Stem- Spraak- en Taalpathologie

Supplement, September 2014

15th International Science of Aphasia Conference

Stem-, Spraak- en Taalpathologie 32.8310/supplement/1914
Vol. 19, 2014, Supplement 1, pp. 1-197

PREFACE

Dear participants,

We are very pleased to welcome you to the 15th Science of Aphasia conference, being held from September 19 till September 24, 2015 in the San Camillo Hospital in Venice, Italy

The 2014 program theme is: Aphasiology: past, present and future

Invited speakers are: Ria De Bleser, Audrey Bowen, Marco Catani, Chris Code, Olga Dragoy, Hugues Duffau, David Howard, Peter Mariën, Gabriele Miceli, Carlo Miniussi, Lyndsey Nickels, Carlo Semenza, Cynthia K. Thompson, Evy Visch-Brink, Frank Zanow.

The SoA conferences are intended to bring together senior and junior scientists working in the multidisciplinary field *Neurocognition of language* and to deal with normal function as well as disorders. The size of the conference has a maximum of about 150 participants to ensure direct interaction between the participants. The focus of this year's conference is on the past, present and future of Aphasiology:

The San Camillo Hospital in Venice-Lido is a health care facility, mainly devoted to the rehabilitation outcomes of traumatic brain injury and spinal cord, stroke, multiple sclerosis, amyotrophic lateral sclerosis, Parkinson's disease, neuropathy and dementia.

In 2005 the hospital received recognition from the Ministry of Health of the Institute for Research, Hospitalization and Health Care (IRCCS) specializes in the "discipline of neuro-rehabilitation motor, communication and behavior." The experience in telemedicine, robotics and Brain Computer Interface (BCI) allowed the hospital to develop a communication system based exclusively on the modulation of brain activity recorded with an electroencephalograph, even without moving a muscle. This system will allow people not able to perform movements or to speak to communicate and also to carry out activities. The San Camillo Hospital is situated on the Lido of Venice. The Lido — or Venice Lido (Lido di Venezia) — is an 11 kilometres (7 miles) long sandbar in Venice; it is home to about 20,000 residents.

The city of Venice, or in Italian Venezia, is a city in northeastern Italy, sited on a group of 118 small islands separated by canals and linked by bridges. It is located in the marshy Venetian Lagoon which stretches along the shoreline, between the mouths of the Po and the Piave Rivers. Venice is renowned for the beauty of its setting, its architecture and its artworks. The city in its entirety is listed as a World Heritage Site, along with its lagoon.

We wish you a pleasant conference!

The organizing committee of SoA.

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Organization

The 15th International Science of Aphasia Conference is held in Venice, Italy, September 19-24, 2014.

Chair*:*
Prof. Carlo Semenza, University of Padova, Italy

The 2014 scientific committee is composed of:

Ria de Bleser (honorary member)
Roelien Bastiaanse (chair)
Wendy Best
Frank Burchert
David Howard
Roel Jonkers
Gabriele Miceli
Lyndsey Nickels
Brendan Weekes

The 2014 abstract selection committee is composed of:

Roel Jonkers (chair)
Frank Burchert
David Copland
David Howard
Lyndsey Nickels
Isabell Wartenburger

Abstract Booklet
Alice Pomstra

Conference Program

Friday, September 19, 2014

17:30 – 19:00 Reception and registration

Saturday, September 20, 2014

8.30 – 9:30 Coffee and registration

Session One. Past: History of Aphasia

(chair Roelien Bastiaanse)

9:30	*Roelien Bastiaanse*: Intro: Pre Broca
9:45	*Chris Code :* Broca and his contemporaries
10:30	*Ria de Bleser*: German aphasiology
11:15	***Coffee Break***
11:45	*Marco Catani*: American aphasiology (Boston School)
12:30	*Olga Dragoy*: Russian aphasiology (Luria)

13:15 – 15:00 Lunch

15:00 – 17:00 Contributed Papers I

(Chair Olga Dragoy)

Bos.: The neural correlates of past time reference

Arslan: Source memory deficits in aphasic and healthy aging speakers of Turkish

Popov: Unaccusative Verb Production Revisited: Evidence for Dual Deficit

Salmons: The comprehension of Catalan OVS and OSV structures in Broca's aphasia

Jochmann: The effects of slowed speech on comprehension of German non-canonical sentences in aphasics with and without hearing impairment

Munarriz: The role of typological distance in differential impairments in bilingual aphasia: evidence from Spanish-Basque agrammatism.

17:00 – 17:30 Short presentations Poster Session I

(Chair Sylvia Martinez-Ferreiro)

17.30 – 18.30 Poster Session I/Coffee

Adelt: Do Pronouns Make a Difference? On-line Processing of Relative Clauses in the Visual-world Paradigm

Brandao: Communicative strategies in expressive aphasia: discourse as a guideline for rehabilitation
Capitani: Lexical-semantic errors are more consistent than phonological errors on the repeated naming of the same picture: a study on aphasic patients.
Feiden: Anomia and paraphasia in oral speech production
Fyndanis: Structural case in agrammatic aphasia: Evidence from Greek
Gora.: Cross-language influences in multilingual aphasia
Haaland: "I wake up every day thinking I can write" – an agraphia treatment study
Ishkanyan: Syntactic comprehension deficits in Armenian-Russian bilingual speakers with aphasia
Jap: Sentence Comprehension in Aphasic Speakers of Standard Indonesian
Khakalo: A Vaster VAST: Comprehension and production of verbs and sentences in Russian
Knoph: The impact of Semantic Feature Analysis on verb production in two multilingual speakers with aphasia
Satoer: Glioma surgery in eloquent areas, can we preserve cognition?

Sunday, September 21, 2014

Session Two. Presentations I: Awake surgery

(Chair: Evy Visch-Brink)

9:30	*Hugues Duffau*: Perspective from a neurosurgeon
10:15	*Peter Mariën*: Perspective from a neurolinguist
11:00 – 11:30	***Coffee Break***
11:30	*Carlo Semenza*: Perspective from a numberologist
12:15	General discussion

13:00 – 15:00 Lunch

15:00 – 17:00 Contributed papers II

(Chair Davide Crepaldi)
De Witte: Non-Organic Language Disorders after Awake Brain Surgery
Groenewold:: The effects of direct and indirect speech on English discourse comprehension in aphasia
Romanova, et al*:* Facilitation effect in proper and common noun naming
Bose: Relationship between semantic transparency of compound words and semantic processing skills in aphasia: Data from compound word reading
Ribu: Imageability and phonological neighborhood density effects in speech processing
Keulen: Foreign Accent Syndrome: a typological overview

17:00 – 17:30 Short presentations Poster session II

(Chair Sylvia Martinez-Ferreiro)

17:30 – 18:30 Poster session II/ coffee

Bambini: The Italian version of the Communication Outcome after Stroke (COAST) scales for patients and caregivers
Jesus: Assessment of Aphasia in Portugal: Past, present and future
Manouilidou: Lexical-semantic deficits in Mild Cognitive Impairment, et al: the case of abstract vs. concrete nouns
Pellet: Outcome of computer-assisted treatment in a case of non-fluent primary progressive aphasia with apraxia of speech
Penaloza: Associative learning and retention of novel labels for novel visual referents in patients with chronic aphasia
Stavrakaki: Production of verbs with alternating transitivity by patients with Primary Progressive Aphasia
Vlasova: Speech disorders and its postoperative progress in patients with symptomatic epilepsy
Wimmer: Verbal Agreement Inflection in Wernicke's and Broca's Aphasia – a comparison
Zanini: When verbs help naming nouns: a study on derived nominals in aphasia
Azimova: Verbs in Uzbek agrammatic spontaneous speech
Zivanovic: Predictors of Post-Stroke Aphasia Recovery – A Systematic Review
Vukovic: Quality of communication life in individuals with Broca's and Conduction aphasia
Lesniak: Language dissolution and restitution in L1 and L2

18:30 Meeting Scientific Committee

Monday, September 22, 2014

Presentations II: Aphasia Trials

(Chair: Ria de Bleser)

9.30 *Audrey Bowen*: Randomized Control Trials: The ActNow study
10.15 *Evy Visch-Brink*: Randomized Control Trials: The RATS studies
11.00 Coffee break
11.30 *Lyndsey Nickels*: Single Subject Experimental Design
12.15 *David Howard*: Single Subject Experimental Design and Randomized Control Trial: The Semafor study

13.00 Lunch, Excursion and Dinner

Tuesday, September 23, 2014

Session Three Future: Neurotechnology

(Chair: David Howard)

9.30 Frank Zanow: Combination of neuro imaging methodologies
10.15 Carlo Miniussi: Transcranial Direct Current Stimulation
11.00 Coffee
11.30 Gabriele Miceli: The use of transcranial Direct Current Stimulation in aphasia therapy
12.15 Cynthia K. Thompson: Neuro Imaging in the study (and recovery) of aphasia

13.00 - 15.00 Lunch

15.00 – 17.00 Contributed papers III

(Chair Roel Jonkers)

Crepaldi: How to become twice more precise in detecting neuropsychological impairments

De Aguiar: Aphasia rehabilitation from a linguistic perspective and the role of tDCS

Hanne: An eye tracking study of time reference processing in individuals with agrammatic aphasia

Silberling: Eye movement based evaluation of a text-level reading intervention

Krajenbrink: Investigating the role of neighbours in treatment of acquired dysgraphia

Rofes: Naming finite verbs predicts language abilities in daily living

17.00 – 17.30 Short presentations Poster session III

(Chair Roel Jonkers)

17.30 – 18.30 Poster session III/ coffee

Yarbay Duman: Tense, Aspect and Modality in Three Populations: Typically Developing Children, Children with Specific Language Impairment (SLI) and individuals with Broca's Aphasia

Martinez Ferreiro/Reyes: Strategies in non-fluent aphasia: Object clitic substitutions and redundant structures

Pistono: Memory and language interactions during discourse of patients with MCI due to AD

Lange: Speech Mapping of the Broca Region using repetitive Transcranial Magnetic Stimulation

Primassin: Neural Correlates of Motor and Language Recovery after Stroke: Four Single Case Studies
Martin: Improving communication in aphasia: A comparison of naming- and discourse based treatment, both facilitated by transcranial direct current stimulation (tDCS)
Van Dun: Cerebellum and Apraxia
Zakarias: Positive effects of computerized executive function training in aphasia. A pilot study
Meteyard: Sentence production training in severe expressive aphasia and apraxia of speech: a case study
Roxbury: Relationship between subacute brain activity and aphasia recovery
Bambini: Concretism, pragmatics, and the interplay of language and cognition in schizophrenia
Franzon: Semantic interpretability speeds up the processing of morphologic features. A psycholinguistic experiment on Gender Agreement
Pourquie: Past, Present and Future of Basque aphasiology and Cross-linguistic studies of aphasia
Sierpowska: Mapping the dorsal and ventral language streams using electrical stimulation and diffusion tensor imaging.

Wednesday, September 24, 2014

Breakfast and departure

The neural correlates of past time reference

Laura S. Bos[1,2,3], Roelien Bastiaanse[2], Jan Ries[3], and Isabell Wartenburger[3]

[1]*International Doctorate in Experimental Approaches to Language and Brain (IDEALAB)*
[2]*University of Groningen (Groningen, NL)*
[3]*University of Potsdam (Potsdam, GER)*

Introduction

Background

Tense inflection is problematic for individuals with agrammatic aphasia. Recently, it has been claimed that past time reference by verb inflection is particularly impaired, because it requires additional processing: In order to use a verb with past time reference, one has to make a link to the event in discourse. No such link is needed for non-past time reference. Therefore, non-past verb forms are relatively spared in agrammatism. This is captured in the Past DIscourse LInking Hypothesis (PADILIH; Bastiaanse et al., 2011).
The PADILIH has been argued to extend to all discourse-linked verb forms, irrespective of tense. Crucially, tense does not always coincide with time reference. In Dutch, reference to the past can be established by a finite verb in the simple past tense (past imperfect), or by a periphrastic past verb form (the present perfect). The latter form consists of an auxiliary in present tense plus a participle (i.e. 'has+V-ed'). Dutch aphasic speakers are impaired on both types of past time reference compared to the simple present (Bos & Bastiaanse, 2014), with the simple past being the most difficult form to produce.
The PADILIH is a processing-based hypothesis of which traces can be found in non-brain-damaged speakers, too. In their electrophysiological brain responses, discourse-related differences between past and non-past time reference have been found (Dragoy et al., 2012), which cannot be related to tense per se (Bos et al., 2013).

Current study

The PADILIH suggests that reference to the past requires discourse linking and discourse linking requires extra processing; the question is which brain regions are engaged in this additional processing. Multiple fMRI studies have shown that the left inferior frontal gyrus (IFG) is essential for processing of grammatical morphology (e.g., Sahin et al. 2009) and that in agrammatic aphasia the left IFG is often not functional (e.g., Damasio, 1991). Hence, IFG is a likely candidate for the extra processing needed for past time reference. Another possibility is that the right hemisphere plays a role in discourse linking needed for reference to the past. Malfunctioning of the left IFG may cause a disconnection with the contralateral area, which has been associated with discourse processing by Menenti et al. (2009). Lastly, the supplementary motor area (SMA) has been associated with greater processing complexity in selecting grammatical inflections (e.g., Sahin et al., 2009; Yu et al., 2013) and is thus a candidate for additional activation in the more difficult past conditions.
In the current study we investigated whether additional brain activation is found for past versus non-past time reference for the contrast of (1) simple past versus present

tense (refuelled-refuels) and of (2) periphrastic past versus future time reference (has refuelled – will refuel). We focussed our discussion of the results on the IFG and the SMA.

