

Retrieval of verbs from the lexicon in people with aphasia: an information-theoretic approach.

Published: 16-06-2010

Last updated: 02-05-2024

The goal of this research project is to find out to what extent people with aphasia suffer from reduced processing capacity. We will use new insights from healthy language processing providing quantitative measures of "complexity" to...

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

Summary

ID

NL-OMON34988

Source

ToetsingOnline

Brief title

Lexical retrieval of verbs in aphasia.

Condition

- Other condition
- Vascular injuries

Synonym

aphasia, language disorder due to stroke

Health condition

afasie door CVA

Research involving

Human

Sponsors and support

Primary sponsor: Universiteit Utrecht

Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: aphasia, inflection, information theory, verbs

Outcome measures

Primary outcome

Reaction times and error rates in the 3 experiments will be analysed using a logistic regression model. Factors will be regularity and tense. Coefficients will be: frequency, number of synsets, information load and inflectional entropy.

This way we want to investigate to what extend frequency, synsets, information load and inflectional entropy have an effect on reaction times and error rates and whether this is different for regular verbs or irregular verbs and present or past tense verbs.

Secondary outcome

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Study description

Background summary

Word finding difficulties are a common and very frustrating symptom of aphasia. Research over the last thirty years has investigated which categories of words are more difficult or easier for people with different types of aphasia. For people with Broca's aphasia verbs (in addition to words from functional categories, such as determiners and pronouns) are particularly difficult

(Berndt et al, 1997; Kim and Thompson, 2000). Recent research shows that this difficulty with verbs may not be restricted to patients with Broca's aphasia: patients with Wernicke's patients have been shown to have similar difficulties. When verbs are produced by patients with aphasia, they often lack inflection (e.g. he walk, instead of he walks). Interestingly, not all inflected verb forms are equally difficult to produce. What is still unclear is why some verb forms are more difficult than others. Some researchers claim that in aphasia grammatical knowledge about how to form inflected verb forms is lost due to damage to the brain (Friedmann and Grodzinsky, 1997), whilst others suggest grammatical knowledge is intact but is difficult to access and activate due to reduced processing capacity in these patients. The lost knowledge hypothesis predicts that if a patient has for example difficulties forming regular past tense forms, they will always have this difficulty. Variability within patients should not be found. Furthermore, in this framework this difficulty should occur regardless of the type of verb that the patient wants to use. All verbs should be equally difficult. The processing difficulty hypothesis on the other hand, allows for variability within and between patients. It suggests that efficient information transmission in the brain is disrupted by tissue damage. Depending on context, both linguistic and non-linguistic, a patient might sometimes succeed in forming past tense and sometimes fail. Thus far there has been very little research on which (linguistic) factors may enhance or decrease performance. Finding out which factors impede on effective information transmission in the brain, both in language and other cognitive domains has crucial implications for diagnosis of aphasia and aphasia therapy. As discussed below, this research project aims to explore information processing in the brain. Linguistic factors that increase complexity of verb forms will be explored in order to explain variability of verb retrieval within patients. In addition, a visual task will be used to explore the possibility that the tissue damage in the brain has led to more general reductions in effective information transmission. Exact quantitative data on how information transmission in the brain (in language as well as other domains) is affected by tissue damage will contribute to a better understanding of information processing in the healthy brain, and is expected to assist in identifying effective compensatory mechanisms / interventions in brain damaged patients. The linguistic factors that will be investigated in this project have been shown to play an important role in lexical retrieval in healthy adults. This research has shown that the complexities of words and word families are important factors in the processing time required to retrieve lexical items (including inflected forms) from the mental lexicon (Moscoso del Prado Martin, Kostic and Baayen, 2004). This line of research uses statistical measures from information theory to calculate complexity of specific word forms. For each inflected verb form a complexity measure can be created. The higher the value of the complexity measure, the longer it takes for normal adults to process the verb form. In addition measures for the competition of the family of words can be calculated and its influence measured on processing time. In healthy adults these differences in processing time are very small and go unnoticed in conversation. The capacity of the normal brain is by far sufficient to process

a verb of any complexity measure without errors. However, we know that in the damaged brain verb retrieval is problematic. The processing capacity of (linguistic) material is reduced. It is therefore very interesting to find out if those verb forms with higher complexity values are the verb forms that are more difficult (and sometimes impossible) for these patients to produce. In addition, the influence of the verb's surrounding neighbours, or its family, in the mental lexicon may have changed as transmission of information is reduced.

This research project aims to examine possible reduced processing capacity in people with aphasia. Unlike previous research, this project will be the first to provide quantitative measures of *complexity* of linguistic material. This provides a unique opportunity to investigate information processing in the damaged brain. Clear predictions can be made and if confirmed by our experiments, strong evidence can be provided for a reduced processing capacity account of aphasia. In addition to investigating linguistic factors, this project will also probe information processing in the visual domain. Reduced information processing for linguistic material in the damaged brain is likely to be found in the aphasic speakers, as they are known to have language difficulties. However, it is unclear whether subtle difficulties in information processing may also be evident in other cognitive modalities.

Study objective

The goal of this research project is to find out to what extent people with aphasia suffer from reduced processing capacity. We will use new insights from healthy language processing providing quantitative measures of "complexity" to investigate to what extent complexity of verbs and their families influence the reaction and error rates in verb retrieval in aphasia. If processing capacity is reduced in people with aphasia, we would expect that verb forms with a high complexity (high information load) will be retrieved more slowly (or not at all) from the lexicon. Furthermore, we aim to explore whether this reduced processing is limited to language material. We will include a task of visual cognition to search for dissociations or parallels in language and visual cognition.

Study design

Participants will take part in 3 experiments. Experiment 1 involves an auditory lexical decision task in which the participant will be asked to indicate whether an auditory stimulus is a real word or not. In experiment 2 participants will be asked to name a series of action pictures. For experiment 3 participants will be asked to indicate whether a predetermined goal is present or absent in a visual display. For each task reaction times and error rates will be noted.

For a detailed description of the research design, please refer to page 13 in

the protocol.

Study burden and risks

Participants will be asked to perform 3 behavioural tasks. This will take 2 hours spread over 2 sessions. There will be ample opportunity for breaks. The set up is mobile and participants can therefore be tested at home if this has their preference. The burden for the participants is therefore very limited. As two of the tasks involve language these tasks may lead to some frustration for the participants with aphasia. There will be plenty of opportunity to discuss this and of course participants are free to leave the research at any moment.

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

Voor de afasiegroepen:

A Patients with a single CVA in the left hemisphere

B Aged over 18 and no loss of mental capacity

C Language disorder due to CVA

D At least 3 months post onset

E Hearing within normal range

F Native Dutch speakers; For the control group:

A Healthy men and women

B Native speakers of Dutch

C Older than 18

D righthanded

Matched on a 1 to 1 basis to the participants with aphasia. Matching by:

A Age

B Gender

C years of education

Exclusion criteria

Participants with aphasia:

A History of speech and or language disorders prior to stroke

B Severe attention difficulties

C Global aphasia

D Neglect, hemianopsia or other cortical visual impairments

E Verbal dyspraxia

Healthy control participants:

A. A history of speech and/or language difficulties

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:	Basic science

Recruitment

NL
Recruitment status: Recruitment stopped
Start date (anticipated): 01-11-2010
Enrollment: 48
Type: Actual

Ethics review

Approved WMO
Date: 16-06-2010
Application type: First submission
Review commission: METC Universitair Medisch Centrum Utrecht (Utrecht)
Approved WMO
Date: 26-07-2010
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	ID
CCMO	NL30433.041.10