



# Transcranial Magnet Stimulation

Applications

# We are here for you!

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Neuromodulation can help patients with psychiatric disorders and chronic pain as well as assist patients' rehabilitation process. By measuring and modulating brain activity, the outcome of conventional therapy can see long term improvements.

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## What is TMS?

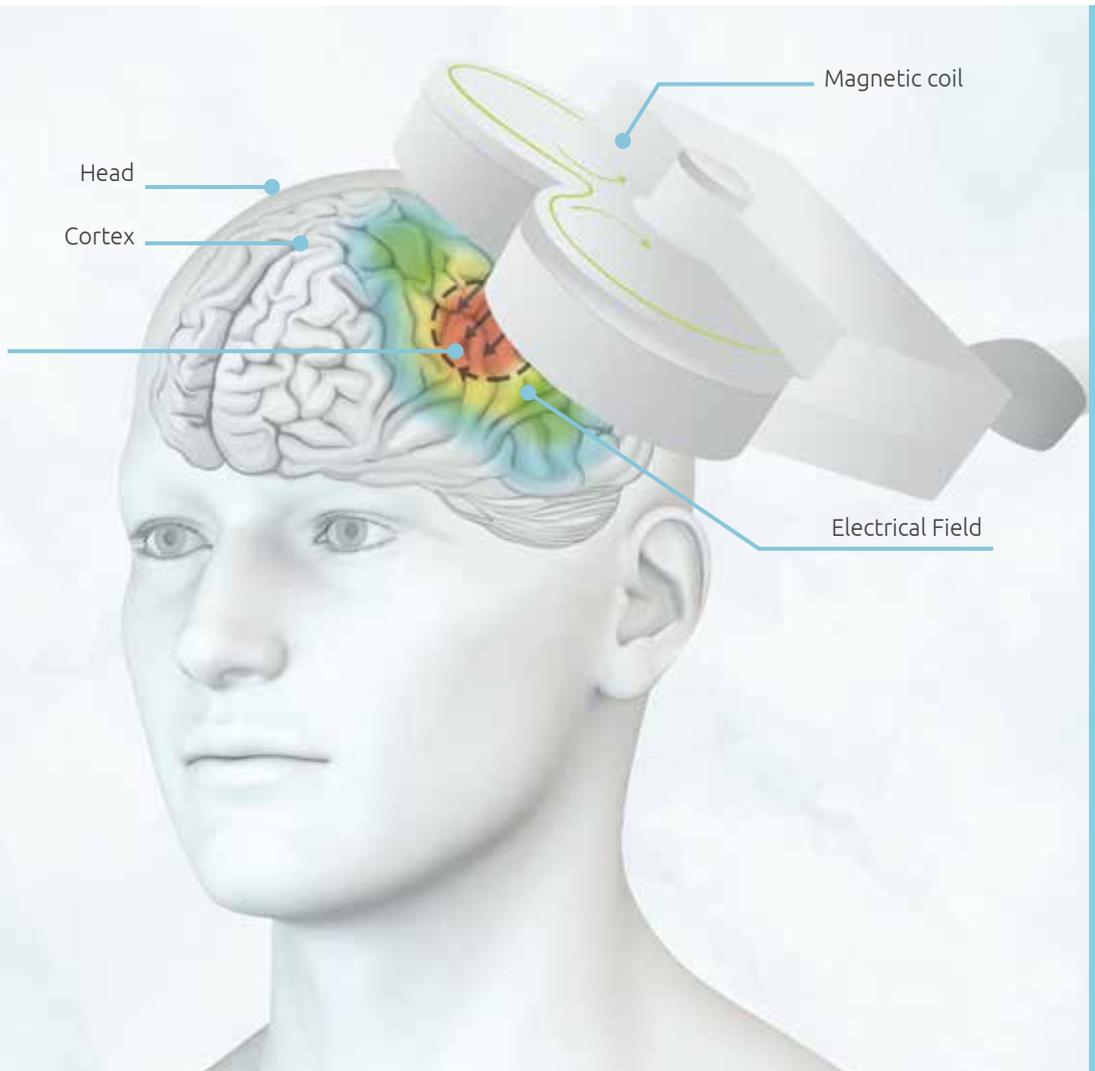
Transcranial Magnet Stimulation (TMS) is a highly effective, non-invasive and well tolerated therapy method. Numerous studies have shown it to be highly efficient in various indications of psychiatry and neurology. In neurology, TMS is also used for diagnostic purposes.