Methods

Participants and Materials

Twenty healthy speakers of Dutch (7 male, mean age 24, range 19-32) participated in this fMRI-study. Thirty sentences per experimental condition (see examples 1-4 below; target responses in square brackets) were used. Participants were shown a picture denoting the action of the verb for 2 seconds. Then, the sentence was presented in written form until the penultimate phrase. One or two ellipses indicated whether they had to overtly respond with a single or periphrastic verb form, respectively. The next trial began after a jittered inter-stimulus-interval.

(1) simple present:

ik	*verwar*	*de*	*vrouw*	*terwijl*	*ze*	*diesel …*	*[tankt]*
I	confuse	the	woman	while	she	gas …	[refuels]

(2) simple past:

ik	*verwarde*	*de*	*vrouw*	*terwijl*	*ze*	*diesel …*	*[tankte]*
'I	confused	the	woman	while	she	gas …	[refuelled]'

(3) periphrastic future:

ik	*verwar*	*de*	*vrouw*	*voordat*	*ze*	*diesel …*	*…*	*[gaat tanken]*
'I	confuse	the	woman	before	she	gas …	…	[will refuel]')

(4) periphrastic past:

ik	*verwar*	*de*	*vrouw*	*nadat*	*ze*	*diesel …*	*…*	*[heeft getankt]*
'I	confuse	the	woman	after	she	gas …	…	[has refuelled]')

Data acquisition and analysis

The Siemens 3T TrioTim scanner of the Dahlem Institute for Neuroimaging of Emotion (D.I.N.E.) was used to acquire functional/anatomical scans. DARTEL-normalised functional scans of response preparation from picture offset to response onset were analysed with SPM8 (Wellcome Department of Cognitive Neurology, London, UK). Main areas of activation with a cluster size threshold of 10 are reported with uncorrected $p < .001$.

Results and discussion

Past over non-past

The preliminary fMRI analysis (see Figure 1) showed showed a greater BOLD signal change for both types of past over non-past time reference bilaterally in the prefrontal area – the supplementary motor area and the frontal superior medial gyrus. These prefrontal areas have been associated with increased difficulty in implementing grammatical inflections (e.g., Sahin et al., 2009; Yu et al., 2013). This can be explained by

the PADILIH: the past is more marked than the non-past, resulting in increased difficulty in selecting past time reference inflection.

Simple past over present

The contrast of simple past (most impaired in Dutch agrammatism) and present additionally yielded increased activation in the left inferior frontal gyrus, the area which is commonly compromised in agrammatism. The lack of significant activation on the left IFG for the contrast of periphrastic past over future suggests that this region is taxed for past tense inflection, but not for discourse-linked past time reference specifically. Even though the periphrastic past and the future have different time reference, they are both verb clusters with a present tense auxiliary.

Overall, the results provide further support for a fundamental difference between past and non-past time reference, and reflect processing difficulties that aphasic individuals experience with past time reference.

-FIGURE-1-ABOUT-HERE-

Figure 1. Activation patterns for (A) simple past over simple present and (B) periphrastic past over future (uncorrected, $p < .001$). Legend: IFG = inferior frontal gyrus; SMA = supplementary motor area.

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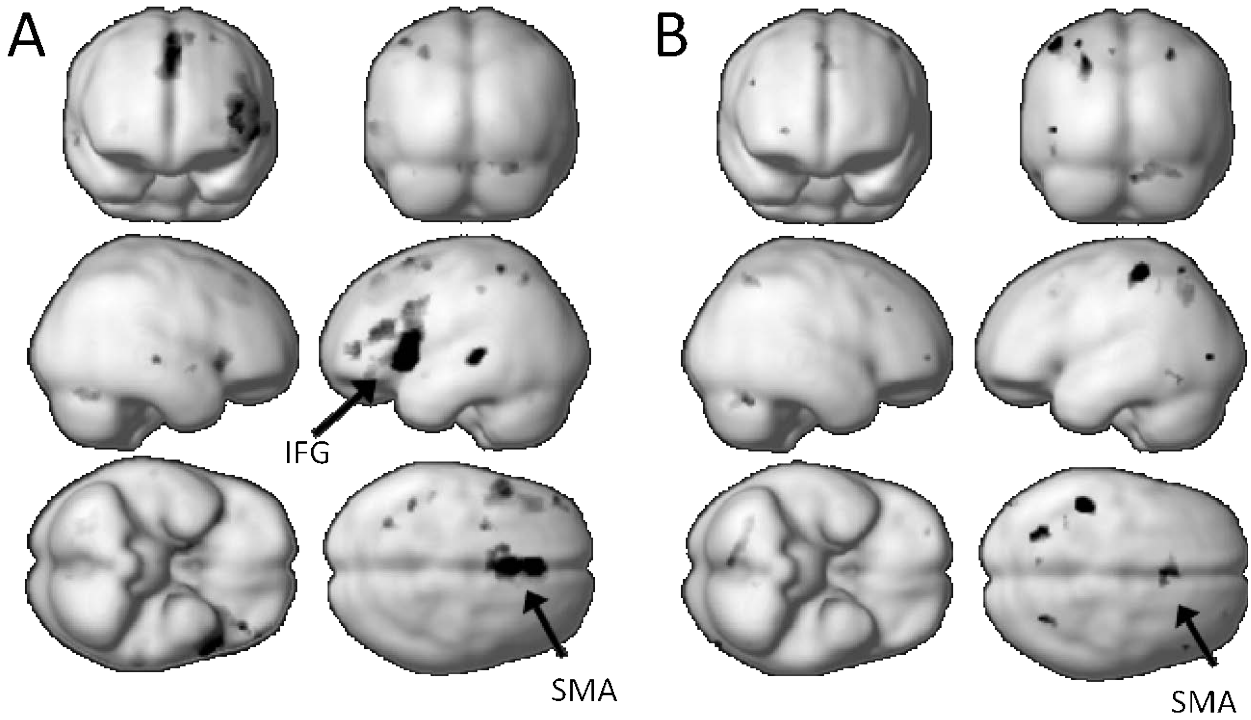
A
IFG
SMA
B
SMA

Source memory deficits in aphasic and healthy aging speakers of Turkish

Seçkin Arslan[1] and Roelien Bastiaanse[2]

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[2] *Center for Language and Cognition Groningen (CLCG), Department of Linguistics, University of Groningen, The Netherlands*

Introduction

Source memory or *source monitoring* refers to the processes of encoding, storing, and retrieving from where and which sources a piece of particular memory was gained (Johnson, Hashtroudi, & Lindsay, 1993). Neuropsychological studies on frontal lobe patients and healthy aging adults have shown that the source memory is vulnerable (Glisky, Polster, & Routhieaux, 1995; Janowsky, Shimamura, & Squire, 1989; Swick, Senkfor, & Van Petten, 2006). However, few studies tested patients or aging adults in languages other than English. Turkish grammar, for instance, requires speakers to indicate whether past events were 'seen' directly or 'heard' through a third-person report. A recent study has shown that Turkish agrammatic speakers were more impaired in producing 'seen past' than 'heard past' verb forms (Arslan, Aksu-Koç, Maviş, & Bastiaanse, subm.). However, identifying whether the information was received through the 'seen' sources was better than through the 'heard' sources, suggesting that the agrammatic speakers might not monitor the information sources mapped onto seen/heard past verb forms accurately. Therefore, the current study addresses whether monitoring the sources of memories is impaired in the aphasic patients and healthy aging speakers of Turkish.

Methods

Participants

We tested three groups of participants: eight aphasic patients (three fluent patients: two females, M*age* = 55.6; five non-fluent patients: one female, M*age* = 59; post-onset > eight months), fifteen younger non-brain-damaged individuals (NBDs; nine females, M*age* = 26.4), and five elderly healthy aging NBDs (4 females, M*age* = 54.2).

Materials and Procedure

The source monitoring task in Arslan, de Kok, and Bastiaanse (in progress) was used. Stimuli included eighty meaningful inanimate objects. Forty objects were represented as black-white line drawings (seen items). The other forty objects were audio recorded as spoken words (heard items). All the stimuli were concrete nouns. The experimental

design included two phases: 'study' and 'test'. At the study phase, all eighty objects were presented. The seen and heard items were presented as separate blocks counter-balanced across the participants. At the test phase, a subset of forty items from the study list (twenty seen items and twenty heard items) was presented as 'old items'. An additional set of forty items was used as 'new items'. All the items in the test phase were presented as written words. For each test item, the participants had to respond to 'old/new' and 'source monitoring' judgments. First, they had to judge whether a test item was from the study list or not. This is referred to as 'old/new recognition'. If the participants judged an item 'old', subsequently, they had to decide whether it was a seen or heard item. This is referred to as 'source monitoring'. Source monitoring responses were scored when the items were recognized correctly in the old/new judgment.

Results

Old/new recognition

Non-parametric tests were used to analyze the data. The aphasic individuals scored lower in old/new recognition than the elderly NBDs (z = -3.437, p = .001), and the younger NBDs (z = -6.221, p > .001), see Table 1. The elderly NBDs did not differ from the younger NBDs (z = -1.566, p = .117). Rejection of new items was more difficult than recognition of old items for the non-fluent aphasic individuals (X^2 = 15.068, df = 1, p > .001); and for the elderly NBDs (X^2 = 6.273, df = 1, p = .012). In the fluent aphasic individuals, however, there was not such a difference (X^2 = .311, df = 1, p = .577). The younger NBDs showed the opposite pattern of the non-fluent aphasic individuals and elderly NBDs: they were better in rejecting the new items than recognizing the old items (X^2 = 24.624, df = 1, p > .001).

Source monitoring

Source monitoring performance of the aphasic individuals was reduced compared to the elderly NBDs (z = -3.418, p = .001) and the younger NBDs (z = -7.347, p > .001). Comparably, the elderly NBDs performed lower than the younger NBDs (z = -2.547, p = .011), see Table 1. Recalling source was better attained for the seen than for the heard items in non-fluent aphasia (X^2 = 57.063, df = 1, p > .0001); in fluent aphasia (X^2 = 8.120, df = 1, p = .004); and in the elderly NBDs (X^2 = 6.033, df = 1, p = .014). The younger NBDs, however, did not differ in recalling sources for seen or heard items (X^2 =1.286, df = 1, p = .257).

Discussion

We showed that old/new and source monitoring judgments were affected in fluent and non-fluent aphasia compared to the younger and elderly NBDs. The elderly NBDs also differed from the younger controls in making source monitoring but not old/new judgments. The non-fluent aphasic individuals were more affected in making source monitoring judgments for the 'heard' items than for the 'seen' items, although the results of the fluent aphasic individuals and elderly NBDs pointed to the same direction. Our

results, thus, confirm earlier neuropsychological studies, and indicate that lesions leading to fluent and non-fluent aphasias, as well as healthy aging, affect source monitoring judgments. Our data indicate a similar direction of source identification deficits as in Arslan et al. (subm.) who showed the agrammatic speakers of Turkish cannot attribute information sources to the seen/heard past verb forms. We argue that source confusions in Turkish non-fluent aphasia may be due to source memory deficits.

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Table 1. Mean recognition and source monitoring accuracies *(SDs)* of the participants

	Old/new recognition			Source monitoring		
	Old	New	Total	Seen	Heard	Total
Younger NBDs	.71*(.45)*	.83*(.37)*	.77*(.41)*	.89*(.31)*	.86*(.35)*	.88*(.33)*
Elderly NBDs	.79*(.40)*	.68*(.46)*	.74*(.43)*	.86*(.34)*	.70*(.46)*	.79*(40)*
Non-fluent aphasia	.70*(.45)*	.51*(.50)*	.61*(.48)*	.74*(.37)*	**.19*(.39)***	.54*(.50)*
Fluent aphasia	.68*(.47)*	.71*(.45)*	.69*(.46)*	.91*(.29)*	.65*(.48)*	.79*(.41)*
Aphasia total	.69*(.46)*	.58*(.49)*	.64*(.48)*	.86*(.35)*	**.36*(.48)***	.63*(.48)*

Unaccusative Verb Production Revisited: Evidence for Dual Deficit

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Introduction

Previous studies have identified a number of factors that influence verb production in aphasia. According to the Argument Structure Complexity Hypothesis (ASCH; Thompson 2003), an increase in syntactic complexity adds to the processing load, which in turns impedes verb production. The number of arguments is recognized as the major component of syntactic complexity, predicting that verbs with more arguments are more difficult to produce. Regarding the locus of the deficit in the speech production model (Levelt 1989), the ASCH predicts that the lemma access level is impaired in verb production. Since lemmas contain the information on the number of arguments, the more arguments there are, the more syntactically complex the lemma becomes.

A study by Bastiaanse and Van Zonneveld (2005) found that the number of arguments may not be the most important grammatical factor in verb production. When comparing the production of verbs with alternating transitivity, Bastiaanse and Van Zonneveld demonstrated that the intransitive realization of the verb (1) was more difficult than the transitive one (2).

(1) John broke the vase.

(2) The vase broke.

