Investigating the timing of interactions between visual cortex areas during object categorization: A transcranial magnetic stimulation study

Published: 29-05-2019
Last updated: 09-04-2024

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON48262

Source
ToetsingOnline

Brief title
Timing of object categorization

Condition

- Other condition

Synonym
niet van toepassing

Health condition

Niet van toepassing - onderzoek bij gezonde vrijwilligers

Research involving

Human

Sponsors and support

Primary sponsor: Radboud Universiteit Nijmegen
Source(s) of monetary or material Support: ERC consildator grant

Intervention

Keyword: Object categorization, Transcranial magnetic stimulation, Visual cortex

Outcome measures

Primary outcome

In experiment 1 the main parameter is the percentage of correct categorization.

Participants choose between four options for object and scene stimuli. In

experiment 2 the main parameters are percentage of correct animacy detection.

Participants have to categorize an isolated object, or object in scene as

animate (humans, animals, etc.) or inanimate (houses, cars, etc.).

Secondary outcome

In experiment 2 the secondary parameter is reaction time.

Study description

Background summary

The human visual cortex is able to rapidly categorize objects. In ambiguous situations contextual information from the surrounding scene can help this process. This implies that the early visual cortex, receiving visual information, object-selective visual cortex and scene-selective cortex have to interact. Indeed, neuroimaging studies have provided evidence for such interactions. However, causal evidence as well as the specific timing of when the visual information is processed remains elusive.

Study objective

The aim of this study is to causally dissociate the time course of

scene-assisted and isolated object recognition and provide evidence for a direct feedback processing from scene- to object-selective cortex, as well as investigate the role of feedback to V1.

Study design

A two-part within-subjects design. In the first experimental session sensitivity to TMS over object- and scene-selective cortex will be determined by replicating the study of Dilks et al. (2013). Based on participants* behavioural response to transcranial magnetic stimulation (TMS), they will perform one of three experiments in the second session. In each of these experiments participant rate whether an object is animate or inanimate. Degraded objects will be shown with scene background, or isolated (intact) objects will be shown. In experiment 2a TMS over right object-selective cortex will be given at different time points: early (60-100 milliseconds afters visual presenation), middle (160-200 milliseconds after visual presenation), and late (260-300 milliseconds after visual presentation). The different timings allow for investigating the processing of isolated objects versus objects in scenes. In experiment 2b TMS will be delivered over right scene-selective cortex at the same time points. This allows for investigating the role of scene-related information processing during object categorization. Finally, in experiment 2c TMS will be delivered over V1 at the same time points. This allows for investigating the role of early visual cortex in object categorization.

Intervention

TMS will be applied to interfere with ongoing brain activity. In experiment 1 five pulses separated by 100 ms will be given per trial (following the procedure of Dilks et al., 2013). In experiment 2 two pulses separated by 40 ms will be given per trial.

Study burden and risks

The currently proposed TMS paradigms do not carry any significant risks. Safety guidelines as acknowledged by the International Federation of Clinical Neurophysiology will be followed strictly. Potential side-effects are fatigue and headache. These are generally mild discomforts that respond promptly to common analgesics. Volunteers can withdraw from the study at any given time and there are no direct benefits for the participants.

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

Between 18-35 years of age years; Right-handed; Non-smoking; Normal or corrected-to-normal vision; Willingness and ability to give written informed consent and willingness and ability to understand the nature and content, to participate and to comply with the study requirements.

Exclusion criteria

1) Average use of more than 3 alcoholic beverages daily; 2) Use of psychotropic medication or recreational drugs; 3) Epilepsy or history of an epileptic insult; 4) A nuclear family member with epilepsy; 5) Pregnancy; 6) Serious head trauma or brain surgery; 7) Neurological or psychiatric disorders; 8) Large or ferromagnetic metal parts in the head (except for a dental wire); 9) Implanted cardiac pacemaker or neurostimulator; 10) Participation in a NBS study in the past 28 days; 11) Previous participation in 10 or more NBS studies.

Study design

Design

Study type: Interventional

Masking:	Double blinded (masking used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	28-10-2019
Enrollment:	72
Type:	Actual

Ethics review

Approved WMO

Date:	29-05-2019
Application type:	First submission
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	NL69407.091.19