TMS is applied by positioning a magnetic coil on the surface of the head and stimulating the brain with short magnetic pulses. Thereby, TMS can affect the brain in a targeted and highly precise manner. The choice of treatment protocol determines whether the stimulation has an excitatory or inhibitory effect.

### **TMS offers decisive advantages over other forms of therapy:**

- non-invasive, few side effects
- painless and safe
- non-convulsive (not spasm inducing)
- outpatient or inpatient treatment is possible
- no anesthesia/sedation required
- specifically stimulates certain brain regions
- well tolerated

Neuronal  
Activation



# Areas of Application

## **TMS in psychiatry**

TMS can help patients who do not respond to drug therapies. If drugs are poorly tolerated, TMS is a welcome, highly effective alternative.

The effects of stimulation begin to show after only a few treatments. When combined with psychotherapy, the positive effect is intensified. This is reflected in response rates of 66% and remission rates of 56%\* as well as more long term sustainable success.

\* Donse L. et al. 2017

### **TMS in neurology, rehabilitation and pain therapy**

TMS shows clear analgesic effects for different types of pain. In neurological rehabilitation and treatment of neurodegenerative diseases, TMS is primarily used to regain or maintain motor, speech and cognitive functions.

Treatment using a combination of conservative methods and TMS has proven to be sensible and effective. Studies show good results, e. g. in motor training or in speech therapy.

TMS is a method for examining the central motor system. It supplements the diagnosis of evoked potentials with motor evoked potentials (MEP).

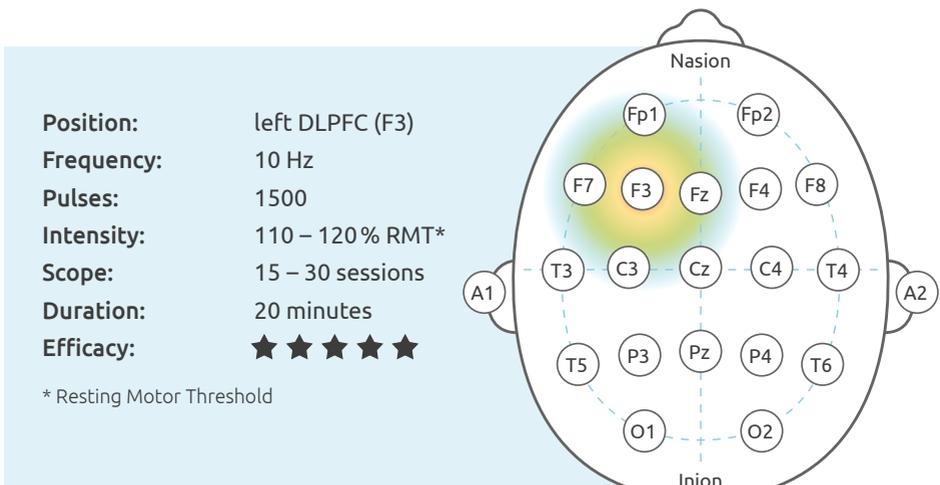


# Depression

In depressed patients, neuronal activity is often reduced in the frontal area of the left hemisphere of the brain (the dorsolateral prefrontal cortex, DLPFC). The patients' depressive symptoms can decrease if the activity in the left DLPFC is increased with TMS treatment.

TMS is particularly helpful for patients who have not responded successfully to medication. Unlike ECT (electroconvulsive therapy), TMS is painless, has few side effects and can be applied without anesthesia. The activity of the left DLPFC is increased with high-frequency TMS. Patients are able to tolerate this treatment well.