The intransitive realization in (1) is unaccusative, meaning that the only argument is the Theme that has moved to the subject position. Based on the movement property of unaccusative verbs, Bastiaanse and Van Zonneveld concluded that the source of difficulty was in violating the basic word order, and not the number of arguments. Their assumption is that every language has a canonical underlying word order (e.g., V-S for sentences with unaccusative verbs in Dutch), and that any changes in that word order will affect production in aphasia, thus the Derived Order Problem Hypothesis (DOP-H). Unlike the ASCH, the DOP-H places the deficit in the grammatical encoding phase.

The current study looks deeper into the issue of unaccusative production and deficit localization. The previous studies have not taken into account the difference between non-derived unaccusative verbs (e.g., fall, arrive), and unaccusative verbs derived from transitive verbs (henceforth anticausatives). Theoretically, the two unaccusative classes differ at the presyntactic (lemma) level. Reinhart (2000) in her Theta System theory suggests that verbs with alternating transitivity represent one concept, and are therefore a single lexicon entry. Just before the derivation (grammatical encoding), the transitive lemma of a verb with alternating transitivity is rendered intransitive unaccusative through the lexical operation Expletivization. After that, at the grammatical encoding level, unaccusative and

anticausative verbs cannot be differentiated any more, as they both comprise a Theme movement to the subject position. This study hypothesizes that Expletivization is a factor adding to syntactic complexity of the anticausative verb. If the production of anticausative verbs is more impaired, the deficit distinguishing the two unaccusative classes should be at the lemma level, which is where the anticausative derivation takes place. Such an assumption is in line with the ASCH and syntactic complexity. If there is no discrepancy in the production between the two unaccusative classes, the DOP-H is correct in predicting that the only relevant deficit is at the grammatical encoding level.

Methods

The aphasic group consisted of four people with Broca's aphasia, diagnosed with the Serbian adaptation of the Boston Diagnostic Aphasia Examination (Goodglass and Caplan 1972). The control group consisted of eight participants, matched for age and education level with the experimental group. All participants were monolingual speakers of Serbian.

The participants performed a sentence production task. For this purpose, 50 verbs were chosen. In order to elicit the sentences, 50 black-and-white drawings were used. Each drawing depicted one event. In addition to the visual presentation of an event, the infinitive form of the verb was given above the drawing to avoid interference with word-finding difficulties. The test consisted of 50 test items, with 10 items in the unaccusative group, 10 items in the anticausative group, and 30 items divided between one intransitive and two transitive groups that served as control conditions.

Results

The control group performed at ceiling, and was significantly better than the experimental group in all the conditions (chi-squared test: χ^2= 79.6, df= 4, p= 0.000). The question in this study was if the production of unaccusative verbs differed significantly from the production of anticausative verbs. The data obtained from the four people with aphasia point in this direction; anticausative verbs were significantly more impaired than unaccusative verbs (χ^2= 5.409, df= 1, p= 0.02). The other pairwise comparisons between the conditions are given in Table 1.

Table 1: P-values (chi-square test) for the pairwise comparisons between the conditions in the experimental group

Comparison	Results (p)
Intransitive - Unaccusative	0.018*
Intransitive - Anticausative	0.000*
Unaccusative – Anticausative	**0.02***
Unaccusative – Transitive 1	0.22
Unaccusative – Transitive 2	1
Anticausative – Transitive 1	0.000*
Anticausative – Transitive 2	0.01*
Transitive 1 – Transitive 2	0.35

Discussion

The results clearly show that the production of anticausative verbs is more impaired than the production of unaccusative verbs. The results are in line with the ASCH (Thompson 2003) and show that syntactic complexity is a factor in verb production. The additional lexical operation applied at the lemma level of anticausative verbs adds to their syntactic complexity, and makes them more difficult than unaccusative verbs. The deficit, in this case, has to be at the lemma level.

Still, the results do not necessarily contradict the DOP-H (Bastiaanse and Van Zonneveld 2005). The movement, and consequently the variation in the basic word order, clearly play a role in aphasic verb production. Our data show that unaccusative verbs are more difficult than unergative verbs. Since they have an equal number of arguments, the only difference is at the grammatical encoding level where the movement operation takes place. Therefore, unaccusatives, as well as anticausatives, indicate a deficit at the grammatical encoding level. The difference between the two unaccusative classes is that anticausative verbs have an additional deficit at the lemma level, which makes them even more difficult. The difference at the lemma level can only be captured by the ASCH and syntactic complexity since the DOP-H does not have predictions about the lemma level.

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The comprehension of Catalan OVS and OSV structures in Broca's aphasia

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Introduction

The aim of the present study is to test the comprehension of topicalisation in agrammatism in order to evaluate current hypotheses on the comprehension deficit in Broca's aphasia. Such constructions present some interesting properties in Catalan that make them suitable for this purpose: they can present noncanonical word orders, which are predicted to be impaired by the Derived Order Problem Hypothesis (DOP-H; Bastiaanse & Van Zonneveld, 2005), and they are argued to be derived by movement, which is crucial for their analysis under the Trace-Deletion Hypothesis (TDH; Grodzinsky, 2000; 2006) and the Featural Underspecification Hypothesis (FUH; Grillo, 2008).

Antecedents

To our knowledge, there is only one study concerning the aphasic comprehension of Clitic Left Dislocations (CLLD) in Romance languages: Beretta et al. (2001), where the comprehension of two Spanish-speaking patients was tested. The mean performance of the two subjects was at chance; however, individual results reveal that one subject performed notably more successfully than the other (mean percentages of 75% and 35% of correct responses respectively). Hence, the sample was too small and the performance too heterogeneous to draw robust conclusions.

Methods

A binary sentence-picture matching task was conducted with nine Catalan-speaking agrammatic aphasics (4 females and 5 males, 1 left-handed, mean age of 59.6, all affected by CVA), and nine education- and age-matched control subjects. We tested 20 declaratives (1), 20 subject topicalisations (2), 20 CLLDs with preverbal subjects (3), 20 CLLDs with postverbal subjects (4) and 20 declaratives with a preverbal object clitic (5). All sentences were semantically reversible transitive sentences and were introduced by a sentence to justify the use of a topicalisation. All sentences were recorded digitally by a native speaker, so the characteristic intonational contour associated with topicalisation in Catalan was preserved.

(1) a. La pallasso va amagar als nens. *Declarative (SVO)*
D-f clown past-3s hide Acc+D-m.pl boy-pl
'The clown hid the boys'

b. L' àvia va pentinar a la nena.
D-f.s grandmother past-3.s comb Acc D-f.s girl
'The grandmother combed the girl'

(2) La pallasso, va amagar als nens. *Subject topicalisation (SVO)*
'(As for) The clown, he hid the boys'

(3) Als nens, la pallasso els va amagar. *CLLD with a preverbal subject (OSclV)*
CL-m.pl
'(As for) The boys, the clown hid them'

(4) Als nens, els va amagar la pallasso. *CLLD with a postverbal subject (OclVS)*
'(As for) The boys, the clown hid them'

(5) La pallasso els va amagar. *Declarative with an object clitic (SclV)*
'The clown hid them'

Results

Considering the results by item type (Table 1), the participants performed above chance in the control conditions, that is, declaratives and subject topicalisations. The mean percentage of correct responses reached 80.6% on the object clitics, which indicates that

	SVO decl	SVO top	OSclV	OclVS	SclV
aphasic	90%	78.33%	67.78%	48.89%	80.6%

this structure was not problematic for agrammatic individuals. The performance on CLLDs with preverbal subjects showed to be quite high as well, even though slightly worse than the performance on the control conditions. Finally, performance with CLLDs with postverbal subjects was at chance. For CLLD we looked at the impact that the resumptive clitic -in agreement with the subject in number and gender- could have had on the results, comparing the comprehension of those sentences where the subject and the object matched in gender and number (1b) to the comprehension of those sentences where there was a gender and number mismatch (1a). The aphasics' performance did not depend on this factor: they were 63.3% correct with matched subject/object and 53.3% with the unmatched. These results are inconsistent with the FUH, according to which aphasics should benefit from mismatching of phi-features, as has been shown in other populations (Friedmann, Belletti and Rizzi, 2008).

Table 1. Mean percentages of correct responses by condition

Discussion

The results reported here on declaratives and subject topicalisations are consistent with the hypotheses mentioned before, since such structures present the canonical word order in Catalan (SVO). The good performance shown in the comprehension of object clitics is in line as well with previous literature (Luzzatti et al. (2001) for Italian and Martínez-Ferreiro (2010) for Spanish, Galician and Catalan). Despite the noncanonical word order SclV of such structures, the theories that hypothesise the use of a linear strategy to assign thematic roles correctly predict the good performance reported in our study. Yet, it remains unclear whether the noncanonical position of the object clitic is predicted to be problematic under the DOP-H and the FUH. The performance on CLLDs with postverbals subjects (OclVS) dropped significantly, indicating that agrammatics fail in comprehending them, as predicted by all the hypotheses taken into consideration here. The same results have been reported in previous research on the comprehension of similar OVS structures, like focalisations (among others, Burchert et al., 2003; Gavarró, 2005; Friedmann et al., 2010). However, agrammatics showed relatively unimpaired comprehension of CLLDs with preverbal subjects (OSclV), contrary to what has been reported in Beretta et al. (2001) for Spanish, and in studies where similar constructions were tested in other languages (Friedmann & Shapiro 2003 and Friedmann et al. 2010 for Hebrew and Russian focalisations, respectively). Our findings challenge current theories on agrammatic comprehension, since these syntactic constructions are argued to have undergone movement and present a noncanonical word order (OSclV) and, hence, they are expected to be problematic for agrammatic patients. All the hypotheses cited above fail in explaining the data reported in the present study, which suggests that current theories on agrammatic comprehension need to be revised.

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The effects of slowed speech on comprehension of German non-canonical sentences in aphasics with and without hearing impairment

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Introduction

In aphasia, and especially in agrammatic aphasia, comprehension of non-canonical sentences as object-first structures is more impaired than that of canonical structures as subject-first sentence types. These difficulties increase with faster speech rates (Love et al., 2008). Aphasics often complain that people speak too fast (Silkes, 2012), and in aphasia therapy it is common to apply a slower speech rate. Studies have shown that agrammatic aphasics improve significantly in comprehending object-first structures when speech rate is slowed down (Dickey et al., 2007, Love et al., 2008). This leads to the idea that in agrammatic aphasia the syntactic operations per se are not impaired, but that lexcial or syntactic processing is slowed down and that thus the time course of the acoustic presentation is too fast for agrammatic aphasics in order to compute the syntactic representations which results in comprehension problems (Burkhardt et al., 2003).
Many aphasics also experience deficits of intelligibility because of a hearing impairment, and are thus even further handicapped in understanding conversational speech as reduced intelligibility hinders comprehension as well. Slowing or time expansion of speech has been found to facilitate intelligibility and thus comprehension for spoken sentences in hearing impaired non-aphasic adults (Gordon-Salant et al., 2007).We therefore expect time-expanded speech to improve intelligibility and comprehension in hearing impaired aphasics as well.
We hypothesize that slowed linguistic processing is responsible for the canonicity effect in agrammatic aphasia. Slower speech rates will result in better comprehension of non-canonical conditions for non-hearing impaired aphasics compared to performance at a normal speech rate. Hearing impaired aphasics will benefit from slowed speech in their performance in all structures.

Methods

In this study we examine the effects of uniformly time-expanded speech with four different German syntactic structures (two canonical and two non-canonical) and three different

speech rates- conversational, moderately expanded to 120% and highly expanded to 135% - on the comprehension performance of agrammatic and other aphasics with and without hearing impairment.

Design

We employ a sentence picture matching task with 15 items per syntactic structure: Two German main clauses (SVO, OVS) and two relative clause structures (SR, OR). These are presented in three different speech rates with two black and white pictures, one depicting the target and one serving as a distractor with reversed thematic roles. All subjects heard all 180 sentences.

Material

SVO	Der kleine Junge umarmt den dicken Nikolaus.
	The_{NOM} $small_{NOM}$ boy_{NOM} hugs the_{ACC} fat_{ACC} Santa Claus
	'The small boy hugs the fat Santa Claus.'
OVS	Den dicken $Nikolaus_i$ umarmt der kleine Junge $\_t_i$.
	The_{ACC} fat_{ACC} Santa $Claus_i$ hugs the_{NOM} $small_{NOM}$ boy_{NOM} $\_t_i$.
	'It is the fat Santa Claus that the small boy hugs.'
SR	Der $Junge_i$, der_i den Nikolaus umarmt, ist klein.
	The_{NOM} boy_{NOMi} who_{NOMi} the_{ACC} Santa Claus hugs is small.
	'The boy, who hugs Santa Claus, is small.'
OR	Der $Junge_i$, den_i der Nikolaus umarmt $\_t_i$, ist klein.
	The_{NOM} boy_{NOMi} who_{ACCi} the_{NOM} Santa $Claus_{NOM}$ hugs $\_t_i$ is small.
	'The boy, who is being hugged by Santa Claus, is small.'

Participants

So far, 22 aphasics with mild to moderate severe impairment have been tested, 12 were diagnosed with agrammatic aphasia, 7 with hearing impairment. We also tested 35 age-matched controls with (N = 14) and without (N = 21) hearing impairment.

Results

Preliminary results as shown in Figure 1, show that all aphasics, and especially agrammatic aphasics, profit from slowed speech in their comprehension performance of non-canonical sentences. Hearing impaired aphasics benefit from slowed speech in their comprehension of

all structures. Non-aphasic hearing impaired controls also show improved comprehension when presented with slowed sentences.

