TMS and the temporal dynamics of word production

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

Summary

ID

NL-OMON46259

Source
ToetsingOnline

Brief title
word production time course

Condition

- Other condition

Synonym
the process of how we produce words, 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: picture naming, TMS, word production

Outcome measures

Primary outcome

The main behavioural parameter will be picture naming latencies dependent on

tpTMS stimulation site and time window.

Secondary outcome

Not Applicable

Study description

Background summary

In 2004, Indefrey and Levelt proposed a comprehensive spatial and temporal neural model of word production. The model (2004) outlines candidate regions in the word production process as well as their functional time windows. More recently, Indefrey (2011) update the existing model, giving the following processing stages: conceptually driven lexical retrieval in the left mid MTG from 200-275ms after picture onset; phonological code retrieval in the left posterior MTG/STG from 275-355ms after picture onset; phonological encoding (syllabification) in the left posterior IFG (pars opercularis) from 355-455ms (duration varies with number of syllables); phonetic encoding and articulation in bilateral inferior motor cortices from 455- 600ms after picture onset; finally self-monitoring takes place in bilateral STG.
An online TMS picture naming study by Schuhmann et al. (2012) stimulated the LIFG, mMTG and pSTG, during different time-windows after picture onset. They found that LIFG activity is functionally relevant at an earlier time-window (300ms) and that stimulating pSTG shows no effect in earlier time windows for phonological code retrieval. The current experiment wishes to address these issues by replicating the Schuhmann et al. (2012) study while 1) manipulating word length in order to manipulate the functional time window of

LIFG and 2) stimulating pMTG to disrupt phonological code retrieval, as opposed to mMTG.

Study objective

Our objective is to disrupt neural activity in left inferior frontal gyrus (LIFG), left posterior middle temporal gyrus (pMTG), and left posterior superior temporal gyrus (pSTG) during different time-windows after picture onset in order to determine the functional relevance of each brain area throughout the word production process.

Study design

In this study participants will undergo a picture naming task. Triple pulse transcranial magnetic stimulation (tpTMS) will be applied to three stimulation sites in the left hemisphere: inferior frontal gyrus (IFG), left posterior middle temporal gyrus (pMTG) & posterior superior temporal gyrus (pSTG). During the task participants will receive a tpTMS stimulation in one of the three stimulation sites, at one of five time-windows following picture 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 stimulation 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 fMRI 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

Only healthy, right handed, native Dutch participants, age 18-32, with normal vision or corrected to normal vision by means of contact lenses.

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, EEG, tDCS/tACS)
• 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:	Pending
Start date (anticipated):	10-06-2018
Enrollment:	24
Type:	Anticipated

Ethics review

Approved WMO Date:	03-12-2018
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	01-08-2019
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	NL65887.091.18