Level of evidence = Level A (definitely effective)



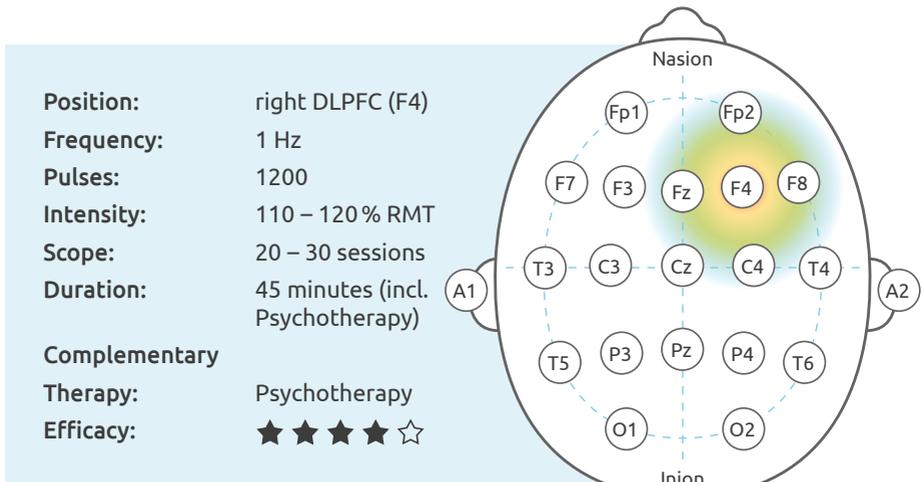
Source: Lefaucheur JP et al. 2020

# Depression: TMS plus Behavioral Therapy

Psychotherapy aims to improve the patients' condition sustainably by changing destructive patterns of thought and behavior. TMS can reduce depressive symptoms. The complementary use of TMS is therefore useful for patients who are not yet able to actively participate in psychotherapy. TMS can result in increased benefits from psychotherapy for these patients. Patients who are skeptical about psychotherapy may also be convinced this way.

The percentage of patients who achieve remission is significantly higher under TMS. A combination of therapy and low frequency stimulation above the right DLPFC has proven successful.

Level of evidence = Level B (probably effective)



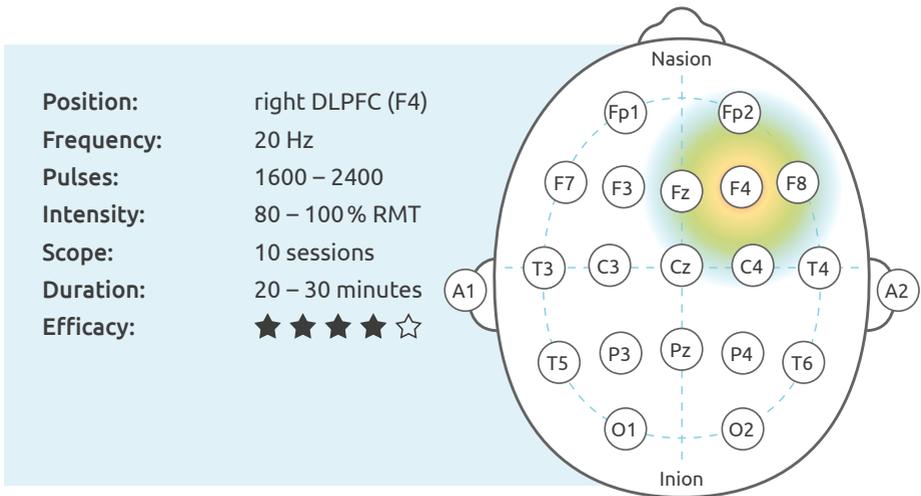
Source: Donse L et al. 2018

# Post-Traumatic Stress Disorder

In many cases, post-traumatic stress disorder (PTSD) cannot be sufficiently treated. Oftentimes patients don't even find their way towards therapy. The risk of addiction, depression and other mental illnesses rises sharply with PTSD.

TMS above the right DLPFC can lead to a significant reduction of symptoms. Anxiety and depressive symptoms may noticeably decrease. Patients report a more positive experience of themselves and find social life to be accessible again. TMS has a lasting effect beyond the duration of the therapy.