Discussion

So far, our results show that in aphasia, slowed presentation facilitates comprehension of non-canonical sentences which might indicate that slowed language processing abilities are responsible for the deficit in comprehension of non-canonical sentences. Slowed speech also in general improves sentence comprehension both in hearing impaired aphasics and controls, which is in line with Gordon-Salant et al. (2007).
These results indicate that providing more time compensates for auditory processing problems caused by hearing impairment. They also confirm studies by Love et al. (2008) and Dickey et al. (2007) that more specific comprehension problems with non-canonical sentences caused by syntactic processing problems can be compensated by slowed speech.

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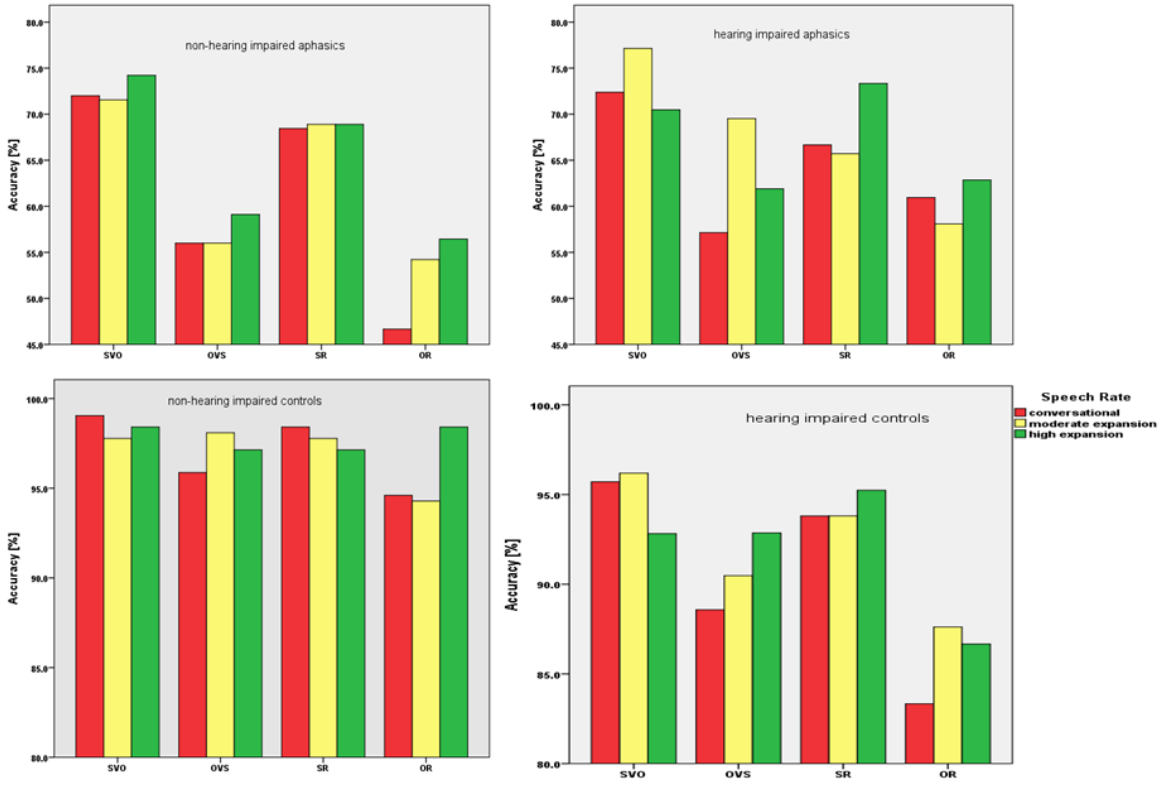
Figure 1. Accuracy (in %) per speech rate and sentence structure of non-hearing impaired (N = 15) and hearing impaired aphasics (N = 7), and non-hearing impaired (N = 21) and hearing impaired (N = 14) controls.



The role of typological distance in differential impairments in bilingual aphasia: evidence from Spanish-Basque agrammatism

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Introduction

Research on bilingual aphasia provides evidence for one of the recurrent debates in bilingualism, namely whether the two languages have a shared/separate representations in the bilingual brain (Abutalebi & Green, 2007; Paradis, 2004). On the one hand, several data from studies on bilinguals with aphasia are considered to present support in favor of the shared representation of the two languages: a) cases of parallel impairment and recovery (Abutalebi & Green, 2007); b) cross-linguistic transfer of therapy benefits from the treated to the untreated language (Faroqi-Shah, et al., 2010); c) cross-linguistic priming studies showing that hearing a sentence in one language can facilitate the production of a sentence with the same structure in another language (Verreyt, et al., 2013) and d) the finding that some bilinguals use the same processing strategy regarding cues for interpretation for their two languages (Wulfeck et al., 1986). On the other hand, data reporting non-parallel impairments and recovery patterns in bilinguals with aphasia (Adrover-Roig et al., 2011; Kambanaros & Grohmann, 2012; Venkatesh et al., 2012) are considered to support the view on the neurofunctional separation of the two languages in the brain, and point towards distinct neural circuits within the same broad cortical areas (Paradis, 2004) casting doubts on the shared representation account.

Several factors are claimed to modulate different kinds of cross-linguistic influence (Faroqi-Shah et al., 2010; Goral et al., 2012) and consequently to affect postmorbid performance in bilingual aphasia (Ansaldo et al., 2008; Paradis, 2004). Among these factors, linguistic and structural distance appears as a promising one: the smaller the differences between the languages and the structures involved, the more likely it is for crosslinguistic influence to arise (cf. Verryt et al., 2013; Goral et al., 2010), and as a consequence the easier for parallell impairments to surface (De Diego Balaguer et al., 2004; Hernández et al., 2008; Tschirren et al., 2011), and the bigger the differences between the languages and the structures involved the less likely it is for CLE to surface and thus the more likely for non-parallel impairment/recovery patterns to arise (cf. Diéguez-Vide et al., 2012; Goral et al., 2010; 2012; Kambanaros & Grohmann, 2012; Venkatesh et al., 2012).

In this study, we explore the morphosyntactic performance of a Spanish-Basque bilingual patient in her two languages in order to see whether the impairment affects the two languages similarly, and typological distance between these languages may influence the (dis)similarities found. According to finding from previous studies, a more similar performance is expected across languages in those morphosyntactic structures which are at a surface level similar between the two languages (cf. Verreyt et al., 2013).

Methods

Participants

This study is based on a case study of an early Spanish-Basque bilingual with chronic Broca's aphasia, which was highly proficient in her two languages premorbidly. The bilingual participant received therapy in Spanish and after the lesion Spanish is almost exclusively the language used. A second unimpaired participant matched in gender, age, education and language background acted as a control.

Procedure

Spontaneous and experimental data from a variety of comprehension and production tasks, from more restrictive (picture description, sentence-to-picture matching) to more naturalistic tasks (spontaneous speech, role playing) was collected 5 years post onset in order to assess performance of certain movement-derived structures in both languages. Three types of sentences were studied: a) canonical and topicalization root sentences, b) subject and object relatives and c) subject and object root questions.
Among these structures, canonical and topicalization structures as well as relatives differ in word order between Spanish and Basque, but questions have the same surface order in both languages.

Results

Results revealed important differences between tasks, modalities and languages. Although some target-deviant instances were attested in the production of questions in naturalistic tasks, the production of canonical and movement-derived structures appears to be preserved to a high extent as indicated by the near normal performance in picture description experimental tasks in both languages (> 95% of accuracy). However, a selective and differential impairment surfaced in comprehension as revealed by sentence-picture-matching tasks: selective difficulties were attested in the comprehension of both questions and relatives ($p < .001$ both) (as well as in OSV and OSV topicalization structures depending on the task), and only in Basque (Figure 1).

Discussion

The preservation of movement derived structures in production might suggest a parallel impairment/recovery which could be due to some cross-language transfer of spontaneous or treatment-based recovery in production (cf. Goral et al., 2010). In contrast, the differential impairment affecting Basque more than Spanish not only in the structures that differ between the two languages (subject relatives) but also in those that have the same surface linear order (object questions), are difficult to explain if some strategy for comprehension were transferred cross-linguistically (cf. Venkatesh et al., 2012). We propose that several morphosyntactic differences between Spanish and Basque (head-final vs. head-initial, prenominal relatives vs. postnominal relatives, ergative vs. accusative overt marking) might have an impact on the different reliability and availability of morphosyntactic cues for comprehension in both languages. Thus, we claim that morphosyntactic distance between

Spanish and Basque might have hindered the possible cross-linguistic transfer of comprehension strategies from the best preserved Spanish to the lesser preserved Basque. This interpretation is in line with other cases of non-parallel recovery in contact situations of typologically distant language pairs (cf. Diéguez-Vide et al., 2012; Kambanaros & Grohmann, 2012; Venkatesh, et al., 2012).

Finally, the differential impairment attested in this bilingual with aphasia challenges neuropsycholinguistic models which argue in favor of shared syntactic representations (Verreyt et al., 2013, see also Ullman, 2001 for early bilinguals) and appear to be more compatible the view on the neurofunctional isolability of the morphosyntactic representations of the two languages (Paradis, 2004). Thus, our data along the lines of other studies indicate that typological distance between languages in general, and language-specific features of the structures in particular surface as key factors for impairment/recovery patterns in bilingual aphasia.

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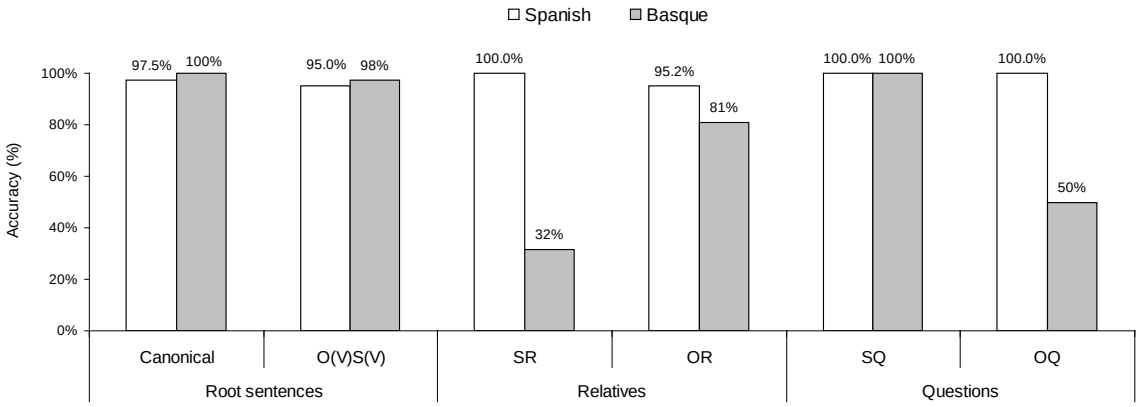

Figure 1. AF's accuracy percentages in the comprehension of root sentences, relatives and questions in sentence-picture matching tasks.

Do Pronouns Make a Difference? On-line Processing of Relative Clauses in the Visual-world Paradigm

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Introduction

Considering the processing of relative clauses, cross-linguistic studies in aphasia have often revealed patterns of above chance performance for subject relative clauses (SRCs) and chance performance for object relative clauses (ORCs) in off-line tasks such as sentence-picture verification (e.g., Burchert, De Bleser, & Sonntag, 2003). A similar subject-object asymmetry was observed on-line, as evidenced by longer self-paced listening times for ORCs compared to SRCs (Caplan, Waters, Dede, Michaud, & Reddy, 2007).

In an attempt to explain sentence comprehension deficits in aphasia, Garraffa and Grillo (2008) and Grillo (2008) proposed an extension of the linguistic framework of Relativized Minimality (RM; Rizzi, 2004). They argued that movement-derived non-canonical sentences (such as ORCs) cause a processing disadvantage compared to SRCs, because only the former contains more than one potential antecedent for the trace in the extraction site of the object. Interestingly, Friedmann et al. (2009) observed that in Hebrew typically-developing children this processing disadvantage for ORCs disappears when one of the antecedents is a pronoun.

The present ongoing study focuses on German, a language in which SRCs and ORCs are strict minimal pairs in terms of word order. We adopt the extension of RM and investigate whether the presence of pronouns facilitates the processing of ORCs in healthy adults and individuals with aphasia (IWA). To our knowledge, such an investigation has not been published yet.

Methods

Material

Test sentences are 64 RCs in total, 32 SRCs and 32 ORCs. All RCs contain an RC head which is followed by a second constituent that is either a DP or a personal pronoun. RC heads contain eight singular feminine or eight singular neuter nouns, whereas all the second constituents are masculine and marked for plural. Due to case syncretism, RC head and second constituent provide no information about word order. Disambiguation occurs sentence finally at the finite verb through number marking. A sentence final verb in singular is in agreement with the RC head and refers to an SRC, while a final verb in plural agrees with the second constituent and refers to an ORC. Accordingly, target sentences are distributed over four conditions with 16 sentences each: SRC with two full DPs (1), SRC with a pronoun as second constituent (2), ORC with two full DPs (3), ORC with a pronoun as second constituent (4). Moreover, 32 questions with a prepositional phrase referring to a symbol that identifies one of the animals (see balloon on pig A in Figure 1) were used as fillers (5).

