Accumulation processes in memory decisions

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We will study how a memory decision comes into being and how decisions based on information that is directly available to the senses may or may not differ from decisions based on information in memory. The neural correlates of perceptual decisions...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Psychiatric disorders NEC
Study type	Observational invasive

Summary

ID

NL-OMON36167

Source
ToetsingOnline

Brief title
ACCDECMEM

Condition

- Psychiatric disorders NEC

Synonym
not applicable

Research involving
Human

Sponsors and support

Primary sponsor: Rijksuniversiteit Groningen
Source(s) of monetary or material Support: Europese Unie (Marie Curie Career Integration Grant)

Intervention

Keyword: computational models, decisions, memory, oscillations

Outcome measures

Primary outcome

The study parameters are the dynamics in the observed EEG and fMRI data during the perceptual and memory tasks, which will be compared to the predictions of a mathematical model of evidence accumulation. Evidence accumulation can take place either on the basis of information directly available to the senses, or on information only present in memory.

Secondary outcome

To use the information about the neural correlates of evidence accumulation to extend and improve our mathematical models of decision making, such that they can make predictions about the interactions between brain areas.

Study description

Background summary

Every day we need to remember whether we have seen people or items before and adjust our decisions accordingly. The goal of the proposed research is to further our understanding of decisions based on remembered information by following those as they happen in the brain. To be able to study neural decision dynamics, we use computational models. These models describe decisions as a protracted process where information is slowly accumulated, and as soon as the accumulated information crosses a decision threshold, the participant gives the response corresponding to the decision threshold that is reached (there is a decision threshold corresponding to each possible answer. In the context of the tasks we typically use, those would be thresholds for "yes" and "no" answers). This evidence accumulation process has also been observed in neural data, during decisions based on perceptual information. But also decisions for which the information that is needed to make them is not directly available to the sense (i.e., it has to be retrieved from memory) can be described with

these mathematical models. However, neural correlates of these models have not yet been described. In the context of decisions based on information in memory, not only the dynamics at the moment of the decision are of interest, but also in the stages of the task that lead up to these decisions, which describe how information is encoded and maintained. Secondary research questions involve describing how the neural dynamics of those task stages develops. They will elucidate how memory and decision systems interact dynamically to ensure good recognition memory performance.

Study objective

We will study how a memory decision comes into being and how decisions based on information that is directly available to the senses may or may not differ from decisions based on information in memory. The neural correlates of perceptual decisions have been described extensively, but little is known about how the brain implements decisions based on information in memory.

Study design

To answer this question, we will collect concurrent EEG and fMRI measurements while participants engage in perceptual and memory tasks matched in difficulty and stimuli. Participants make repeated decisions, such that we can obtain sufficient amounts of information to average out the noise in the EEG and fMRI data. For every decision that a participant makes, we can follow the dynamics with millisecond-resolution in EEG, yet this gives very little information about the location in the brain where these processes happen. fMRI in contrast only gives a single datapoint per decision, but has excellent spatial resolution. We will use the combined EEG/fMRI data (i.e., combining the spatial resolution of fMRI with the temporal resolution of EEG) to see whether our neural data agree with predictions of a model of evidence accumulation for decisions, and to what extent the neural correlates of evidence accumulation agree between perceptual and memory tasks.

Study burden and risks

The experiments will not entail more than minimal risk to the participants. The study is not intended to benefit the subjects directly. Rather, the data collected during this study can improve our understanding of how decisions made based on information in memory manifest itself in the brain.

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

Age 15-35, right-handed, normal seeing.

Exclusion criteria

* Wearing braided hair (which makes recording of reliable EEG signals nearly impossible)
* Insufficient mastery of the Dutch language
* Neurological problems (including epilepsy)
* Use of drugs that may influence the task performance
* Due to the use of MRI scanning, several additional criteria will apply. The participants will have to fill out a detailed questionnaire covering safety aspects of the research in relation to the 3 Tesla magnetic field and the MRI environment. These criteria are:
* MR incompatible implants in the body (such as ear prothesis or other metal implants)
* Any risk of having metal particles in the eyes due to manual work without proper eye protections
* Tattoos containing red pigments
* (Suspected) Pregnancy
* Claustrophobia

* The refusal to be informed of structural brain abnormalities that could be detected during the experiment

Study design

Design

Study type: Observational invasive

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	11-06-2012
Enrollment:	40
Type:	Actual

Ethics review

Approved WMO

Date:	26-10-2011
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Approved WMO

Date:	16-12-2011
Application type:	Amendment
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

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	NL37221.042.11