The Neural Dynamics of Concurrent Multitasking

Published: 20-11-2012
Last updated: 26-04-2024

Our main objective is to identify the neural dynamics of multitasking and mechanisms of goal selection. Furthermore, we want to develop a model of how the human brain prioritizes and processes multiple tasks using the neuroimaging results.

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

Summary

ID

NL-OMON36970

Source
ToetsingOnline

Brief title
NEDMULTITASK

Condition

- Other condition

Synonym
None

Health condition

geen, de proefpersonen zijn gezond

Research involving
Human

Sponsors and support

Primary sponsor: Rijksuniversiteit Groningen
Source(s) of monetary or material Support: European Research Council

Intervention

Keyword: cognition, fMRI, multitasking

Outcome measures

Primary outcome

The study parameters are the dynamics and topography of neural activation in the observed fMRI data, as well as the behavioral data (reaction times, performance) collected during the session. The main outcomes of the study (endpoints) will consist of:

- the neural activity due to performing tasks concurrently and separately.

- the behavioral response related to performing the tasks.

- the results of the application of model based analysis to these data.

- a description of the brain activity as a function of interactions between tasks that use specific (possibly overlapping) brain functionality.

Secondary outcome

Not applicable

Study description

Background summary

We are at a point where the influence of multitasking reaches into just about every aspect of our daily lives. As such, our understanding of the phenomenon has become an important research topic. In the proposed research our goal is to further our understanding of multitasking behavior by following them as they happen in the brain.

Several neuroimaging studies have compared the brain activation during single tasks to that during dual tasks. In most studies, the summed activation measured during two single tasks is compared to the activation of the two tasks in parallel. Results are varied: different studies find different brain areas. Even in terms of activation there is no agreement: some studies find additional activation, while others find reduced activation.

The disadvantage of traditional fMRI analysis - as performed in previous studies - is that as tasks become more complex, it becomes increasingly hard to isolate particular cognitive functions, because every variation of the task always involves a combination of functions. We propose to use (in addition to standard analysis) a range of numerical methods to map the neural dynamics found in multitasking situations.

Even though identifying its neural dynamics helps us in understanding multitasking, it does not yet answer the question how people select which tasks to do in the first place. To understand how and when multitasking can be dangerous, we have to understand how people decide to take on and abandon tasks. We believe that in many multitasking situations cognitive factors play a decisive role. Therefore our second aim is to use the imaging data to find the mechanisms behind the goal selection found in multitasking behavior.

Study objective

Our main objective is to identify the neural dynamics of multitasking and mechanisms of goal selection. Furthermore, we want to develop a model of how the human brain prioritizes and processes multiple tasks using the neuroimaging results.

Study design

We will collect MRI measurements while participants engage in combinations of cognitive tasks. These tasks each have different cognitive requirements (visual perception, motor control, working memory, etc.), which possibly overlap with each other.

Study burden and risks

Functional MRI is an eminently safe technique; there are no risks that have been associated with the acquisition of fMRI data per se. Above certain limits, warming and/or an itching/tingling feeling (stimulation of peripheral nerve terminations) are possible. However, the magnetic intensities used in this research are amply below these limits. The data collected during the functional and anatomical MRI scans will be used for research purposes only. However, if evident abnormalities in the brain are noticed, then the General Practitioner, who is indicated by the subject, will be notified.

The strong magnetic fields used by fMRI can dislocate ferromagnetic particles inside the brain and the eyes, interfere with the functioning of electronic devices implanted inside a person's body (pacemakers, insulin pumps, etc.), as well as induce heating in artificially metal-rich regions (red tattoos, metallic supports to previously fractured bones, prosthetic implants). In order to stave off the risks involved with such possible conditions, subjects will be required to complete a questionnaire and only if none of the exclusion criteria is met the subject will be allowed to participate in our experiment. Furthermore, the study is not intended to benefit the participants directly.

Contacts

Public
Rijksuniversiteit Groningen

Nijenborgh 9
Groningen 9747 AG
NL
Scientific
Rijksuniversiteit Groningen

Nijenborgh 9
Groningen 9747 AG
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

Age range: 18-35

Right handed

Exclusion criteria

MR incompatable (posibility of any incompatible metal objects inside the body)
Hearing disability
History of psychiatric disorders
Wearing glasses (lenses are allowed)
Alcohol/drug abuse
Pregnancy
Dentures

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):	01-11-2012
Enrollment:	20
Type:	Actual

Ethics review

Approved WMO Date:	20-11-2012
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)
Approved WMO Date:	21-12-2012

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	NL41988.042.12