			Relative clause				
			RC head	**Subject extraction site**	**2nd constituent**	**Object extraction site**	**Final verb**
SRC	(1) full DP, n=16	Wo ist das Schwein$_{+NP}$ (*Where is the pig that is tickling the wolves?*)	das$_i$	t$_{i\ +NP}$	die Wölfe$_{+NP}$		kitzelt
	(2) pronoun, n=16	Wo ist das Schwein$_{+NP}$ (*Where is the pig that is tickling them?*)	das$_i$	t$_{i\ +NP}$	sie$_{-NP}$		kitzelt
ORC	(3) full DP, n=16	Wo ist das Schwein$_{+NP}$ (*Where is the pig that the wolves are tickling?*)	das$_i$		die Wölfe$_{+NP}$	t$_{i\ +NP}$	kitzeln
	(4) pronoun, n=16	Wo ist das Schwein$_{+NP}$ (*Where is the pig that they are tickling?*)	das$_i$		sie$_{-NP}$	t$_{i\ +NP}$	kitzeln
	(5) Filler, n=32	Wo ist das Schwein mit dem Ballon (*Where is the pig with the balloon?*)					

Procedure

All sentences are presented auditorily and animated colored illustrations of animals are shown simultaneously on a computer screen. In all sentences, animals are arranged as follows: One animal (X) is on the left side of the screen, two other animals (YY) are in the middle, and one animal is placed on the right side of the screen (see an example in Figure 1). Animals and the performance of the action (e.g., tickling) are introduced in a preview followed by the auditory presentation of the target sentences. The participants' task is to identify the animal X to which the sentence refers. During this task, eye movements are collected as an on-line measure of sentence processing. Off-line comprehension is measured in terms of accuracy of target identification.

Participants

Ten IWAs with sentence comprehension deficits that are not due to pre-lexical and lexical impairments take part in the experiment. Additionally, 30 healthy controls are tested, matched in age and years of education.

Hypothesized Outcomes

Following the RM approach, our predictions are as follows:

(i) **SRC vs. ORC:** The performance for all SRCs irrespective of the presence of a pronoun should be different compared to ORCs in terms of higher accuracy scores in IWAs' off-line comprehension and faster or longer fixations to the target picture in both participant groups.

(ii) **ORC in controls:** ORCs with a personal pronoun as a second constituent (cf. 4) are assumed to give rise to a processing advantage (at least on-line; see Gordon, Hendrick, & Johnson, 2001 for similar results in self-paced reading experiments) compared to ORCs with a DP as a second constituent (cf. 3). There should be no such difference in their off-line performance.

(iii) **ORC in IWA:** A processing advantage for ORC with pronouns as a second constituent (cf. 4) is assumed to emerge both on- and off-line in contrast to ORC with DPs as a second constituent (cf. 3).

Results and discussion

Data collection and analysis is still ongoing. Results will be ready by September and presented and discussed with respect to the above mentioned hypotheses at the Science of Aphasia conference.

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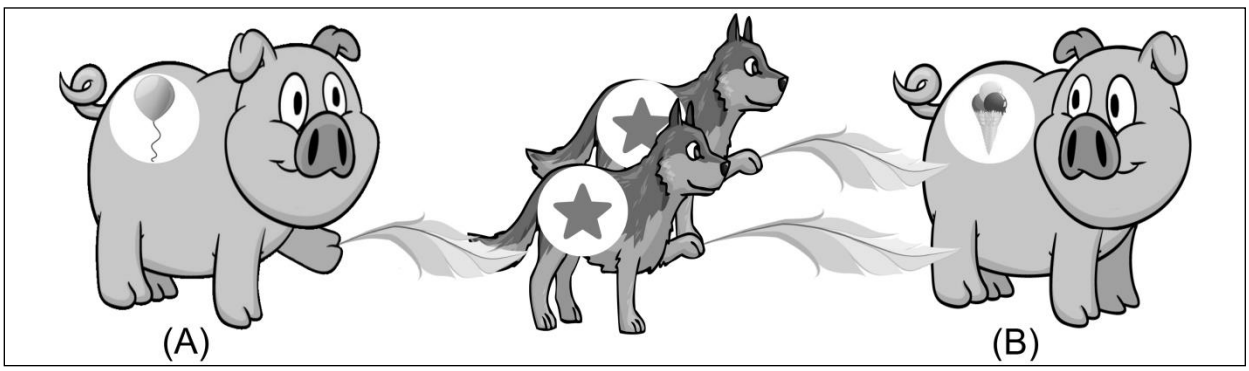

Figure 1. Sample picture for sentences 1-5. Target in SRCs and filler: pig (A), target in ORCs: pig (B)

Communicative strategies in expressive aphasia: discourse as a guideline for rehabilitation

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Introduction

Traditional language-oriented approaches focus on training specific deficits, while neuropsychological approaches apply information processing models to provide a rational approach to the intervention combining preserved abilities and training of impaired skills. Pragmatic approaches focus on compensatory verbal and non verbal strategies to improve communication between patients and their communication partners (Meinzer et al., 2007). This study makes an effort to combine the neuropsychological perspective with a pragmatic approach in order to plan a language intervention program for two small groups formed by the expressive aphasics who participated in this investigation. The principle in combining these approaches is the achievement of a greater behavioral relevance in the creation of the aphasia treatment program which will soon be tested[i].

The main purpose of this preliminary investigation was to detect which communicative strategies, i.e. verbal and nonverbal clues, accompanied anomia and paraphasia repair in the discourse of participants with predominantly expressive aphasia. Discourse analysis was used to understand how patients with aphasia compensated for their microlinguistic impairments. Two different discourse conditions were used – an autobiographical memory interview and a single picture description task. Neuropsychological evaluations were taken into account in interpreting preserved cognitive and linguistic processes used in the compensation of the deficits observed in discourse production.

Methods

Participants

A total of ten participants with predominantly expressive aphasia who suffered an ischemic cerebrovascular accident in the last 2 years. Patients with severe perceptual or cognitive deficits were excluded, as well as left-handed patients and patients with additional neurological diagnoses. Aphasia diagnoses were made by neurologists and confirmed by speech therapists based on the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1982; Radanovic & Mansur, 2002).

Instruments and procedures

An adaptation of the Autobiographical Memory Interview (Kopelman, Wilson & Baddeley, 1990) and the Cookie theft picture description task of Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 2000) were used to elicit two different contexts for discourse production. The narratives and descriptions elicited were filmed and recorded in a quiet room. Analysis of the transcribed discourse focused on both verbal and non verbal strategies used for compensating each instance of anomia and each attempt to repair paraphasia. Discourse was analyzed by a Linguist and 15% of the corpus was independently

analyzed by a Speech-Language Pathologist obtaining 90% of agreement for inter-judge reliability. Instances of disagreement appeared in the detection of communicative strategies and were discussed and scored after obtaining agreement. In addition to the language skills evaluated with the Boston Diagnostic Aphasia Examination, other neuropsychological abilities were accessed through a cognitive screening battery which included subtests of attention, working memory, episodic, semantic and nonverbal memory, perception and oral and written language (Instrumento de Avaliação Neuropsicológica Breve – Neupsilin; Fonseca, Salles & Parente, 2008).

Results

The participants' discourse was marked by frequent anomia and paraphasia occurrences, both noun and verb impairments being observed. Noun impairments were frequent in anomia, while verb impairments were often shown in instances of morphemic paraphasia, which was not always associated with severe agrammatism. Participants produced well-structured discourse, although topic shifts were frequently observed, possibly as a strategy for retrieving easily accessible information to avoid long pauses and maintain the discourse flow while holding the turn. A variety of communicative strategies were used when facing anomia or when trying to repair paraphasia. The most frequent verbal strategies observed consisted in metalinguistic comments such as explanations about word retrieval difficulties, help requests made to the listener, paraphrases and topic shifts. Non verbal strategies consisted in gestures used in order to express action, location and function. Neuropsychological profiles matched microlinguistic deficits and preserved cognitive abilities were also in conformity with the communicative strategies used in discourse.

Discussion

The findings of the study confirm the results of previous research on predominantly expressive aphasics,
which also showed preservation of discourse structure with frequent instances of lexical retrieval difficulties acompanied by verbal and non verbal repair strategies (Beeke et al., 2014; Sekine, 2013). Discourse processing models and rehabilitation approaches which support the use of both verbal and nonverbal pragmatic strategies are discussed.

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[1] This is a preliminary study of the research project entitled "Rehabilitation in expressive aphasia: efficiency and impact in the life of aphasics" (*Reabilitação nas afasias expressivas: eficiência e impacto na vida do afásico*), conducted in a collaboration between the Health and Human Communication Department and the Linguistics Department in the Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil.

Lexical-semantic errors are more consistent than phonological errors on the repeated naming of the same picture: a study on aphasic patients.

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Introduction

The aim of this study was to analyse the consistency of the error types observed on repeated presentations of the same stimulus in a picture naming task. The variability of the response to the same stimulus has been generally dismissed as experimental "noise"; however, the consistency level is interesting per se, as it reflects the influence on the response of a set of psycholinguistic variables (e.g. word frequency) that sometimes cannot be overtly identified (Capitani & Laiacona, 2004; Cuetos, Aguado, Izura & Ellis, 2002).

The consistency of the responses given to the same stimulus characterizes the naming process as a point between two theoretical extremes: complete *stimulus-dependence* (a given stimulus is invariably associated to the same response type, e.g. correct, or lexical-semantic error, and so on) *versus* complete *stimulus-independence* (the response is completely independent of the identity and the characteristics of the stimulus itself).

In this study we contrast the consistency of lexical semantic errors and that of phonological errors in a group of aphasic patients.

Participants

Thirty-three aphasic patients were asked to name the same set of 80 pictures from the Snodgrass and Vanderwart set, for three times within an interval of less than 2 days (Capitani, Laiacona, Capasso, Costanzo, Rosci, Allamano, Lorenzi & Miceli, 2012). Responses were classified into 6 different categories (correct, lexical-semantic error, phonological error, mixed error, no response and other errors). For each patient, the prevailing error type was identified by using multinomial confidence intervals for the different response types. More in detail, we checked whether the exact confidence intervals of lexical-semantic and phonological errors overlapped. In case of overlap, the patient was considered to be affected by a "double error" impairment (lexical-semantic *and* phonological). By contrast, if confidence limits did not overlap, the patient was labeled as "lexical-semantic", or "phonological", according to the prevalent error type.

From this sample we selected the patients (n=10) presenting with a "double error" pattern: in this group lexical-semantic and phonological errors had the same prevalence (respectively 10.7% and 10.2%, paired t-test <1, df=9, ns). All participants suffered from stroke; 5 were males and 5 females, their mean age was 57 years (sd =17.1), and mean education was 8.9 years (sd =5.1).

Statistical Methods

The statistical programmes used in this study are implemented in the StatXact 9 package, (Metha & Patel, 2010). Response consistency was investigated using the *kappa* index (Cohen, 1960), a statistic that allows to quantify the agreement between two classifications set on a nominal scale keeping into account the consistency expected by chance. *Kappa* derives from the sum of separate terms, and can be specifically decomposed into the contributions provided by each response type. This procedure allows a direct and pair-wise comparison between the consistency of lexical-semantic errors and of phonological errors, within the same patient, with the crucial advantage of having the 2 partial *kappa* values (lexical-semantic and phonological) calculated in the context of the same general severity and of the same number of opaque responses (mixed errors, no responses and other errors).

Results

Lexical-semantic errors had a significantly higher consistency than phonological errors. The average partial *kappa* of lexical-semantic errors (0.044, sd = 0.023) was higher than that of phonological errors (0.019, sd = 0.025), and the paired t-test was significant: t= 2.311, with df=9, p= .046 (two-tailed); the significance was confirmed after an angular transformation of the original partial *kappa* values (t= 2.624, p=.028), and even with the non-parametric permutation test, that yielded an exact p = .048. Figure 1 shows the relevant data for the "double error" patients.

Discussion

The outcome of the paired comparison between the partial *kappa* values is interesting for many reasons. The first is that this analysis cannot be marred by any difference between the basic rates of the various types of errors, or by any between-subject bias. Second, notwithstanding the small sample, a full significance level was attained and was confirmed through different statistical approaches.

The most likely interpretation of our findings is that lexical-semantic errors depend on stimulus-specific predictors. They could be more consistent than phonological errors simply because they are more strongly influenced by any stimulus-related variables than phonological errors. One can presume the condition of "stimulus dependence" (and consequently be entitled to chase the predictors) to be present only when a consistent behavior is observed. If any variables can significantly predict a given type of error, consistency will ensue by necessity. Conversely, failure to find significant predictors, in the face of significant consistency, would suggest that such predictors do exist, but escape identification. Lower consistency of phonological errors in "double error" patients suggests that these errors may be more similar to the condition formerly defined as "stimulus independence".