Level of evidence = Level B (probably effective)



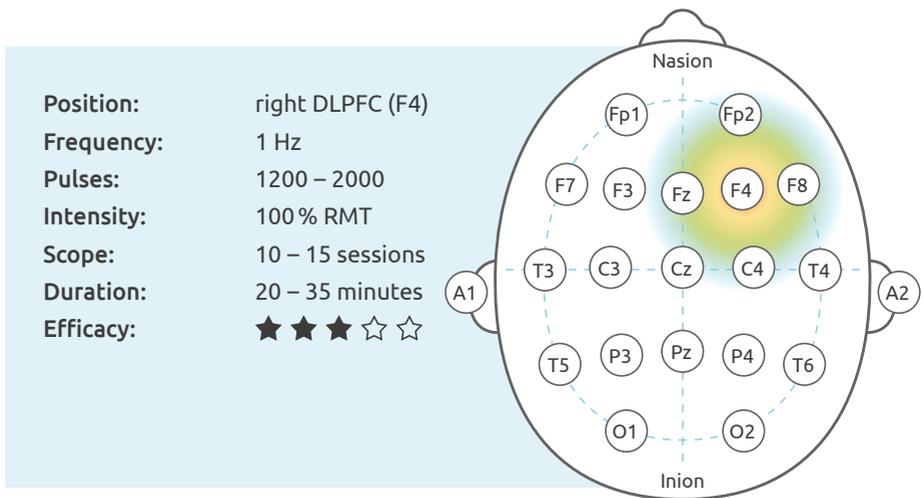
Source: Boggio PS et al. 2010, Ahmadizadeh MJ & Rezaei M 2018, Cohen et al. 2004

# Obsessive-Compulsive Disorder

OCD is usually chronic. A large proportion of patients respond inadequately to therapy (cognitive-behavioral therapy, medication). TMS can help some of these patients.

The permanent changes in the metabolic activity of the brain are most important for the treatment of OCD. This not only affects the location of stimulation, but also more distant areas of the brain. The effect is transmitted via neural networks. Particularly for chronic patients, the sustained effect of TMS can create the basis for a normal life.

Level of evidence = Level C (possibly effective)



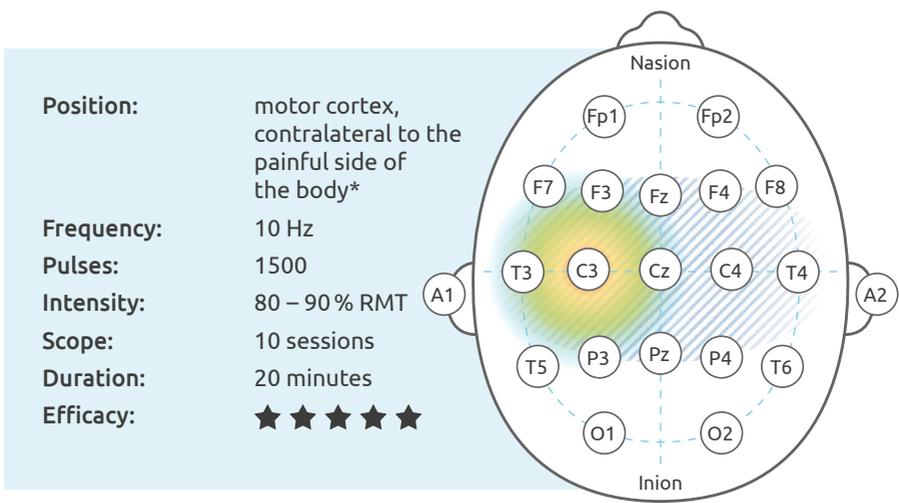
Source: Elbeh KAM et al. 2016, Seo HJ et al. 2016

# Neuropathic Pain

Neuropathic pain is the result of a nerve injury. Pain-related changes in the central nervous system cause the pain to persist long after its cause has been eliminated. For many patients, drugs do not sufficiently relieve the pain. If the attempted treatments do not prove to be effective, long-term pain can lead to depression and/or anxiety. In turn, these can increase the pain.

