Bilingual Language Control in Speaking and Translating

Published: 04-02-2008
Last updated: 10-05-2024

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

Summary

ID

NL-OMON31878

Source
ToetsingOnline

Brief title
Language control

Condition

- Other condition

Synonym
nvt

Health condition

het onderzoek richt zich op het gezonde brein

Research involving
Human

Sponsors and support

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

Intervention

Keyword: bilingualism, brain, cognitive control, fMRI

Outcome measures

Primary outcome

n.v.t.

Secondary outcome

n.v.t.

Study description

Background summary

In the growing European Union internationalization goes hand in hand with an increasing number of language backgrounds among its citizens. Being able to speak several languages and switch between them is of increasing importance for many citizens for both professional and private reasons. Although the ability to speak to languages is often taken for granted, it is hotly debated how bilinguals effectively keep their two languages functionally separate. Numerous studies have shown that bilinguals cannot prevent interference from the other languages (e.g., Christoffels et al, 2003; De Groot et al., 2000; Hermans et al, 1998; Rodriguez-Fornells et al., 2005). Nevertheless, bilinguals have the striking ability to confine their speech to just one language but are also remarkably apt at changing language at will. Considering that languages are represented in anatomical overlapping regions (e.g., Vingerhoets et al., 2003) the key question is how language is controlled in our brain.
Sometimes the ability to voluntarily speak a specific language is lost (Paradis, 2004). Bilingual aphasic patients sometimes mix languages pathologically or switch between them without other linguistic impairment (Fabbro et al, 2000). For example, in an exceptional case of alternate antagonism, comprehension was normal but the patient was only able to speak Arabic one day and French the next. On days she could not speak French, for example, she was still able to translate from Arabic into French (Paradis et al, 1982). This not only indicates that language systems may be preserved even

when language control is impaired, but also that language production and translation may not be equivalent.
The Inhibitory Control (IC) model accounts for different recovery patterns in aphasic bilinguals by assuming that their ability to control language is damaged (Green, 1986; 1998). In this model a language-nonspecific control device regulates the activation of various competing task schemas that specify how a certain task (e.g., picture naming in English) is performed. It is assumesd that processing in one language comes about by inhibition of the other. Language switching experiments provide compelling evidence for the IC model: It takes longer to switch from the second language (L2) to the dominant language (L1) than vice versa (Meuter & Allport, 1999). This is explained by assuming that L1 takes longer to recover from inhibition than L2. Note that language-switching creates a situation in which both languages are frequently used (mixed-language context), which is an aspect of the bilingual processing that has been largely ignored. Yet, we found that a mixed-language context profoundly slows down L1 without affecting L2 (Christoffels et al, 2007). The question of language control becomes more pertinent when considering verbal translation, an ability that emerges from acquiring another language. Here, both languages are implicated at the same time (De Groot & Christoffels, 2006; 2007). Indeed, according to the IC-model even single word translation is a high-conflict task. Even more complicated is simultaneous interpreting, where the interpreter must continuously listen to and comprehend the speaker*s speech and produce its translation at the same time. This is especially puzzling because comprehension and production activate largely overlapping temporal brain areas (Christoffels et al, in press). How is interpreting at all possible if the input language is inhibited when both languages are involved and activated simultaneously? In current models of bilingual processing translation and interpreting are poorly accommodated (Christoffels & De Groot, 2005). Some important issues are as yet unanswered, such as which brain areas support language control, what are the neural correlates of translation processes and what is the causal relation between control areas and language selection? We believe that merging insights from psycholinguistics with a neurocognitive approach can help to provide a framework to address these issues now that we are able to use imaging methodology is to language research. Note that overt language production has not been applied often in fMRI due to motion artifacts, but recently used it successfully in single word production (Christoffels et al., in press; 2006).

The aim of the current study is to identify the neural substrates of bilingual language control in single language production and translation from one to another language. This aim is important because insights in language control may help to understand and treat the problems faced by bilingual aphasics and improve language education generally and the training of professional translators and interpreters, specifically. Further, these insights are imperative to develop a neurological plausible model of language processing that can explain bilingual speech production and translation.

Study objective

The primary objective of this study is to gain understanding of the neurocognitive basis of language control. To this end, we will acquire fMRI data and behavioral responses of healthy bilingual adults.
Secondary Objective(s): There is still a dearth of information on the topic of second language processing and translation. The design is rich in the sense that many different aspects are worthwhile addressing, some of which still exploratory. The secondary objectives are: (1) to study single language production in the native tongue and in the second language, (2) to study translation processes, (3) to investigate how single language production and translation depend on similar or different brain structures by directly comparing the two tasks, (4) to study language switching, (5) to study effects of language context, (6) to distinguish between sustained and transient aspects of language control, (7)to study the relation between proficiency in the second language switching-related activity in the brain.

Study design

An experimental design is used. Participants will perform a picture naming or translating task under different conditions. Brain activation during task performance is measured using standard event-related functional MRI (see protocol for details).

Study burden and risks

There are no known risks associated with participating in an fMRI study. This is a noninvasive technique involving 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. Subjects 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 language control is instrumental for understanding and treating language deficits, for training of professional translators, and for the design of language education of the general public.

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

Righthanded adult subjects (age 18-35) with no history of neurological disorder/disease and no counter-indications to MRI. Native Dutch speakers with normal vision or contact lenses and a reasonable knowledge of English.

Exclusion criteria

Potential participants will be prescreened for contra-indications for fMRI, which include metal implants, heart arrhythmia, claustrophobia, and possible pregnancy (in adult females). They will additionally be prescreened for head trauma, premature birth, learning disabilities, and history of neurological or psychiatric illness and/or use of psychotropic medications. Because language and bilingualism are the main interest of this study only native-Dutch speakers can

participate. They need to have a reasonable knowledge of English and will be prescreened for any history in language disorders such as stuttering and dyslexia. Finally, left-handed individuals will be excluded from the study because some left-handers have substantially different brain organization relative to right-handers.

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):	01-11-2007
Enrollment:	100
Type:	Anticipated

Ethics review

Approved WMO

Application type:	First submission
Review commission:	METC Leids Universitair Medisch Centrum (Leiden)

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	NL20001.058.07