type 1 diabetes, these dogs carry objects such as juice bottles, retrieve a telephone and sniff breath for low blood sugar.

- **Alzheimer’s helper dogs** — These stay with someone with Alzheimer’s — or fetch help — if the person starts to wander or get into a potentially dangerous situation.

- **Parkinson's disease helper dogs** — These can assist with balance and the redirecting of someone with Parkinson’s disease who has signs of rigidity.

- **Psychiatric service dogs** — These help people who are disabled by severe mental illness by performing specific tasks such as calming severe anxieties, prodding someone to take important medications, and interrupting harmful compulsions and redirecting behavior.

Service dogs must be able to focus exclusively on their handlers while ignoring distractions and other people. In addition, they must be friendly, nonaggressive with other dogs, not overprotective, and neither shy nor nervous. Not many dogs have the temperament for this. Many breeds can be trained as service dogs, but golden and Labrador retrievers are most commonly used.

### Realistic expectations

If you think a service dog might be right for you, it’s important to weigh the pros and cons. The main cons are the work and expense of caring for the dog. For some people, these can cause stress and hardship that outweigh the value of the service dog — especially if the dog and handler aren’t a good match.

On the positive side, studies have found many potential benefits of having a service dog, including:

- **Reduced dependence on others**
- **Reduced need for paid human assistance**
- **Companionship, reduced loneliness and feeling that you’re needed**
- **Family members of the disabled person feeling more at ease with their loved one’s situation**
- **Improved social interactions**
- **Increased independence and mobility**
- **Increased feeling of safety and protection**

When considering a service dog, it’s important to have realistic expectations. Dogs aren’t untiring robots, and they aren’t the solution to every problem. They tend to be best at helping to smooth out the small, frequent bumps in the road of daily life, thereby reducing stress and worry and improving quality of life.

### Not all fun and games

Cost is another important consideration. It usually costs between $10,000 and $20,000 to train one dog, although charity organizations often cover this cost. After a six-month to yearlong training program, suitable dogs are matched to handlers with a disability, and the two are often trained together for a week or two. Periodic, ongoing training and follow-up is common to improve proficiency and to address problems that may arise.

Even if you don’t pay the upfront cost for a service dog, yearly costs of food and veterinary care could be considerable — and can easily rise into the thousands if specialty veterinary care is needed. Some service dog organizations may help defray some of these costs.

Once the dog is at your home, it may take time for positive benefits to emerge. The dog may need time to become comfortable, and you’ll likely need time to learn how best to command and care for it.

Even a well-trained dog is still a dog. Dogs can misbehave — or potentially be annoying by, for example, waking up early, shedding fur or slobbering. There’s also the need for exercise, love and attention, feeding, bathing, and grooming. In short, if you don’t think you could handle a typical pet dog, you should probably think twice about obtaining a service dog.
Dystonia

Muscles, nerves and misfires

If you live with the movement disorder dystonia, it may feel as though you’re constantly battling your own body. Dystonia is characterized by involuntary contractions of a muscle or group of muscles.

For instance, if dystonia affects the jaw muscles, the simple act of brushing your teeth, in which you direct movement of a multitude of muscles, would become different due to muscle spasms that interfere with your ability to open your mouth.

Adult-onset dystonia treatments are highly individualized, but often include the use of botulinum toxin (Botox) injections. Sometimes, specialized surgical procedures are used.

Movement out of order

It’s thought that dystonia is linked to communication problems between nerve cells in a deep region of the brain known as the basal ganglia. This area of the brain is involved in regulating muscle contractions.

One form of dystonia typically emerges early in life — often in childhood — and may be inherited. Very often, early-onset dystonia first starts in a limb, with involuntary muscle contractions impairing movement. Subsequently, over perhaps several years, this childhood-onset dystonia involves the whole body.

Dystonia also can show up in adults. Adult-onset dystonias are quite different in that they usually don’t affect the lower half of the body. Some examples include:

- **Neck (cervical dystonia)** — Contractions may pull your head backward, or may cause your head to twist painfully to one side.
- **Eyelids (blepharospasm)** — With this type of dystonia, rapid blinking or squinting may become so severe as to make you functionally blind.

- **Jaw or tongue (oromandibular dystonia)** — This type of dystonia may result in slurred speech or difficulty swallowing or eating.

Some dystonias are task specific. A single, repetitive motion, such as writing, may bring out cramping and muscle pain. For golfers, the problem of tremors, jerking and freezing while putting — called the yips — can harm their golf scores.

Adult-onset dystonias typically begin slowly without being noticed and then evolve over three years or less. After that point, they tend to remain relatively stable. In a few instances, the involuntary contractions may let up over time.

Some people can reduce muscle contractions by using a trick that involves touching the affected area.

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Deep brain stimulation involves implanting in the brain a thin wire with electrodes at the tip. The device is connected to a stimulator that’s implanted near the collarbone.

Medications generally don’t provide much benefit for adult-onset dystonias. The exception is when dystonia occurs due to an underlying disorder, such as dystonia that’s associated with Parkinson’s disease.

Certain forms of dystonia may be treated with specialized surgical procedures. In the case of cervical dystonia that can’t be well managed with botulinum toxin, surgery may be done to sever nerves that otherwise overfire and produce painful muscle contractions.
Exercise to burn calories

What it takes

You’re hungry and in a rush. You open the refrigerator door and spy two options to satisfy your hunger until dinnertime. In the crisper is an apple. On a shelf is a candy bar.

You know that the apple is better for you, but how much damage could one candy bar really do to your ongoing effort to keep your weight under control?

You might be surprised.

The number of calories packed into certain food and drink items can be astounding. One way to gauge the number of calories in a given food item is to connect it with the amount of exercise it takes to burn off those calories.