TMS can reduce both the pain and the pain-induced accompanying symptoms, such as fatigue. This makes it easier for patients to lead a more active lifestyle, experience their pain as less agonizing and increase their quality of sleep. Early TMS treatment (within the first five years after the onset of pain) leads to particularly good results.

Level of evidence = Level A (definitely effective)



Source: Lefaucheur JP et al. 2020, Ma SM et al. 2015, Khedr EM et al. 2015

\* Image example: Stimulation above C3 with pain on the right side



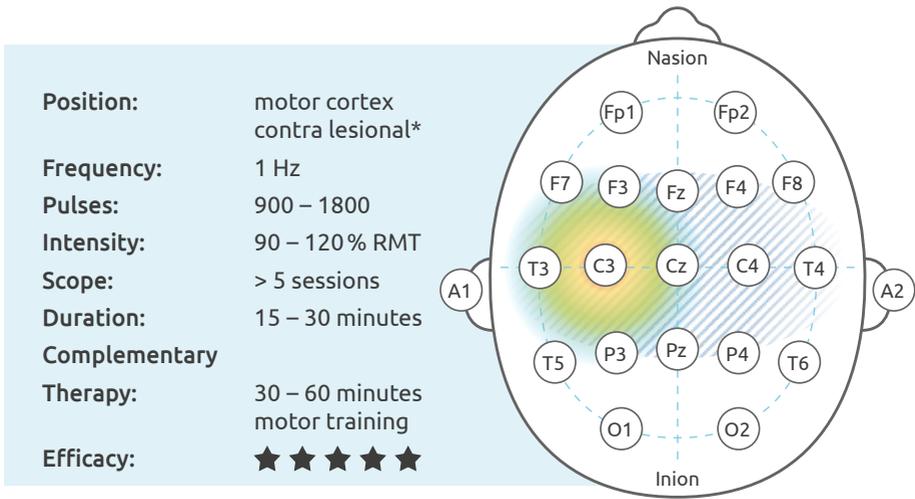
# Motoric Disorders of the Hand (after a Stroke)

A brain which has been damaged by a stroke has to learn to reorganize itself through repeated practice, e. g. in physiotherapy. However, the brain of an adult is not prepared for this constant practicing and learning.

TMS can activate damaged areas in the brain and inhibit activity in the areas which compensate for them. Through this, it gets easier to form new neural networks in order to better implement other therapeutic exercises.

TMS is used in the post-acute or chronic stage. Magnetic stimulation in combination with motor training of the upper or lower extremities has proven to be particularly effective.

Level of evidence = Level A (definitely effective) - post-acute  
 Level C (possibly effective) - chronic