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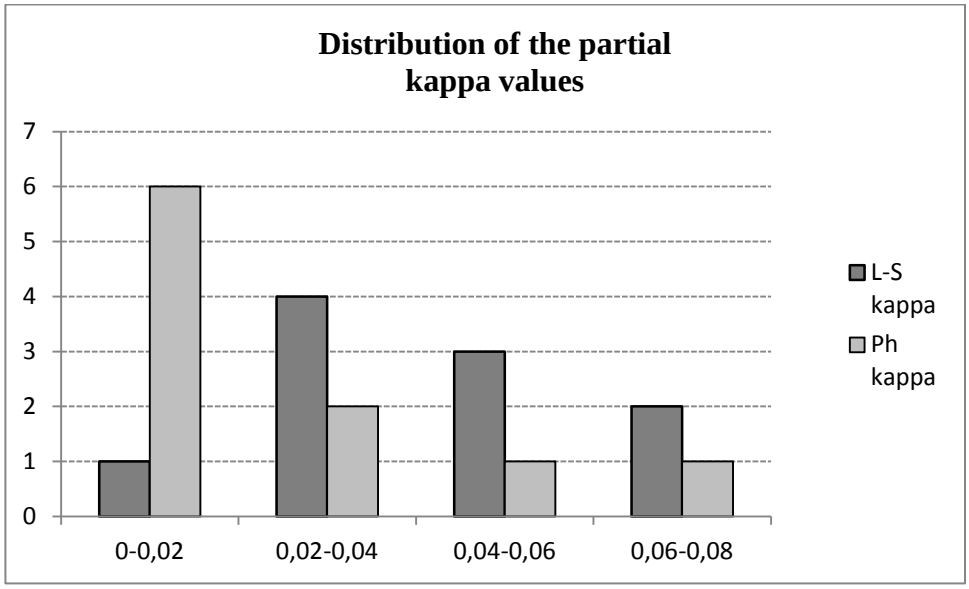
Figure 1: Distribution of the partial *kappa* values for the 10 "double error" patients.



L-S: lexical-semantic errors Ph: phonological errors

Anomia and paraphasia in oral speech production

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Introduction

A large number of studies in Neuropsychology and Aphasiology have analyzed lexical access in the case of individuals with aphasia through the use of controlled experimental tasks. However, the analysis of spontaneous speech with the purpose of improving the description of language disorders common to these aphasic patients is still lacking and problematic (Prins & Bastiaanse, 2004). Within this context, the present study aimed to investigate lexical access in aphasia in spontaneous versus semi-spontaneous speech production of Brazilian Portuguese, focusing on two different linguistic phenomena that result of aphasia - anomia and paraphasia.

Methods

Participants

A total of ten participants with predominantly expressive aphasia who suffered an ischemic cerebrovascular accident in the last 2 years. Patients with severe perceptual or cognitive deficits were excluded, as well as left-handed patients and patients with additional neurological diagnoses. Aphasia diagnoses were made by neurologists and confirmed by speech therapists based on the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1982; Radanovic & Mansur, 2002).

Instruments and procedures

An adaptation of the Autobiographical Memory Interview (Kopelman, Wilson & Baddeley, 1990) and the Cookie Theft picture description task of the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 2000) were used to elicit oral production in two different discourse environments. The narratives and descriptions elicited were filmed and recorded. The analysis of the transcribed discourse focused on the occurrence of instances of anomia and morphemic, phonemic, and semantic paraphasia. Discourse was analyzed by two Linguists and 15% of the corpus was independently analyzed by a Speech-Language Pathologist obtaining 90% of agreement for inter-judge reliability. Any disagreement that appeared in the detection of instances of anomia and paraphasia were discussed and scored after obtaining agreement. In addition to the language skills evaluated with the Boston Diagnostic Aphasia Examination, other neuropsychological abilities were accessed through a

cognitive screening battery which included subtests of attention, working memory, episodic, semantic and nonverbal memory, perception and oral and written language (Instrumento de Avaliação Neuropsicológica Breve – Neupsilin; Fonseca, Salles & Parente, 2008).

Results

Overall results showed that most cases of anomia took place when participants tried to access concrete nouns and proper names in both tasks. Occurrences of morphemic paraphasia were more frequent than phonemic and semantic paraphasia in the Autobiographical Memory Interview. When the cases of morphemic paraphasia occurred in the production of verbs, participants showed difficulty with the use of both tense and aspectual morphological markers, mainly in contexts which demanded reference to past events. With respect to function words, gender marking proved to be particularly difficult as well.

Discussion

According to our results, it was possible to observe a difficulty in accessing and producing concrete nouns and proper names during the oral speech production (Hanley & Kay, 1998; Lyons, Hanley & Kay, 2002). The cases of morphemic paraphasia related to verb production showed that this difficulty was related to the reference to the past, because a discourse linking was required (Bastiaanse, 2013; Avrutin, 2006). Furthermore, it was also possible to observe, based on cases of morphemic paraphasia, a difficulty in bending gender to function words, being the morpheme of gender preserved in nouns, oppositely of what has been reported in previous studies (Bastiaanse et el. 2003; Perlak & Jarema, 2003; Kulke & Blanken, 2001).

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Structural case in agrammatic aphasia: Evidence from Greek

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Introduction

Several (morpho)syntactic phenomena have been extensively explored in agrammatic aphasia. Some have been consistently found to be impaired (e.g., tense), and some unimpaired (e.g., subject-verb agreement) (e.g., Friedmann & Grodzinsky, 1997; Wenzlaff & Clahsen, 2004; Fyndanis et al., 2012). However, the evidence for some categories, such as structural case, is limited and contradictory.

It has been suggested that, in languages with overt case-marking (e.g., German, Greek, Hebrew), this morphological device might be used to assign thematic roles correctly, and, thus, might lead to correct interpretation (Lamers & Ruigendijk, 2008). While De Bleser et al. (1988) and Heeschen (1980) found their German-speaking agrammatic subjects to be sensitive to case morphology, Burchert et al. (2003) and De Bleser et al. (2005) did not replicate this finding. Although their agrammatic participants were able to discriminate different case markings on the word level, case morphology was not enough to lead them to correct sentence interpretation. (For similar results from Hebrew agrammatic comprehension, see Friedmann & Shapiro, 2003.)

Regarding production, several studies have reported that agrammatic speakers have difficulty realizing the correct case inflection, at least in non-canonical structures (e.g., Bastiaanse et al., 2003; De Bleser et al., 2005). Based on their findings, however, Ruigendijk and her collaborators (e.g., Ruigendijk, 2002; Ruigendijk & Bastiaanse, 2002; Ruigendijk & Friedmann, 2008; Ruigendijk et al., 1999) have argued that structural case as such is not impaired, but its correct production depends on the presence of case-assigning elements, such as verbs and prepositions. Ruigendijk and colleagues have found that, when case-assigners are present, case-marking is realized correctly.

Against this background, we will examine the ability of Greek-speaking agrammatic individuals to comprehend and produce structural case. In Greek, Determiner Phrases (DPs) are overtly marked for case, with case-marking being realized on the determiner, the noun, and the adjective.

Methods

Participants

Three Greek-speaking individuals with non-fluent agrammatic aphasia, TG, NP, and AV, and six controls participated in this study. All three agrammatic participants had suffered a left ischemic CVA at least 16 months post-onset. The diagnosis was based on the Greek standardized version of the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass & Kaplan, 1983; Papathanasiou et al.,

2008), on analysis of semispontaneous speech—following the coding procedures described in Thompson et al. (1995)—, and on clinical consensus. AV had a severe motor speech disorder and was not tested on the sentence completion task.

Experiments

To test the ability of agrammatic participants to comprehend and produce structural case, we developed three tasks: a grammaticality judgement task (GJT), a truth-value judgement task (TVJT), and a sentence completion task (SCT).

The GJT consisted of 96 sentences, 48 grammatical and 48 ungrammatical, all of which included a transitive two-place verb in active voice. The external argument was marked for nominative and the internal for accusative case in the grammatical sentences. Both arguments were marked either for nominative or for accusative case in the ungrammatical sentences (i.e., half the ungrammatical sentences were of the "nominative-nominative" type, and half of the "accusative-accusative" type). Participants were auditorily presented with the sentences and instructed to judge their grammaticality.

The TVJT consisted of 40 sentence-picture pairs; in 20 of the pairs, the sentence matched the accompanying picture, and in 20 it did not. All 40 sentences were semantically reversible and non-canonical, with a transitive two-place verb in active voice. Given that agrammatic speakers are able to process active voice and to activate the argument structure of the verb (see Thompson & Shapiro, 2005, and relevant references therein), in this experiment the two arguments of the sentence can be successfully mapped onto the depicted entities based on case information only. Twenty pictures were used, each of which appeared twice (once in the true and once in the false condition). Participants were asked to judge whether the sentence matched the picture.

The SCT included 40 experimental items. Each item consisted of a picture and an incomplete sentence that was auditorily presented to the participants. All sentences contained a two-place verb in active voice and described the associated picture (precisely, the depicted action and one of the two arguments; half sentences contained the subject/agent and half the object/theme). Participants were instructed to complete the sentence orally providing the missing argument.

Results

All control participants performed at ceiling across tasks, so their performance will not be further considered. The agrammatic participants had poor performance on all three tasks (Table 1). AV performed at chance on both comprehension tasks (by Binomial test, 2-sided p=.760 and p=1.98 for GJT and TVJT, respectively), while TG performed at chance on the TVJT only (p=1.96). TG's performance on the GJT and NP's performances on both comprehension tasks were above chance (GJT for TG and NP: p=.052 and p=.000, respectively; TVJT for NP: p=.006). However, both were mildly impaired in these tasks; NP's performance on GJT and TVJT were 71% and 73% correct, respectively, while TG performed 60% on GJT. In production, both participants tested on the SCT were found severely impaired (25% and 50% for TG and NP, respectively).

Discussion

The performance of our agrammatic participants on the two comprehension tasks show that they have an impairment (albeit to different degrees) in both recognizing different case-markings and using them to correctly interpret the sentence. Thus, our comprehension results are only partly consistent with studies that have reported a selective deficit in case comprehension that only affects the ability of agrammatic speakers to use case cues to interpret the sentence (e.g., Burchert et al., 2003; De Bleser et al., 2005). We argue, therefore, that in agrammatism case comprehension can be impaired at both the "shallow" and deep levels.

Based on Ruigendijk et al.'s proposal that structural case is correctly produced when the verb is present, we would expect our agrammatic participants to perform well on the SCT, since the verb was always provided. However, both agrammatic speakers that participated in this task had poor performance, which suggests that some agrammatic individuals can also have a genuine deficit in case production.

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Table 1. Agrammatic participants' accuracy scores.

	Sentence completion task	Grammaticality judgement task	Truth-value judgement task
TG	10/40 (25%)	58/96 (60%)	14/40 (35%)
NP	20/40 (50%)	68/96 (71%)	29/40 (73%)
AV	n.a.	50/96 (52%)	13/40 (33%)
Total	30/80 (38%)	176/288 (61%)	56/120 (47%)

Cross-language influences in multilingual aphasia

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Introduction

Recent work on cross-language influences from the treated language to the untreated language(s) in multilingual aphasia suggests that positive treatment effects are not always obtained (e.g., Abutalebi et al., 2009). We examined cross-language effects in an individual who spoke over 10 languages prior to the onset of aphasia, to assess the role of language proficiency on treatment transfer.

Methods

Participant

A 64-year-old native speaker of Flemish (Dutch) who reported varying degrees of proficiency in 10 other languages participated in the study. He sustained a left-hemisphere stroke a year prior to the study, resulting in mild expressive aphasia in all his languages. Self-rated proficiency (for post-CVA) for the languages tested in the study indicated the following hierarchy from more proficient to less: Dutch, German/French/Italian, English, Spanish, Norwegian.

Assessment

Language performance was examined with several experimental tests; for the present presentation, data were analyzed from a task that used six wh-questions to elicit connected speech production (e.g., "what do you like to do on your birthday?"), in seven of the participant's languages. Testing took place via Skype over a five-day period, assessing each language three times over separate days, prior to and following treatment. We examined the answers produced, focusing on three variables: proportion of CIUs (correct information units, Nicholas & Brookshire, 1993) out of total words produced; proportion of grammatical sentences (max score = 100%); how well he answered each question (on an overall scale of 1-3; max score = 54). Production in each language was transcribed and analyzed. Change of 10% or more (with percentages calculated of the compared values) is reported.

Treatment

The participant enrolled in two 4-5 week intervention programs (with a seven-month interval; the participant lives in NY and Belgium; treatment took place while in NY). Intervention I: A modified Oral Reading for Language in Aphasia (ORLA, Cherney, 2004) program was employed to address oral production in Dutch. Forty hours of treatment were administered over five weeks (six to 10 hours per

week). Intervention II: An introduction to Russian as a foreign language course was administered, in accordance to the participant's interest in learning Russian. Forty hours of individual sessions, covering all linguistic aspects, were administered over four weeks (10 hours a week).

Results

We noted improvement in Dutch following the Dutch intervention, and learning for Russian following the Russian course, on various measures not addressed here. An examination of the participant's performance on the answering wh-questions task yielded the following results.

Within-language response to intervention:
Dutch. Following treatment in Dutch, the participant improved his Dutch production on two of the three measures: sentence grammaticality (from 53% to 82%), and how well he answered the questions (total score: from 45 to 53).

Cross-language response to intervention:
Dutch. No change was observed following the Russian course.
German. The participant's production improved on two of the measures: how well he answered the questions (from 35 to 44) and %CIUs (from 72% to 80%) following the intervention in Dutch. There was also an increase in %CIUs (from 70% to 82%) following Russian.
French. There was an increase post Dutch in how well he answered the questions (from 40 to 46). There was a decrease following the Russian course on two of the measures: grammaticality (from 100% to 68%) and how well he answered the questions (from 47 to 40).
Italian. There was an increase post Dutch in sentence grammaticality (from 32% to 55%) and in how well he answered the questions (from 37 to 50). There was no change post Russian.
English. No clear change emerged after Dutch treatment, but a decrease in performance following the Russian course was noted on two measures: grammaticality (from 94% to 67%) and how well he answered the questions (from 51 to 40).
Spanish. Little change was noted post-Dutch treatment. Post Russian there was a decrease in %CIUs (from 69% to 60%) and how well he answered the questions (from 41 to 36).
Norwegian. Change was noted after the treatment in Dutch on the %CIUs measure (from 57% to 36%). Decrease in performance following the Russian course was noted in lower %CIUs (from 50% to 38%), and how well he answered the questions (from 34 to 30).

