Decision-Related Activity in Human Visual Cortex during Perceptual Suppression

Published: 13-12-2010
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To characterize the neural interactions underlying simple perceptual decisions about the target disappearance during motion-induced blindness.

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

Summary

ID

NL-OMON34421

Source
ToetsingOnline

Brief title
Decision-Related Activity in Visual Cortex

Condition

- Other condition

Synonym
Not applicable

Health condition

The study is basic research that does not address any condition.

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit van Amsterdam
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: cognitive neuroscience, human brain, magnetoencephalography (MEG), visual perception

Outcome measures

Primary outcome

Based on our previous fMRI (Donner et al, Journal of Neuroscience, 2008) and MEG (Donner et al, Current Biology, 2009) results, we expect the following modulations of cortical activity to occur around the time of the subjects* behavioral (button press) report of the target disappearance:

(1) A decrease of the specific response to the target in the visual cortex. This decrease will be specific to the cortical representation of the target stimulus, thus confined to the contralateral hemisphere, and it will precede subjects* behavioral report.

(2) An increase of activity in motor cortex contralateral to the upcoming button press that reflects subjects* evolving plan to make the perceptual report.

(3) A *global* response decrease throughout visual cortex, be expressed throughout both hemispheres. We predict that this global response modulation will succeed both response components (1) and (2), as well as subjects*

behavioral report.

We will interpret the target-specific response decrease in visual cortex (1) as the neural basis of the subjective target disappearance, the motor build-up activity (2) as a correlate of subjects* subsequent perceptual decision, and the global response decrease in visual cortex (3) as a feedback signal re-entering early visual cortex. Specifically, based on the latencies relative to (2), we may conclude that this global modulation in visual cortex is triggered by the preceding perceptual decision.

Secondary outcome

Not applicable.

Study description

Background summary

Our brain sometimes *decides* that even salient visual stimuli are not actually present in the external world and hence makes them disappear from our conscious perception, as if erased from the visual scene. For example, when surrounded by a moving visual pattern, a salient visual target disappears completely from conscious perception, only to reappear several seconds later. This phenomenon is called *motion-induced blindness* (Bonneh et al., Nature, 2001). It provides an excellent opportunity for probing the intrinsic neural interactions governing the simple perceptual decision about the presence/absence of simple visual targets. Our previous functional magnetic resonance imaging (fMRI) studies of motion-induced blindness have provided a first window into these neural interactions (Donner et al, Journal of Neuroscience, 2008). In the proposed project, we plan to use magnetoencephalography (MEG) to characterize these neural interactions at higher temporal resolution in the intact human brain. Specifically, the objective of the study is to characterize the temporal sequence the neural events around the time of the target disappearance decision.

Study objective

To characterize the neural interactions underlying simple perceptual decisions about the target disappearance during motion-induced blindness.

Study design

We will record the magnetoencephalogram (MEG) in healthy, adult human subjects, while they experience and report the motion-induced blindness illusion. Stimuli will be presented on a screen and subjects will report their ongoing target perception (*visible/invisible*) by pressing one of two response buttons with their left of right hand. We will use spectral analysis of the MEG signals (e.g., Donner et al, Journal of Neurophysiology, 2007; Donner et al, Current Biology, 2009) to characterize the time course of modulations of different components of cortical activity around the time subjects* behavioral report of the target disappearance.

Study burden and risks

There is no specific risk and burden associated with this study.

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

Young, healthy adults. Age range 18-40 years. Experienced participants in psychophysical and neuroimaging experiments. Written informed consent. Normal or corrected-to-normal vision.

Exclusion criteria

Significant neurological or psychiatric history (in particular, epilepsy). Significant visual disturbance. Claustrophobia. Metal items attached to or inside the volunteers* body that cannot be removed.

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Completed
Start date (anticipated):	14-12-2010
Enrollment:	15
Type:	Actual

Ethics review

Approved WMO Date:	13-12-2010
Application type:	First submission
Review commission:	METC Amsterdam UMC

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	NL32325.029.10