Source: Lüdemann-Podubecká J et al. 2015,  
 Zheng C et al. 2015, Du et al. 2016

\* Image example:  
 Stimulation above C3 with lesion on the right side

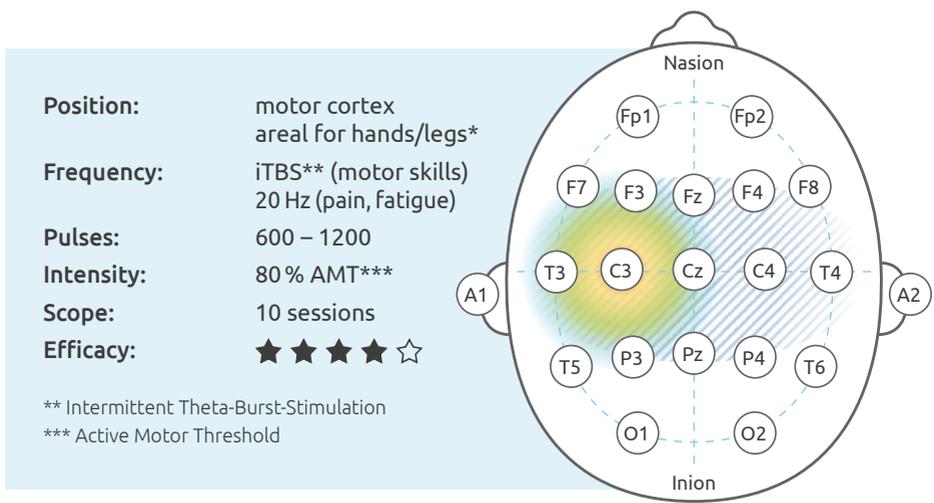
# Multiple Sclerosis

Multiple sclerosis (MS) often leads to a decrease in the body's functionality and restrictions in independent living. In addition, fatigue, pain and depressive moods can impair the quality of life.

It is possible to reduce fatigue and pain with TMS. This can increase the patient's confidence in the effectiveness of treatments and improve their quality of life. In addition, the motor function can be positively influenced.

Specific treatment protocols are available for the individual symptoms. After repeated stimulation, the effects last for up to several months. The effectiveness of TMS has been proven for both relapsing-remitting and secondary progressive MS.

Level of evidence = Level B (probably effective)



Source: Azin M et al. 2016, Korzhova J et al. 2019

\* Image example:  
Stimulation above C3 for the right hand

# Safety and Side Effects

TMS is a non-invasive method for brain stimulation with low side effects. Studies on safety and side effects indicate a clear recommendation. Muscle twitching and tension headaches can occur temporarily in connection with the therapy. Individual patients have reported fatigue or nausea. In very rare cases, an epileptic seizure may be triggered.

## Contraindications

### No application:

- Ferromagnetic material (e. g. cochlear implants, brain and heart pacemakers) or implants (shunts, clips). Should these materials come into contact with the coil (less than 10 cm apart), the implant is at risk of moving or heating up. If the implants are MRI-compatible, they are also suitable for TMS.

### Relative contraindications (treatment possible under certain conditions):

- Stroke (acute phase)
- Focal brain injuries
- Epilepsy (poorly adjusted or untreated)
- Pregnancy





## Experiences

### **Joris van Neijenhof, clinical neuropsychologist**

“When I started at neuroCare after 17 years of working in the field of brain injury rehabilitation, I was not sure what to expect of rTMS. After an intensive training course of 2 days and some additional hands-on training, I was able to start using it with my own patients.



I have found it to be an invaluable tool, especially with depressed patients who had proven to be therapy-resistant to medication and psychotherapy before coming to us.

For them, rTMS is often the last alternative before they have to decide if they want to do invasive ECT treatments with sometimes severe side-effects. Some of these patients had been suffering from depression for more than 20-30 years, and it's wonderful to see them react and improve.

I have also used it successfully with patients with OCD, pain, motor stroke and even a complex symptom like depersonalisation reacted positively to rTMS.

One of the best things of rTMS is that it has no severe side-effects and that patients don't develop treatment resistance and tolerance effects for it. If patients have proven to be responders, they will respond again if they experience relapse. „

**Annika Simlacher, Psychological Psychotherapist**

„During the four years that I have been using TMS devices, I have focused on treating adults of all ages with therapy-resistant symptoms of depression. My treatment approach is a combination of TMS and psychotherapy. This treatment can be carried out with or without medication.



In my therapeutic experience, the combination of TMS and psychotherapy has enabled impressively fast and positive effects.

TMS therapy is particularly suitable for patients who do not - or not sufficiently - respond to medication, or those who suffer from severe side effects.“



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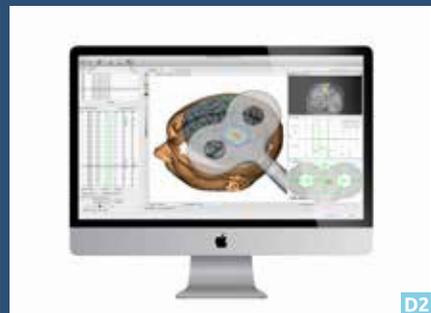
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# neurocare Solutions for TMS

**Tailored to your requirements:** We analyze your needs, give you advice and offer individually tailored solutions consisting of technology, training, supervision and service. We can meet all requirements, from entry-level devices to navigated TMS.



