

# Measuring brain activity associated with visual recognition

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<b>Ethical review</b>	Approved WMO
<b>Status</b>	Recruitment stopped
<b>Health condition type</b>	Other condition
<b>Study type</b>	Observational non invasive

## Summary

### ID

NL-OMON53344

### Source

ToetsingOnline

### Brief title

Measuring brain activity associated with visual recognition  
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### Condition

- Other condition

### Synonym

not applicable

### Health condition

not applicable ( the study only involves healthy adults)

### Research involving

Human

## Sponsors and support

**Primary sponsor:** Universitair Medisch Centrum Groningen

**Source(s) of monetary or material Support:** Ministerie van OC&W,NWO,Horizon 2020;project funded by the European Union

## Intervention

**Keyword:** crowding, filling-in, fMRI, visual recognition

## Outcome measures

### Primary outcome

The main study parameters are the behavioural performance on visual tests and the cortical activation (commonly referred to as the BOLD response) associated with processing visual information.

### Secondary outcome

Eye-movements will be analysed in order to control the fixation of the observers and to define the observer's eye-movement pattern. Furthermore behavioral data will be used threshold measurement and to determine whether observers can detect and identify a stimulus.

## Study description

### Background summary

The Laboratory of Experimental Ophthalmology studies the human capacity to visually perceive and comprehend the world around us. Combining behavioral methods, fMRI, and computational techniques, we aim to unravel how the visual information is processed and what are the critical brain structures involved.

The studies described below are relevant because they contribute to our understanding of how humans perceive their environment, how our brains work, and on the origin of human behaviour. Ultimately, these fundamental insights in vision in health will also contribute to our understanding of vision in disease, improving diagnostic options and rehabilitation.

Our overall aim is to gain knowledge about the process of visual recognition: how do the eyes and the visual cortex extract and integrate local features from the visual scene to create a stable percept? Often visual recognition requires the visual system to fill-in partially missing information. In other cases, in order to maximize the neuronal computational efficiency, visual features are integrated. During the last decades several theories that attempt to explain the way that the brain extracts and integrates visual information have been formulated. However these theories are contradictory and still subject of controversy. Based on our new experiments, we expect to be able to put various existing theories to the test, and to develop and validate new ones. Moreover, we now intend to focus on the role of learning and plasticity in the recognition process.

In the long run, the conclusions gained from our proposed studies in healthy observers will contribute to solving important clinical issues in ophthalmologic pathologies such as glaucoma, amblyopia or macular degeneration, in which visual recognition is impaired. Measuring the degree of this impairment at a very early disease stage is an important diagnostic goal. Nevertheless, symptoms may be masked by the integration or filling-in processes, preventing such early diagnosis. Understanding the underlying mechanisms in the healthy visual system will aid the development of more accurate diagnostic and monitoring techniques. Moreover, various studies suggest that perceptual learning \* popularly referred to as \*brain training\* \* may aid in improving vision and thus serve as a rehabilitation tool. While this notion is still controversial, it does warrant further studies on perceptual learning and brain plasticity.

## **Study objective**

This serves three goals: i) to gain insight into the neural foundations of vision, ii) to develop pointers towards better and more efficient ways to diagnose ocular and neurological disease at an early stage, iii) to understand perceptual learning and to gauge the role it may have for future rehabilitation efforts.

## **Study design**

The study consists of a series of observational studies. Each study will contain two parts: 1) a psychophysical (behavioural) experiment and 2) an (f)MRI experiment. During these experiments, observers will see visual stimuli on a display, to which they will have to respond by making a decision and indicating this decision by pressing a button or key. Meanwhile, the viewing behavior of the observers is measured using a gaze-tracker.

## **Study burden and risks**

There is no increase in risk associated with this study, nor do observers benefit from participation. Observers will view images on a screen and respond to these, undergo a number of basic and standard vision tests (visual acuity, contrast sensitivity, visual fields) and be exposed to (f)MRI experiments with a magnetic field of 3 Tesla and fast fluctuating magnetic gradients and radio-frequency fields. These field strengths are commonly in use in fMRI and MRI research. Until now no side effects have been reported or described in the literature. In very rare cases, observers may experience a harmless, tickling feeling, the result of an abdominal peripheral nerve being stimulated because of the fluctuating magnetic fields.

## Contacts

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## Eligibility criteria

### **Age**

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

### **Inclusion criteria**

Age: \*18 years  
Right-handed  
Normal or corrected to normal eyesight  
Healthy  
Written informed consent

## Exclusion criteria

1. MR incompatible implants
2. Neurological disorders current and/or past
3. Claustrophobia
4. Current ophtalmic or psychiatric disorder
5. The wish not to be informed in case of a possible brain abnormality that could be detected during the experiment.
6. (suspected) pregnancy
7. Tattoos containing red pigments
8. Use of medication that can influence task results

## 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): 01-01-2017

Enrollment: 180

Type: Actual

## Ethics review

Approved WMO

Date: 12-04-2017

Application type: First submission

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	NL59527.042.16