When you look at calories in this way, you’ll quickly realize that the minor food decisions that you make throughout the day — an apple or a candy bar, a bowl of strawberries or a bowl of ice cream, a glass of water or a can of soda — can result in huge swings in calorie consumption, without any benefit in terms of how well your hunger is satisfied, and to the detriment of your health.

Use this chart to determine how many extra minutes you’d have to spend exercising in order to burn off a higher-calorie item, as compared with a lower-calorie item.

### How long does it take to burn it off?

<table>
<thead>
<tr>
<th>Food or drink, calories</th>
<th>Approximate minutes to burn off calories of a certain food or drink if you:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Walk, golf (without cart), dance socially or bicycle at moderate pace.</td>
</tr>
<tr>
<td></td>
<td>Run, bicycle or swim at a fairly intense level.</td>
</tr>
<tr>
<td></td>
<td>125-pound person</td>
</tr>
<tr>
<td>Snickers bar, 2 ounces (oz.), 271 calories</td>
<td>65</td>
</tr>
<tr>
<td>Apple, medium, 72 calories</td>
<td>17</td>
</tr>
<tr>
<td>Root beer, 12 fluid (fl.) oz., 152 calories</td>
<td>37</td>
</tr>
<tr>
<td>Sparkling water, 0 calories</td>
<td>0</td>
</tr>
<tr>
<td>Ground beef, 85% lean, 3 oz., 213 calories</td>
<td>51</td>
</tr>
<tr>
<td>White tuna, water packed, 3 oz., 109 calories</td>
<td>26</td>
</tr>
<tr>
<td>Vanilla ice cream, 1 cup, 274 calories</td>
<td>66</td>
</tr>
<tr>
<td>Strawberries, 1 cup, 53 calories</td>
<td>13</td>
</tr>
<tr>
<td>Glazed doughnut, medium, 239 calories</td>
<td>57</td>
</tr>
<tr>
<td>Toast, whole-grain, 1 slice with 1 tablespoon (tbsp.) jam, 125 calories</td>
<td>30</td>
</tr>
<tr>
<td>Starbucks Caffé Mocha, 2% milk, whipped cream, 12 fl. oz., 270 calories</td>
<td>65</td>
</tr>
<tr>
<td>Coffee, with 1 tbsp. half-and-half and 1 teaspoon sugar, 12 fl. oz., 40 calories</td>
<td>10</td>
</tr>
</tbody>
</table>
Second opinion

Questions and our answers

Q: Does eating cheese have a tendency to increase a person’s cholesterol? Would eating a hard, sharp, aged cheddar cheese be more harmful than eating cottage cheese or a soft cream cheese?

A: If you’re watching your cholesterol intake, it’s a good idea to be selective in the types of cheese you eat. All cheeses made from whole milk or cream — including hard, soft and creamed-type cheeses, such as cottage or ricotta — generally have higher amounts of fat and cholesterol than their lower-fat counterparts.

Generally, harder cheeses have higher fat and cholesterol than do soft cheeses.

For instance:
- A 1 cup of regular cottage cheese has 9 grams (g) of fat and 35 milligrams (mg) of cholesterol. Fat free cottage cheese is a healthier choice, with just 1/2 g of fat and 10 mg of cholesterol.
- A 1 1/2-ounce (oz.) serving of cheddar cheese made from whole milk has 14 g of fat and 45 mg of cholesterol. The low-fat version has 3 g of fat and 9 mg of cholesterol.
- A 1-oz. serving of regular cream cheese has 10 g of fat and 31 mg of cholesterol. The fat-free product has no fat and no cholesterol.

Based on the heart-healthy diet recommendations of the American Heart Association, your best bet is to choose fat-free, 1 percent fat and low-fat dairy products. So, as a general rule, avoid full-fat cheese and instead select:
- Fat-free cheese
- Low-fat or part skim milk cheese
- Cheese with less than 3 g of fat an ounce

It’s a good idea to limit the frequency and quantity of the cheese you eat. And, when selecting cheese, refer to the Nutrition Facts label for specific information on fat and cholesterol content per serving.

Q: My eyelashes have become very thin over the years, and I’m hopeless with mascara. Is it safe to use this new prescription product that’s supposed to grow eyelashes?

A: The product you’re referring to is bimatoprost — and the brand name is Latisse. It entered the prescription market earlier this year following approval by the Food and Drug Administration (FDA) as a treatment for inadequate upper eyelashes (hypotrichosis).

Bimatoprost is the drug used in prescription eyedrops to treat glaucoma — the brand name of that product is Lumigan. Eyelash growth was an unexpected side effect experienced by those using Lumigan.

With regular nightly applications along the lash line of the upper eyelid — it’s not to be applied to the lower eyelid — Latisse gradually encourages growth of longer, thicker and darker eyelashes.

It’s usually three to four months before the full results are seen. The improved lashes remain as long as the product continues to be used. If Latisse is discontinued, lashes eventually revert back to what they were like before.

There can be side effects with its use. Eyes may become itchy and there may be eye redness. Skin darkening is possible on the eyelid close to where Latisse is applied. Another potential side effect is permanent darkening of iris pigmentation. In addition, if the product regularly runs or drips onto other skin around your eyes, hair growth may occur there, as well.

There have also been reports of people using the drug contracting bacterial keratitis, which can cause blindness, but that risk has not been fully studied. Cost also may be a consideration. Cosmetic drugs generally aren’t covered by insurance, and Latisse may cost as much as $120 a month.

Have a question or comment?

We appreciate every letter sent to Second Opinion, but cannot publish an answer to each question or respond to requests for consultation on individual medical conditions. Editorial comments can be directed to:

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