Discussion

We identified two patterns in our results: a) improvement in the stronger languages (German, French, Italian) following treatment in the participant's native Dutch, along with no change in performance in the less-proficient English, Spanish, and a decrease in the least-proficient Norwegian; b) decreased quality of production in the less-proficient languages following the introduction of a new language (as well as in French, one of the stronger languages). These patterns suggest that the influence of intervention in one language on the remaining, untreated languages of a multilingual person with aphasia may be positive only among relatively proficient languages. Furthermore, the introduction of a new language and

the learning-oriented (rather than therapy-like) nature of the sessions during that phase may have resulted in suppression of the participant's non-native languages.

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"I wake up every day thinking I can write" – an agraphia treatment study

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Introduction

Writing therapy has not fallen within the traditional domain of aphasia rehabilitation (Whitworth, Webster & Howard, 2013). Written language production is often the least examined neuropsychological function (Lorch, 2013). However, written language plays an important role in everyday life. BN was a 64-year-old, right handed, monolingual male. An optician by profession, he was referred to our center due to a sudden onset of writing disorders some months earlier. There were no known episodes of brain damage. His main symptom was agraphia, but some marginal additional aphasic symptoms could be observed. He had trouble reciting and writing the last half of the alphabet and he would do errors reading aloud if given time pressure. No anomia or other aphasic symptoms could be observed during conversations, but there would be naming errors during confrontation naming tasks (action words and objects). There were no cognitive symptoms other than the writing/language symptoms. The aim of the treatment was to identify viable strategies BN could use in his everyday life, to enhance his writing abilities. Hence, his treatment was organized in line with a multiple baselines across treatments study, to compare two different strategies. Based on assumptions according to the dual route model (such as the single-word processing logogen model underlying the PALPA test), assessment and two short subsequent treatments were planned. As such, a confirmatory approach to theory development was taken in the clinic (Nickels, Kohnen & Biedermann, 2013).

Methods

Assessment

Subtests from the *Psycholinguistic Assessments of Language Processing in Aphasia* (subtests 26, 36, 39, 40, 44, 45 (as spelling and as repetition), 46, 53) (Kay, Lesser & Coltheart, 2009), the *Verb and Sentence Test* (subtest 4) (Bastiaanse, Lind, Moen & Simonsen, 2006), the *Alphabet Test* (Corneliussen, 2003), informal tests of words' metrical shape, as well as supplementary reading/spelling tests and tests of auditory processing from the *Newcastle University Aphasia Therapy Resources* (Morris et al., 2011) were completed.
BN performed at ceiling on repetition of nonwords, but struggled with writing them. He could translate single phonemes into appropriate graphemes, and he showed good auditory phoneme discrimination. In writing (words & nonwords) he mainly used a sub-lexical strategy, but his strategy was not efficient, particularly not for nonwords. He needed time and made several self-corrections, especially when writing irregular words. Hence, the error pattern suggested partial impairment both to sub-lexical and lexical routes (cf. Beeson et al., 2000). Accordingly, the focus of therapy became the phonological-to-graphemic conversion (treatment A) and the orthographic output lexicon (treatment B).

Treatment

Treatment A aimed at re-establishing or enhancing his intuitively preferred, but not so successful sub-lexical writing strategy: the phonological-to-graphemic conversion. Treatment B aimed at teaching him an alternative writing strategy, to help him more successfully access words within the orthographic output-lexicon. This latter treatment involved learning him to take into account words' metrical shape and/or syllables, as well as enhancing lexical access using his well-functioning semantic system.
Treatment A was a computer-based treatment administrated by BN himself at home – the writing to dictation for 20 nonwords. During writing of graphemes, the computer would sound out the corresponding phonemes. On his own initiative, BN kept a log monitoring his training. He trained daily for two weeks. To BN, this method did not have face value, but still he was conscientiously training almost every day (30 minutes a day, for 13 out of 14 days). This was followed by assessment, and a week's training (treatment B) face-to-face with two SLTs at the center (a total of 12 hours during 4 days). Treatment B focused solely on real words. There were no lists of training words, but the two SLTs had agreed on a common pedagogical principle for treatment: tasks should inspire BN to find words' orthography by tapping into the words' syllables and metrical shape, rather than by trying to make use of the phonological-to-graphemic conversion. Intrinsic to treatment B was also making use of the good semantic skills of BN. BN instantly found this latter method to have face value. He volunteered to take part in 4 of 5 days of therapy offered with treatment B.

Results

In table 1, some of the assessment results pre and post treatment are presented.
Treatment A shows some effect on the nonwords trained, but do not generalize to control nonwords. The lack of generalization is also seen in PALPA 45 (nonwords). Treatment B shows generalization both to untrained words (the last three dictations in the table) and to (untrained) nonwords (PALPA 45).

Discussion

Even though not the target of intervention, also nonwords (meant to serve as a control task) show an effect after treatment B. These results called for post hoc theoretical interpretations of the treatment results (Nickels, Kohnen & Biedermann, 2013) for the clinicians. Is this effect due to BN being able to access words, and "hold on to" accessed words, more efficiently, using a metric/syllable approach to ameliorate the buffer capacity and/or the access to the orthographic output lexicon from the phonological output lexicon? Or, is the underlying impairment (before treatment) also inhibiting BN in segmenting novel auditory stimuli into their constituent sounds or syllables? This latter hypothesis might explain why a metric/syllable approach would affect both word and nonword writing. Regardless of this, would a generalization to nonwords be more compatible with a model including a separate syllable level and/or storage? Alternative explanations are explored further in the poster.

Epilogue

Follow up assessment shows stable results. However, BN told that the improvements had not led to a functional impact in daily activities. One reason for this, was that he seldom actually managed to

apply the new writing strategies in daily life. He added: “You see, I wake up every day thinking I can write.”

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Table 1.

	T1	**T2**	**T3**	**T3**
Writing to dictation	*Before* treatment	*After* treatment **A**	*After* treatment **B**	*After* treatment **B** incl. *other-initiated self-repair*
Nonwords (treated)	4/20	14/20		
Nonwords (control)	1/12	3/12		
PALPA 43: morphology		58/60		
PALPA 45: nonwords	11/24	8/24	22/24	24/24
PALPA 44: regularity	35/40		39/40	40/40
words with consonant clusters	48/54		52/54	54/54
irregular words	22/30		28/30	30/30

Syntactic comprehension deficits in Armenian-Russian bilingual speakers with aphasia

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Introduction

According to the neurolinguistic literature, more than half of the world's population is bilingual (Grosjean, 1994). As a consequence, there is a large number of bilingual individuals with aphasia (Paradis, 2001). Nowadays it is important to take into account bilingualism when assessing and treating a patient with aphasia. The better preserved language could be the one that is not spoken by the hospital staff, while it could serve as means of communication, if properly assessed (Paradis & Libben, 1987). Also, one modality could be more impaired in one language than the other one and recovery patterns may differ across the languages (Paradis, 2011). Moreover, there is no evidence that monolingual therapy is generalizable for other languages, too (Paradis, 2004), while the therapy offered might not meet the patient's social needs.

It is very common for an Armenian speaker to be bilingual. Armenia is a former Soviet republic and there is a large number of Armenian-Russian bilingual residents in the Republic of Armenia. Therefore, it is important to consider bilingualism when studying language deficits in Armenian speakers with aphasia for the above-mentioned reasons.
For appropriate assessment of bilingual patients with aphasia the Bilingual Aphasia Test (BAT; Paradis & Libben, 1987) has been developed and adapted to many languages. The Eastern Armenian BAT (Paradis & Sakayan, 1989) is the only aphasia assessment tool for Armenian. The existing version has never been standardized. Having been created more than twenty years ago, it is no longer linguistically and culturally appropriate. Therefore, it was necessary to develop an updated version of the test.

The aim of this study is twofold: to come up with an improved diagnostic tool for Eastern Armenian and to provide evidence about recovery patterns across languages. Armenian and Russian languages share many syntactic features (e.g. different case marking on animate and inanimate direct objects). Based on Fabbro's (2001a) suggestion that similar deficits between languages occurs as a result of similarities in their grammars and different symptoms manifest where the languages differ, we can hypothesize that regardless of other linguistic deficits, Armenian-Russian bilingual speakers with aphasia will have similar impairment in syntactic comprehension across languages.

Methods

Participants

Five post-stroke individuals with aphasia participated in the study (two male, three female, aged 51-80 years, 4-23 months post-onset, all of them right-handed). Based on spontaneous speech analysis the participants were classified with non-fluent aphasia (with one of them having global aphasia). Age, gender, language and education matched non-brain damaged (NBD) individuals were recruited as control participants.

Materials & Procedure

The Token Test (DeRenzi & Vignolo, 1962) was translated into Armenian and Russian. The existing version of Eastern Armenian BAT (Paradis & Sakayan, 1989) was modified to meet linguistic and cultural needs of Modern Eastern Armenian. Several changes have been made to the syntactic comprehension subtest of the Russian BAT (Paradis & Zeiber, 1987). The Token Test in Armenian or both languages (depending whether the participant was monolingual or not), Part A of the BAT, the syntactic comprehension subtest of PART B and Armenian-Russian Part C were administered to the participants when applicable. Spontaneous speech samples were recorded, if the participant agreed. Bilingual individuals were tested in two sessions, one session for each language. The syntactic comprehension data were compared to the normal range given for English (Paradis & Libben, 1987) and Token Test results were compared to cut-offs (Spellacy & Spreen, 1969).

Results

The five control participants had ceiling or near to ceiling performance in Token Test in both languages. The speakers with aphasia, except for two of them, scored lower than the cut-off score 156 in both languages. Two participants with aphasia scored at the level or above the cut-off in the Armenian version of the test.

Three out of the five non-brain-damaged participants scored within the normal range of the syntactic comprehension subtest in both languages. The other two scored below normal range in at least one sentence type in both languages. Four out of five speakers with aphasia performed below the normal range, with one of them performing at chance level in all sentence types and languages. One of the speakers with aphasia, although making errors in various sentence types of the Armenian version of the subtest, scored within the normal range in all sentence types. However, his performance was below the normal range in Russian in several sentence types.

Discussion

The results suggest selective recovery in two of the participants in their stronger language. As the results of BAT should be comparable across languages (Paradis & Libben, 1987), poor performance of some of the non-brain-damaged participants compared to the English normal range suggested that the Eastern Armenian and Russian BAT need further improvement. A larger number of participants and a more homogenous group is necessary to test the hypothesis regarding syntactic deficits. Future research should be focused on standardizing the Eastern Armenian BAT, adapting the BAT into other dialects of Armenian and creating new bilingual pairs for the BAT Part C, which can later be tested on a larger group of participants.

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Sentence Comprehension in Aphasic Speakers of Standard Indonesian

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Introduction

Studies on aphasic sentence comprehension have shown different performance patterns. Though agrammatic comprehension regularity has been disputed (Berndt, Mitchum, & Haendiges, 1996), several theories such as the Trace Deletion Hypothesis (TDH; Grodzinsky, 1995) and the Derived Order Problem Hypothesis (DOP-H; Bastiaanse & Van Zonneveld, 2005) support performance consistency. In particular, the DOP-H is based on empirical findings across languages (for a review of the hypothesis, Abuom, Shah, & Bastiaanse, 2013) and accounts for both production and comprehension. The DOP-H assumes that every language has a base word order where the constituents are placed in the array that occurs "naturally" or is most common; all other word order are derived by linguistic operations and, therefore, difficult for aphasic individuals with a grammatical deficit. In the current study, this hypothesis is tested for Standard Indonesian (SI)

In a case study (Postman, 2004) and a spontaneous speech analysis (Anjarningsih, Haryadi-Soebadi, Gofir, & Bastiaanse, 2012) it was shown that SI aphasic speakers could comprehend passive sentences and also produce them at a rate that is proportionate to healthy speakers. The difference between passives in SI and other languages is the frequency with which passives are used: Passives in SI are highly frequent (Sneddon, 1996). The current study aims to test whether passive sentences are relatively spared in aphasic individuals with a grammatical deficit, as suggested by Postman (2004) and Anjarningsih et al. (2012). To compare the influence of both word order and frequency we tested actives (high frequency, base order); passives (high frequency, derived order); subject clefts (low frequency, base order); object clefts (low frequency; derived order). The DOP-H predicts that passives and object clefts will be more impaired than the actives and subject clefts. However, if frequency plays a role, the passives will pair with the actives (and subject clefts) and the object clefts will be selectively impaired.

Methods

Participants

Five individuals with aphasia (IWAs) and 12 non-brain-damaged Indonesian speakers participated in this study. IWAs originated from 2 nursing homes in Central Java. A screening test was held prior to testing. The Token Test was translated to SI and IWAs with more than 12 errors were then tested

with the SI aphasia battery "TADIR" (Dharmaperwira-Prins, 1996) to classify the aphasia types. IWAs with the diagnosis Broca's aphasia or transcortical motor aphasia were included on the basis of their agrammatic speech. One IWA who was classified as 'global aphasia' was excluded because the aphasia was too severe to elicit reliable data.

