Neural mechanisms and brain structures underlying individual differences in acquisition of vocabulary and grammar of an artificial language. A neurolinguistic study of language aptitude.

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Primary Objective: The main objective is to gain insight into the functional and structural neural correlates of success in foreign language learning. To this end, fMRI and DTI data will be acquired together with behavioral responses from healthy…

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

Summary

ID

NL-OMON36936

Source
ToetsingOnline

Brief title
Neural correlates of second language aptitude

Condition

- Other condition

Synonym
language learning talent

Health condition

linguistic research on healthy subjects

Research involving
Human

Sponsors and support

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

Intervention

Keyword: DTI, fMRI, language acquisition, language aptitude

Outcome measures

Primary outcome

The main study parameters are the significant clusters of brain activation associated with grammar and vocabulary acquisition, modulated by second language learning aptitude and the relationship between language aptitude and the structural connectivity of language pathways in the brain. Also, the functional connectivity between brain regions involved in language learning as a function of language aptitude will be concentrated upon.

Secondary outcome

not applicable

Study description

Background summary

There are large differences in the way individual human brains work and are built and although there is some debate as to whether parameters such as the size of different brain structures, the number of neurons used to perform certain functions and the integrity of white matter influence information processing, recent studies show that some of these inter-individual differences correlate with specific cognitive tasks, such as language learning. People differ substantially in their ability to learn languages, especially when it comes to second language acquisition and this universally observable fact may

be linked with the diversity of human brains. Thus, the main question posed in this study is whether language aptitude, as measured by standardized test instruments, corresponds to particular localization patterns of brain activity during learning and to inter-individual differences in the white matter structure.

Study objective

Primary Objective: The main objective is to gain insight into the functional and structural neural correlates of success in foreign language learning. To this end, fMRI and DTI data will be acquired together with behavioral responses from healthy adults while conducting (1) a grammar acquisition task and (2) a vocabulary acquisition task.
Secondary Objective(s): The secondary objective of this study is to examine the neural network mediating the acquisition of novel grammatical rules and vocabulary. To this end, imaging data gathered in two tasks will be analyzed and the time course of activity changes during both tasks compared with each other.

Study design

The participants will perform a grammar acquisition task or a vocabulary acquisition task while fMRI data and manual responses are acquired. Memory performance will be assessed on a separate occasion, after the scanning. The experiment will be carried out using a 3T fMRI scanner at the LUMC. Before experimental session starts, subjects will take part in a behavioral training session outside the scanner to become familiar with the task.
Half of the participants will perform the grammar acquisition task, another half the vocabulary acquisition task. The participants will be placed comfortably in the scanner, total scanning time is approximately one hour. Participants will spend a total of approximately 1,5 hours in the lab, performing behavioral practice testing and filling out questionnaires in addition to performing tasks in the scanner.

Study burden and risks

Participating in an fMRI and DTI study has not been associated to any known risks. This non-invasive techniques involve no catheterizations or introduction of exogenous tracers. Numerous children and adults have undergone magnetic resonance studies without apparent harmful consequences. Some people become claustrophobic while inside the magnet and in these cases the study will be terminated immediately at the subject's request. The only absolute contraindications to MRI studies are the presence of intracranial or intraocular metal, or a pacemaker. Relative contraindications include pregnancy and claustrophobia. Participants who may be pregnant, who may have metallic foreign bodies in the eyes or head, or who have cardiac pacemakers will be

excluded because of potential contraindications of MRI in such subjects. Although there is no direct benefit to the participants from this proposed research, there are greater benefits to society from the potential knowledge gained from this study. Insights in the neural basis of success in foreign language learning has implications for understanding the neural organization of the language system which in turn might help in developing strategies for relearning a language in patients with aphasia.

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 adult volunteers (age 18-25) with high and average level of language aptitude
Right-handed

Monolingual native speakers of Dutch

Exclusion criteria

metal in the body, neurological disorders, claustrophobia, pregnancy, heart arrhythmia

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):	01-05-2013
Enrollment:	80
Type:	Actual

Ethics review

Approved WMO

Date:	20-02-2013
Application type:	First submission
Review commission:	METC Leiden-Den Haag-Delft (Leiden) metc-ldd@lumc.nl

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	NL42849.058.12