Transcranial Magnetic Stimulation (TMS) is a technique that allows to stimulate the brain from outside the head. During TMS a current passes through a coil that is held over the participant's head. In this way a short magnetic pulse is delivered, that can stimulate neurons in the underlying brain area. For example, when the coil is held above the area of the brain that controls the hand, the stimulation can cause the fingers to twitch a little. TMS has been used for both clinical and scientific purposes for nearly thirty years. In the hospital TMS is used, for example, to diagnose the functioning of nerves in patients with multiple sclerosis. In neuroscience, TMS is an important technique to investigate the functions and connections of brain areas. TMS can have a direct stimulation effect, for example as described above when a small finger movement is evoked. However, a TMS pulse can also slightly disrupt the functioning of a brain area for a short while (less than a second). These small perturbations can be measured using a sensitive behavioural task, or with another neuroimaging technique like fMRI or EEG. When multiple pulses are delivered repetitively, for example 600 in a specific pattern, the effects of TMS can last longer, in some cases up to half an hour after the stimulation has ended. This opens up the possibility to study the function of brain areas without the need to give TMS pulses at the very same time.

Because of the magnetic fields induced by TMS, directly before the experiment you have to remove all metal objects from your head (hairpins, ear rings, etc.) and all other objects sensitive to magnetic fields from your body (like mobile phones, bank / credit cards, etc.).

Prior to the study you will be asked to fill in a consent form and a screening questionnaire about your health and other safety aspects of TMS. On the basis of your answers the investigator will decide whether you can participate or not. The details of the experiment are specific for each study, but a few components are regularly used. Often the researcher will take ample time to determine the exact location and intensity of the stimulation before the real experiment will start. During or after the application of TMS, it may be that you have to look at a computer screen, listen to sounds, carry out a reaction-time task, make certain movements, or just sit and be relaxed. Also, TMS is often used in combination with other techniques: for example an EMG measurement to determine the muscle activity in the hand, or an EEG measurement to investigate the brain activity during stimulation. Sometimes the TMS experiment is preceded by a session where an anatomical image of your brain is made in an MRI scanner, or after the TMS experiment your brain activity is measured using fMRI. When you are invited to participate in a TMS study, you will always receive a description of the study beforehand.
Additional Information
The risk associated with participation can be considered as negligible to minimal. The researchers are trained and the used equipment conforms to international safety standards. You can hear the TMS pulse as a click and possibly you can feel that muscles and nerves on your head are stimulated. The most common side effect is a light transient headache (2-4% occurrence) which is short lasting and responds well to light painkillers like paracetamol. A severe headache is uncommon (0.3-0.5% occurrence). In TMS studies of patient populations (e.g. epilepsy) or those exceeding the standard protocols, epileptic seizures have been reported in rare cases. Moreover, the magnetic fields induced by TMS do affect metal objects and electrical equipment near the coil, which is why their presence has to be ruled out (see details below).

You can NOT participate in a TMS-experiment if one of the following applies:
1) You have or have had epilepsy, a convulsion or a seizure
2) You have or have had a serious head trauma or brain surgery
3) You have large or ferromagnetic metal parts in the head (except for a dental wire)
4) You have an active implant, such as a pacemaker, insulin pump, or neurostimulator
5) You are pregnant or you think you are
6) You are younger than 18 years of age

If one of the above is applicable, please contact the investigator before the day of the experiment!

Independent Physician
If you would like to address medical questions related to the experiment you can approach one of the independent physicians, Prof. dr. Guillén Fernández or Prof. dr. Jan Buitelaar, by contacting the administration of the Donders Centre for Cognitive Neuroimaging: 024-3610750.