Neural bases of the interaction between frames of reference and spatial relations

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

Summary

ID

NL-OMON40765

Source
ToetsingOnline

Brief title
Neural substrates of spatial representations

Condition

- Other condition

Synonym
spatial cognition, spatial judgments

Health condition

spatial abilities in healthy and adult people

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Utrecht
Source(s) of monetary or material Support: European Community: Marie Curie Individual Intraeuropean Fellowship

Intervention

Keyword: Categorical/Coordinate spatial, Egocentric/Allocentric Frames of Reference, relations., Visuo-Spatial Cognition

Outcome measures

Primary outcome

The main parameter will be the difference in Blood Oxygenation Level Dependent

(BOLD) signal changes in the ventral and dorsal brain areas in response to the

four kinds of spatial representations (egocentric coordinate; egocentric

categorical; allocentric coordinate; allocentric categorical) used by

participants to indicate the target figure (visuo-perceptual condition) and

that will guide participants* arm movement to touch with the index finger the

position occupied by one of the figures (visuo-motor condition).

Secondary outcome

n.a.

Study description

Background summary

The capacity to judge if an object is closer than another to our body or it is on our right or left requires the combination of two basic spatial dimensions: an egocentric frame of reference (the body) where to anchor metric (coordinate relations, e.g. the keys are 10 cm away from my hand) or abstract spatial relations (categorical relations, such as right/left, above/below). The same is when we judge the position of an object independently from our body but with respect to another element in the environment, in such cases we anchor metric

or abstract spatial relations to an allocentric frame of reference (e.g. the keys are on the table, or close to the mug). Even if egocentric/allocentric reference frames and categorical/coordinate spatial relations are strictly connected and seem to serve similar adaptive purposes (egocentric and coordinate information are particularly useful for action-oriented tasks, whereas allocentric and categorical information for perception-oriented tasks, Kosslyn, 1994; Milner & Goodale, 1995, 2008), they have mostly been studied separately. As a consequence, several studies focused on the intrahemispheric brain differences of egocentric and allocentric reference frames without considering the role of the kind of spatial relation required (categorical vs. coordinate), whereas other studies focused on the brain lateralization of categorical and coordinate spatial relations without considering the role of the frames of reference. However, no study has focused on the differences in the neural underpinnings of the combinations of these two spatial dimensions. Furthermore, no study has explored their combined role in visuo-perceptual and visuo-motor tasks. Therefore, identifying these brain areas will help to paint a more complete and complex picture of human visuospatial processing than that offered by current theories (e.g. the two-streams hypothesis by Milner & Goodale, 1995, 2008) and may provide crucial neuroimaging evidence which serve to support assessment of visuospatial deficits within a neuropsychological diagnosis and rehabilitation context.

Study objective

The main aim of this study is to identify the neural correlates of four kinds of spatial representations, i.e. egocentric coordinate, egocentric categorical, allocentric coordinate, and allocentric categorical, in both visuo-perceptual and visuo-motor tasks. We will look for: an extensive activation of right dorsal areas when egocentric coordinate representations are used to guide the movement on-line; an extensive activation of left ventral areas when allocentric categorical representations are used for visuo-perceptual tasks; finally, we look for an activation of dorsal along with some ventral areas when allocentric coordinate and egocentric categorical representation are used for visuo-motor and visuo-perceptual tasks respectively.

Study design

This study is a within-subjects experiment carried out with neuroimaging techniques (functional MRI). Participants will perform four different spatial tasks in two scanning sessions: visuo-perceptual response and visuo-motor response.

Study burden and risks

There are no known risks associated with fMRI acquisition. The technique does not require administration of any contrast agent or ionizing radiation. The

Utrecht group has ample experience with fMRI scanning (300 sessions per year on the 7 tesla MRI scanner). The fMRI procedure is painless. Slight discomfort may occur due to peripheral nerve stimulation during scanning, or due to lying still with the head and part of the body confined in a tunnel-like device.
The results of this study are important for developing a more complete and complex model of human visuo-spatial processing. Individual subjects in this study are not expected to have any benefits from the outcome of this study.javascript:saveABR('K')

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

Have a normal or corrected to normal vision,
be right-handed,

be between the ages of 18 and 40.

Exclusion criteria

Have history of neurological disorder, have tattoos (i.e. tattoos containing metals and compounds into the skin, and there*s no guarantee that those would be safe under fMRI conditions), piercing or other metal implants in the body (e.g. peacemaker)

Study design

Design

Study type:	Observational invasive
Intervention model:	Other
Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	07-07-2015
Enrollment:	36
Type:	Actual

Ethics review

Approved WMO

Date:	23-10-2014
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Utrecht (Utrecht)

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	NL48311.041.14