mMTG and Lemma Access in Comprehension and Production

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Observational non invasive

Summary

ID

NL-OMON48047

Source
ToetsingOnline

Brief title
TMS & Lemma Access

Condition

- Other condition

Synonym
the process of how we produce and understand words, word comprehension and word production

Health condition

Healthy participants

Research involving
Human

Sponsors and support

Primary sponsor: Radboud Universiteit Nijmegen
Source(s) of monetary or material Support: Max Planck Institute for Psycholinguistics;Nijmegen

Intervention

Keyword: Lemma, MTG (middle temporal gyrus), TMS (transcranial magnetic stimulation)

Outcome measures

Primary outcome

The main behavioural endpoint of the study is the difference in naming

latencies/reaction times as a result of stimulation site and stimulation

time-window. Specifically, we hope to disrupt lemma processing when stimulating

the left mMTG and show no effect when stimulating the vertex.

Secondary outcome

Not applicable

Study description

Background summary

According to a prominent theory (Levelt, Roelofs, & Meyer, 1999), a particular type of mental representation, called a lemma, helps speakers and listeners to link a word*s meaning to its sound. A meta-analysis of neuroimaging studies on spoken-word production by Indefrey and Levelt (2004; Indefrey, 2011a) localized lemmas to the middle section of the left middle temporal gyrus (mMTG; MNI y = -6 to -39 mm). However, evidence for the localization of lemmas for comprehension is lacking. Moreover, evidence is also lacking on when the mMTG is engaged during the course of comprehension and production.
In this study we will conduct 2 tasks (1 production and 1 comprehension). According to the theory by Levelt et al. (1999), both of these tasks require lemma access. During the task the mMTG or Vertex of the subject will be stimulated during varying time-windows in which we expect lexical access to happen. If the lemma is indeed localised to mMTG, then stimulating it in the correct time window should result in reaction times that differ from the

condition in which the mMTG is not stimulated (i.e., Vertex).

Study objective

Our main objective is to probe for the functional time-windows of the mid-portion of the left middle temporal gyrus (mMTG) during word comprehension and word production to determine whether the left mMTG is common to both language comprehension and production. Triple-pulse TMS (tpTMS) will be applied to temporarily disrupt function in this region during one of three different time-windows after stimulus onset. Naming latencies and reaction times will be used to infer the effects of TMS on left mMTG (as compared to sham-vertex stimulation).

Study design

The study takes place at the Donders Centre for Cognitive Neuroimaging (DCCN) and is designed as a within-subject experiment. Subjects will participate in a picture naming and semantic classification task, with participants blind to the relevance of the time and site of stimulation. The study will span one intake session and two experimental sessions, however the intake session and first experimental session will take place on the same day.
The first experimental session is an MRI structural scan and the second experimental session is a TMS session. Triple pulse transcranial magnetic stimulation (tpTMS) will be applied to either the mid portion of the left mMTG or the Vertex. During the tasks participants will receive a tpTMS stimulation to either of the 2 sites, at one of three time-windows following stimulus onset.

Study burden and risks

Each participant will receive no direct benefit from participating in the study, but will receive a compensatory (financial) incentive. Transcranial magnetic stimulation (TMS) is a widely used non-invasive brain stimulation technique, based on the principle of electromagnetic induction. During stimulations, the participant will likely hear the clicks of the TMS pulses and experience stimulation of nerves and muscles of the head. The most common side effect is a light transient headache (2-4% occurrence). A severe headache is uncommon (0.3-0.5% occurrence). In TMS studies of patient populations (e.g. epilepsy) or that exceeded the standard protocols (e.g. in intensity or frequency) epileptic seizures have been reported in rare cases. In the current study all participants will be stimulated with protocols that fall within the safety guidelines. All subjects are screened for their relevant medical history and other TMS safety aspects (e.g. presence of metal parts in the head). In summary, because the risk and burden associated with participation can be considered negligible-to-minimal, we do not expect serious adverse events during the project.

The noise in the MRI scanner, and lying in a small space, may lead to discomfort in some subjects.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

- right-handed
- native speaker of Dutch
- age 18 -35
- normal or corrected-to-normal vision (by means of contact lenses)
- not color blind
- normal hearing
- considered *healthy* as defined by not being subject to the exclusion

criteria below.

Exclusion criteria

* Epilepsy, convulsion or seizure (TMS)
* Serious head trauma or brain surgery
* Large or ferromagnetic metal parts in the head (except for a dental wire)
* Implanted cardiac pacemaker or neurostimulator
* Pregnancy
* Any exclusion as per TMS screening form
* Glasses (contacts required)
* Large or ferromagnetic metal parts in the body (MRI)
* Claustrophobia (MRI)
* Skin diseases at intended electrode sites (EMG)
* Any exclusion as per MRI screening form
* History or current presence of any neurological, or psychiatric disorder
* Any prescribed medication that can alter cortical excitability (e.g. antiepileptics, tricyclic anti-depressives or benzodiazepines)

Study design

Design

Study type: Observational non invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	29-04-2021
Enrollment:	28
Type:	Actual

Ethics review

Approved WMO Date:	11-05-2020
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	07-06-2021
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL71948.091.19