A Theoretical and ERP Study into the Role of Reafferent Connections in Visual Attention and Object Recognition

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The primary question in this study is whether effects of figure size can be measured in ERPs during figure ground segregation tasks. The secondary question is whether this applies for attended as well as unattended stimuli. This secondary question…

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

Summary

ID

NL-OMON30686

Source
ToetsingOnline

Brief title
Reafferent Connections in Visual Attention and Object Recognition

Condition

- Other condition

Synonym
not applicable

Health condition

geen

Research involving
Human

Sponsors and support

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

Intervention

Keyword: attention, Event related potentials, figure ground segregation, reafferent connections

Outcome measures

Primary outcome

The primary experimental study parameterd are foreground figure size and the

attended versus the non attended situation.

The dependent variables are the averaged electrical potentials at certain

intervals after stimulus onset, at different location on the scalp.

De primaire experimentele onderzoeksvariabelen zijn de voorgrondfiguurgrootte

en de geattendeerde versus de niet geattendeerde situatie.

De afhankelijke variabelen hiervoor zijn de gemiddeld gemeten electrische

spanningen op verschillende posities op de schedel.

Secondary outcome

not applicable

Study description

Background summary

Attention serves an important purpose in the human mind by selecting which input signals, that enter our brain via our nerves, will be fully processed and

which are not. The question however is how attention is produced by mechanisms and processes at the neuronal level.
Some computational models, like those based on feedback disinhibition of activation, offer a possible solution to this problem. This study aims at finding evidence that supports these computational models by means of ERPs. A task is designed that predicts certain processes to take place in the brain. Based on previous research it is expected that these processes can result in measurable ERP effects. The experimental task designed to do this, is a task in which figure-ground segregation and a spatial attention task are combined into one.
The figure-ground segregation part of the task is a task in which the shape of a figure has to be detected. To do this, a stimulus screen is presented, with a background covering the whole screen area and a foreground figure that has to be detected and recognized. The background consists of a slanted striped noise pattern in one direction, in a 450 direction compared to horizontal. The foreground figure consists of a similar striped noise pattern, but in which the stripes are orthogonally oriented. The foreground figure can vary in size (large or small), shape (normal or deviant, respectively square or round) and location (left or right). The spatial attention part of the task is that the subject only has to attend to one hemifield per block. The subject has to report deviant shapes in the attended hemifield.

The hypothesis is: ERP-effects of object size can be measured during a visual attention task.

Study objective

The primary question in this study is whether effects of figure size can be measured in ERPs during figure ground segregation tasks. The secondary question is whether this applies for attended as well as unattended stimuli. This secondary question partially serves as a control for the found results.

Study design

This study is aimed at finding ERP effects caused by feedback connections from higher areas in the visual processing pathway to lower areas. This effect is a filtering effect, that is caused by attention and underlying feedback processes. The central hypothesis to be used, is that during recognition of larger objects and the focussing of attention on larger objects, more neurons in the feedback stream will become active, which in their turn will disinhibit or enhance the activations of more neurons in the feedforward stream. An electrophysiological result of this could possibly be measured in the EEG of humans.
To carry out the ERP experiment, stimuli, similar to the stimuli used by Lamme (1995), will be used. These stimuli consist of images with a background and an object, like a filled square or circle, in the foreground. Foreground as well

as background consist of slanted grey stripes in various intensities of brightness, under an angle of 450 to horizontal. Foreground and background are of the same overall colour and brightness. The only feature that separates the foreground from the background is that the angle of the lines in the foreground figure is orthogonal (900) to the lines in the background.
On the screen, a centred fixation cross will be presented, towards which the test subjects have to keep their eyes directed. The figures will be presented randomly on one of two locations in the screen; left and right. The size of the figure will also be randomly chosen from two sizes. Occasionally a figure with a deviant shape (e.g. circle instead of square) will be shown. Then the test subject has to react. In this way the attention of the subject can be maintained towards the perception of the figure. To measure the effect of spatial attention, the location to which the subject should attend, will be varied in blocks (left versus right). Only when the deviant figure is on the attended side, the subject should react. Accordingly we get a 2 × 2 design with large versus small on one dimension and spatial attention versus no spatial attention on the other.

Study burden and risks

For what is known, E.E.G. measures pose no risks.

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

Healthy males or females
Normal sleep patterns
Between 18 and 30 years of age
Normal or corrected to normal vision
Right handed
Have received written information about the experimental set-up and have signed the informed consent form

Exclusion criteria

Neurological complaints
Dyslexia
Working night shifts
Use of medication/drugs that may affect task performance

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	15-01-2007
Enrollment:	12

Type:	Anticipated

Ethics review

Approved WMO	
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	NL15423.042.06