

Neuropsychology of 3D space

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The first line of research encompasses the frequency, severity, and (dis)similarities of perceptual and attentional impairments in near and far space. Differential impairments of near and far space processing are more likely to be found when spatial...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Structural brain disorders
Study type	Observational non invasive

Summary

ID

NL-OMON38284

Source

ToetsingOnline

Brief title

Neuropsychology of 3D space

Condition

- Structural brain disorders

Synonym

bleeding, CVA, infarct

Research involving

Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Utrecht

Source(s) of monetary or material Support: NWO MagW Veni subsidie

Intervention

Keyword: Cross-modal perception and attention, Near-far space, Neuropsychological screening, Parietal-temporal lesions

Outcome measures

Primary outcome

Screening: neuropsychologische test scores, for general knowledge about intact and impaired cognitive domains (especially perception and attention (neglect))

Experiments: response times, accuracy, scan patterns (visual search), level of cross-modal integration, etc.

All these parameters/measurements will be linked to lesions in specific regions of the brain. Based on their performance in the near versus far space conditions, patients will be grouped: a group of patients with impairments in near space, a group of patients with impairments in far space, a group of patients with impairments in both regions, and a group of patients without impairments. Lesion overlap analyses will be performed to look into the neural mechanisms underlying processing in the different regions of space. Common lesion locations in patients with specific impairments in near space or far space will be observed.

Secondary outcome

Neglect: indication of frequency, severity, and (dis)similarities of signs of neglect in near and far space will be obtained. Signs of neglect have been associated with a poor functional outcome compared to absence of neglect.

Knowledge about frequency and severity of far space neglect is as such of great importance. Currently, far space neglect is not generally screened for nor

systematically investigated.

Study description

Background summary

Spatial behaviour refers to all interactions humans can have with objects in space. Space, however is not a unitary entity. A division has been suggested between near space (within reaching distance) and far space (beyond reaching distance). Specific impairments in neurological patients (with temporal or parietal brain lesions) related to the representation of either far or near space have been suggested recently, yet most research and rehabilitation focuses on near space only, thus missing and failing to ameliorate impairments in far space. The aim of the current proposal is therefore to specifically investigate spatial behaviour in near as well as far space in the abovementioned patients.

* Far space is argued to be important in orienting and navigating, has a gaze-centered frame of reference and uses mainly visual and auditory input, and has been linked to processing in the superior temporal region.

* Near space, on the other hand, is important in reaching, grasping and manipulating objects, has an egocentric frame of reference, employs mainly visual and somatosensory input, and has been associated with processing in the inferior portion of the posterior parietal lobe.

This distinction would suggest that lesions in either the temporal or parietal region would lead to impairments in processing of information in one of both regions of space. Impairments in behaviour after stroke, however, are usually only (neurologically, neuropsychologically) screened and investigated in near space, thereby systematically missing possible impairments in far space processing.

The aim of the current proposal is therefore to specifically investigate spatial behaviour in near as well as far space in the abovementioned patients; first, a neuropsychological screening will be performed, both in near and far space; second, patients will be invited to participate in experimental trials. Dissociations and interactions between near and far space will thus be investigated.

Study objective

The first line of research encompasses the frequency, severity, and (dis)similarities of perceptual and attentional impairments in near and far

space. Differential impairments of near and far space processing are more likely to be found when spatial performance of a large group of neurological patients is tested at different distances in space. Neuropsychological screening of all cognitive domains (but particularly visuo-spatial attention and neglect) will be performed. Neuropsychological screening usually focuses on near space only, thus will be expanded to include (visual) stimuli presented in far space as well. Stimuli for the screening (and all experiments) will be presented at multiple distances to measure processing information in near and far space.

Patient will additionally be invited for scientific experiments, such as visual search and cross-modal cueing and integration (see below). All experiments will be performed in near and far space. Based on their performance in the near versus far space conditions, patients will be grouped. Lesion overlap analyses will be performed to look into the neural mechanisms underlying processing in the different regions of space. Common lesion locations in patients with specific impairments in near space or far space will be observed.

Last, plasticity of near and far space will be investigated. It has been found that the use of tools can enlarge near space, as it enlarges reaching distance. Here, tools (e.g. pointing and gripping devices) will be used to investigate the possibility of extending near space in neurological patients. It is expected (for instance) that when patients with specific impairments in far space use a pointing device, impairments in far space may be ameliorated.

Study design

All patients with parietal and temporal lesions will start with a neuropsychological screening in which all cognitive domains will be investigated. Standard neuropsychological test will be digitalised and adapted for far space presentations, such that the visual angle of all stimuli will remain the same for near and far space presentations. Special attention is given to hemispatial neglect, a disorder in which patients systematically ignore information in the contralesional side of space. Neglect has been associated with parietal or temporal lesions.

Patient will additionally be invited for scientific experiments to investigate specificity of information processing in near and far space. One of the experiments will be visual search, in which patients have to search for a target among distractors. Presentation of the stimuli will be in near as well as far space and dissociations in search behaviour will as such be obtained.

For the added multisensory integration paradigm, the general idea of our stimulation is that we use a multisensory-defined (visual and audible) object that moves from the unaffected visual hemifield into the neglected hemifield. We will present a multisensory object in the intact field which moves towards the neglect field. Once the object enters the neglected visual field it either

goes upwards or downwards. The task of the patient is to say whether the object goes up or down. To be able to induce a multisensory aspect of the object we use a looming object. The size of the object grows and shrinks with a frequency of * Hz (once every four seconds). The magnitude variation of the sound must be synchronous (also once every four seconds). When the variation in sound and the size of the object are congruent, patients will be better in detecting the direction of the moving object, compared to no sound or an incongruent sound.

Based on their performance in the near versus far space conditions, patients will be grouped. Lesion overlap analyses will be performed to look into the neural mechanisms underlying processing in the different regions of space. Common lesion locations in patients with specific impairments in near space or far space will be observed.

Study burden and risks

Burden and risks are very limited.

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

Neurological patients: parietal/temporal lesions, <85 years of age, no history of psychiatric disorders or substance abuse,

Healthy controls: < 85 years of age, no history of neurological, psychiatric disorders or substance abuse

Exclusion criteria

Neurological patients: < 18 years, > 85 years of age, history of psychiatric disorders or substance abuse, unable to perform neuropsychological screening and/or experiments

Healthy controls: < 18 years, > 85 years of age, history of psychiatric disorders or substance abuse, unable to perform neuropsychological screening and/or experiments

Study design

Design

Study type:	Observational non invasive
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Other

Recruitment

NL	
Recruitment status:	Recruitment stopped
Start date (anticipated):	11-04-2012
Enrollment:	200

Type:

Actual

Ethics review

Approved WMO

Date:

06-06-2011

Application type:

First submission

Review commission:

METC Universitair Medisch Centrum Utrecht (Utrecht)

Approved WMO

Date:

01-11-2012

Application type:

Amendment

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

CCMO

ID

NL34669.041.10