**A:** suitable device technology for every need in clinical application

**B:** large variety of coils

**C:** deep TMS (dTMS)

**D:** navigated TMS, e.g. Neuro-Cardiac Guided TMS (D1), TMS-Neuronavigation (D2)



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Training & Science

**Would you like to learn more about TMS?**

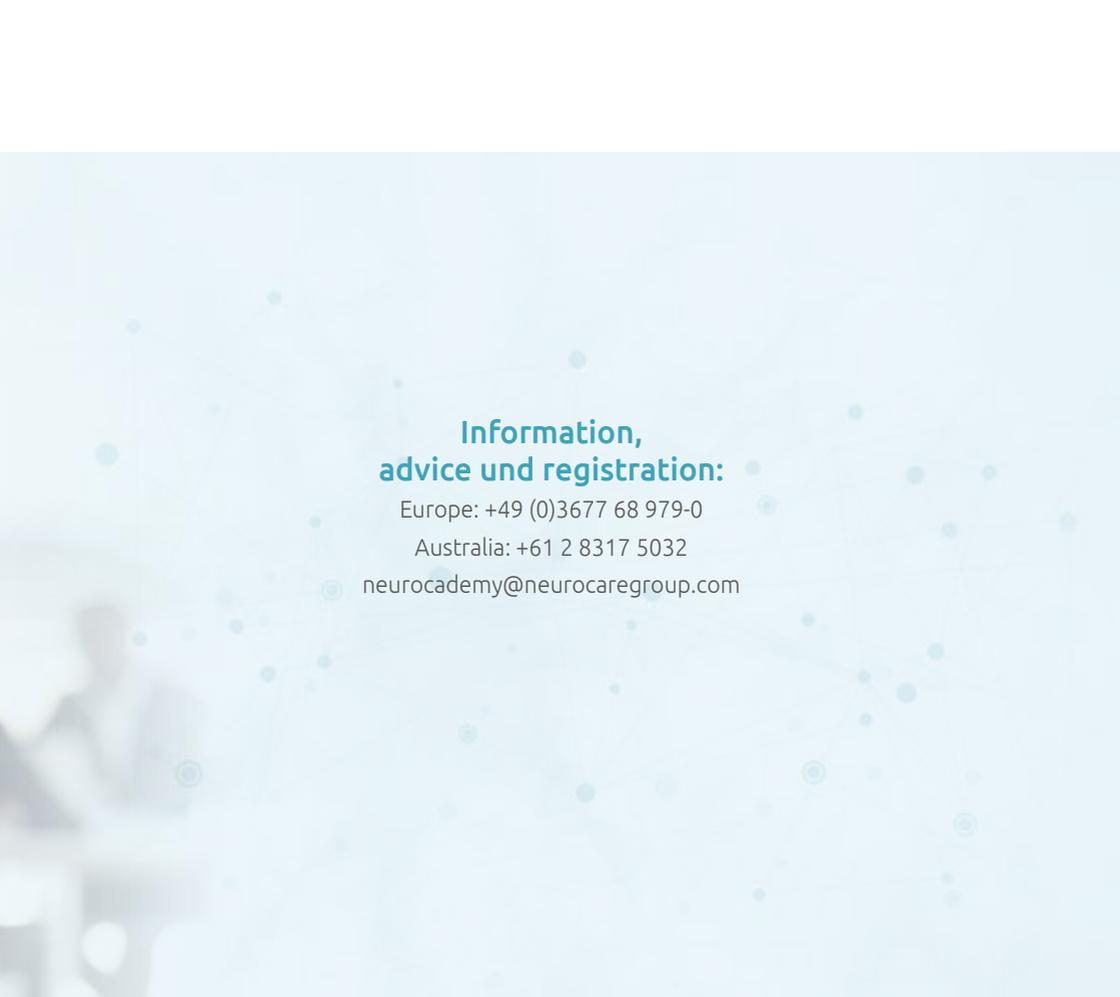
neuroCademy offers all the necessary further training to help you implement TMS in your everyday therapeutic work.

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