Materials

Sentence comprehension was tested with a spoken-sentence-to-picture matching task. It contains 40 semantically reversible sentences distributed equally over 4 experimental conditions (10 actives, 10 passives, 10 subject clefts, and 10 object clefts). Each item is presented as a set of four pictures: one target and three distractors (reversed role distractor, lexical distractor, and lexical distractor with reversed roles).

Results

The control group of 12 non-brain-damaged participants (NBDs) performed close to ceiling level (mean= 0.97, range=38-40 out of 40), which is significantly higher than the IWAs (Mann-Whitney U Test: U=0, p=.001). The scores for each aphasic individual are shown below in Table 1.

Table 1. Sentence comprehension results for aphasic speakers (maximum 10 per condition; 40 in total per IWA)

	type	total	active	s-cleft	passive	o-cleft
1	Broca	25	8	7	5	5
2	Broca	23	9	5	7	2
3	TCM	31	9	9	10	3
4	Broca	29	9	9	5	6
5	Broca	23	6	7	5	5
	Total	**131**	**41**	**37**	**32**	**21**
	%	0.66	0.82	0.74	0.64	0.42

*total represents raw score of correct responses; active, s-cleft, passive, and o-cleft show raw scores in the respective categories. % shows the average percentage of correct responses

Fisher's exact tests were used to test for significance. There was no difference between the sentence types with base word order (active-subject cleft: p=0.4695). There was a significant effect of word order in the cleft sentences (subject vs object clefts: p=0.0022). The passive sentences were not more difficult than the active sentences (p=0.0705) and significantly easier than the object clefts (p=0.0046).

Errors were classified into the three distractor types which are: reversed role distractors (RR), lexical distractors (LD), and reversed role lexical distractors (RRLD). RR occur significantly more often than the two other error types (Fisher's exact: LD, p<.0001; RRLD, p<.0001). The difference between LD and RRLD was not significant (p=.0771).

Discussion

The research question was whether frequency could overrule the effect of derived word order. The scores on the cleft sentences show that for this group of IWAs, sentences with derived word order are harder to comprehend than sentences with base word order, as predicted by the DOP-H. However, the highly frequent passive constructions are not significantly harder than the actives, suggesting that comprehension of passive sentences is relatively preserved. This would confirm the findings of Postman (2004) and Anjarningsih et al. (2012) that the passive is relatively well spared in SI IWAs.

However, the group of IWAs is very small, so the data should be interpreted with caution. Inspection of Table 1 shows that 4 of 5 of the IWAs with Broca's aphasia are more impaired on the passives than on the actives, in fact as a group, they perform at chance level on the passives (and the object clefts). Moreover, the effect of frequency is not in line with earlier findings for agrammatic production. Bastiaanse, Bouma, and Post (2009) reported that frequency of verb forms and grammatical constructions in Dutch did not influence agrammatic performance on production tasks. Hence, although performance on passives is not significantly lower than on actives, more data are needed before we can draw firm conclusions on the effect of frequency of the passive construction on agrammatic sentence comprehension in SI.

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A Vaster VAST: Comprehension and production of verbs and sentences in Russian

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Introduction

In order to address the production and deficits of verbs and sentences in aphasia, diagnostic batteries such as the *Werkwooden-en Zinnentest: WEZT* (Bastiaanse, Maas, & Rispens, 2000) for Dutch and The Verb and Sentence Test (VAST) (Bastiaanse, Edwards, Maas & Rispens, 2003) for English have been introduced. Additionally, linguistically motivated tests for aphasia have been adapted for the Russian language, such as the Bilingual Aphasia Test (BAT) (Paradis, 1987; Paradis & Zeiber, 1987) and the Test for Assessment of Reference of Time (TART; Bastiaanse, Jonkers, & Thompson, 2008; Russian version Dragoy & Bastiaanse, 2010). Nonetheless, there remains a lack of standardized assessment of aphasia for the Russian language.

The present study aims to broaden the cross-linguistic research through the development and standardization of a new diagnostic battery for the Russian language, adapted from the original VAST (Bastiaanse et al., 2003). The aim of this test is to determine the deficits underlying production and comprehension of verbs and sentences, and to utilize the collected data for structuring therapy in a extensive population of Russian aphasic patients.

Given that the verb is the grammatical and semantic core of the sentence, many empirical studies have been devoted to examining this linguistic relationship. Specifically, the type and structure of arguments relating to the verb have shown to be sources of agrammatism for languages such as Dutch and English (Bastiaanse & Van Zonneveld, 2005; Thompson et al., 2007). Dragoy and Bastiaanse (2010) investigated this theory for Russian and found that agrammatic production is also characterized within sentences by constituent movement to a non-base generated position. Grodzinsky (1995) has also demonstrated that sentence comprehension can also be compromised when brain-damaged patients are presented with non-canonical, semantically reversible sentences. For decades, the common form of aphasia assessment and diagnosis has been based on the qualitative, observation-oriented framework of the Lurian Neuropsychological Investigation (Luria, 1966). However, this practice lacked a standardized, norm-referenced basis. The construction of the Russian VAST test will center around scientifically proven approaches to verb and sentence processing in brain-damaged speakers.

Method

Participants

The study will consist of 10 native speakers of Russian, living in the Russian Federation, between the ages 18-25, with no reported sensory or neurological damage, as controls for the current study. The set of 186 verbs intended for use in the Russian VAST will be administered to these individuals for the purpose of standardization. By utilizing the responses collected from this group, norms will be established and referenced for the clinical test. The experimental group will consist of 10 individuals with moderate to severe left hemisphere damage. These participants will be administered the standardized version of the Russian VAST.

Design and Materials

The test will consist of 2 sections, each of which will feature tasks targeted at measuring comprehension. These sections will include picture matching tasks and will be aimed at the processing of individual verbs or of entire sentences. Verbs used in the study will be controlled for factors such as instrumentality, transitivity, name relation (to a noun), frequency, imageability, and age of acquisition. Sentences will be controlled for canonicity and grammaticality. Each section will be scored individually with its own scoring sheet.

Procedure

The task for each section will be introduced with a set of specific instructions by the examiner. Following this, the participant will be given one or more practice examples to acquaint themselves with the procedure and confirm their understanding of the instructions provided. The responses will be recorded on the appropriate scoring sheet and overall result will be calculated at the completion of the task. The responses will not be subject to a time limit.
Data Analysis. As in the case of the original VAST (Bastiaanse et al., 2003), test reliability for the Russian VAST will be measured using Cronbach's alpha. Validity is expected to be high, given the previous results shown by the original test in English.

Expected Results

It is proposed that the results of the Russian VAST battery will demonstrate appropriate internal validity and that the individual tasks of test will indicate significant correlations with the overall scores. Overall, the test is expected to present a clear distinction between aphasic speakers and healthy, non-brain damaged speakers of Russian.

Discussion

The Russian VAST examines how sentence comprehension can be affected by several canonical and non-canonical word orders. Russian is a language with a flexible and relatively free word order, which allows it to mold conveniently within scrambled sentences. However, studies such as Dragoy & Bastiaanse (2010) prove that Russian agrammatic speakers can encounter issues as a result of the descrambling process, which involves derivation through several stages. Such studies have played a critical role in the process of test material selection. Another quality of the Russian language - the infrequency of passive sentences - was also regarded during test construction and resulted in the omission of this sentence type. Overall, the current study presents a highly useful evaluative tool that utilizes visual and auditory tasks to tackle problems arising at the verb and sentence level in a free word order language. The Russian Verb and Sentence Test provides the model for comprehensive assessment of Russian agrammatic comprehension in a clinical battery.

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The impact of Semantic Feature Analysis on verb production in two multilingual speakers with aphasia

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Introduction

The aim of the study is to explore whether Semantic Feature Analysis (SFA) therapy can result in improvement of trained and untrained verbs, general language skills and narrative production in the trained and untrained languages of two multilingual speakers with aphasia. Treatment is conducted in a late acquired language for both speakers.

There is ample evidence that action naming is more difficult than object naming for people with aphasia, especially those with non –fluent aphasia (Faroqi -Shah,2012; Links, Hurkmans, & Bastiaanse, 2010; Mätzig, Druks, Masterson, & Vigliocco, 2009 ; Webster & Withworth, 2012). In monolingual speakers verb retrieval therapy is effective on treated items, but generalization to untreated items is still a challenge (Webster & Withworth, 2012). Research on bilinguals' verb retrieval is limited (Kabanaros, 2010), but a greater verb than noun deficit is found in several studies (Faroqi--Shah, 2012).

SFA is a word retrieval treatment that has shown good results in generalization to untreated objects (Boyle, 2004). So far only two studies have been published on SFA and verb therapy, both on monolingual speakers.

According to earlier research on SFA and action naming (Wambaugh & Ferguson, 2007; Wambaugh et al., 2014) an improvement of the treated verbs is expected. Wambaugh and colleagues found no generalization to untrained items, hence this may not be evident. For two of the participants in these prior studies some changes in discourse was found, with a higher number of correct information units (CIUs) (Nicholas & Brookshire, 1993) post -treatment. The present study explores the use of SFA with verbs in complete sentences, hence increases of content. In discourse and of grammatical sentences are expected. Generalisation to untreated languages of multilinguals is challenging, but according to Edmonds and Kiran (2006) therapy in a less proficient language may facilitate generalization to untreated languages, therefore such a generalization may be found.

Method

Participant 1 is a 50 –year- old female who grew up speaking Portuguese and Ronga, and learned Norwegian as an adult. Due to lack of assessment material, Ronga was not included in the study . Participant 2 is a 59- year-old female, who grew up speaking Japanese. She learned English at school, and German and Norwegian as an adult. Both participants suffer from moderate non-fluent aphasia following left hemisphere strokes.
For both participants two different treatment protocols were provided in an intensive schedule with 20- 25 hours over four weeks each. Both protocols focused on the production of verbs in connected speech. The order of the treatment protocols was counterbalanced across the participants. The treatments consisted of SFA and communication- based treatment, provided in Norwegian, the latest learned language of the participants. This presentation focuses on SFA only.

Outcome measures include the Bilingual Aphasia Test (BAT) (Paradis & Libben, 1987) an action naming test and production of semi-spontaneous narratives (cartoon descriptions and elicited personal narratives).

Within and across-language treatment -associated changes on the BAT and the action naming test were evaluated using the McNemartest. For the narratives, the number of words, the amount of CIUs, AS –units (Foster, Tonkyn, & Wigglesworth, 2000), grammatical clauses, and noun and verb tokens were measured.

Results

For participant 1 the action naming test results show significant improvement in the trained verbs. The untrained verbs in Norwegian, i.e. the verbs she was able to produce at baseline, maintained their high score at the following measurement points. In Portuguese the action naming test shows a significant improvement. The overall BAT- results show a significant increase in the treated language Norwegian (L2), and also a significant increase in Portuguese (L1).

The narrative analysis is in progress for this participant.

For participant 2 the action naming test show s significant improvement of trained and untrained verbs in Norwegian (L4). Significant improvement was found also in German (L3), but not in English (L2) or Japanese (L1), on action naming. The BAT-results did not show a significant improvement in the treated language, Norwegian (L4), nor in Japanese (L1). In English (L2) and German (L3), a significant improvement in her overall scores was evident.

Preliminary analysis of the narrative production in Norwegian (L4), the language of treatment, shows an increase in total word production, total number of CIUs and in percentage of words that were CIUs. Percentage of grammatical sentences also increased, as well as the number of complex sentences. The relative amount of verb and noun tokens did not change.

Concerning transfer to untreated languages, preliminary analysis of the Japanese (L1), English (L2) and German (L3) narratives show mixed results. There is a tendency, though, for an increase in total word production, total number of CIUs and grammatically complex sentences. No change in the relative amount of verbs and nouns is found in any of these languages.

Discussion

The BAT- results suggest that treatment in a late acquired language can lead to cross-linguistic transfer to untreated languages, with different patterns for the different languages. The action naming test suggests that SFA treatment of action naming can lead to improvement of treated, and in one of the participants also untreated, words. Cross-linguistic transfer to verbs in untreated languages was evident for some of the languages. This indicates a selective cross–linguistic transfer from the late acquired Norwegian to languages acquired earlier. In the case of participant 2 there is little transfer to L1, and we may note that in this case the L1 is typologically very different from the later acquired languages.

The preliminary results of the narrative analysis for participant 2 show an overall improvement on sentence and text levels, but no changes at the lexical level, which was expected due to the focus on production of verbs at the sentence level.

The results from the two single case studies will be compared and discussed in light of relative proficiency, inhibition of untreated languages and structural differences between the languages.

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Glioma surgery in eloquent areas, can we preserve cognition?

A systematic review.

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Introduction

In the Netherlands, the incidence of newly diagnosed primary brain tumors is 5-7 per 100,000 of which 20% are low-grade gliomas (LGG)[1]. Cognitive preservation is crucial in glioma surgery, as it is an important aspect of daily life functioning given the relatively long survival time of LGG patients. Several studies claimed that surgery in eloquent areas does not cause severe cognitive damage and that recovery takes place within several months. However, this conclusion was relatively ungrounded due to the application of brief neurological tools or limited cognitive tasks (e.g. naming), the absence of preoperative tasks (only postoperatively), heterogeneous treatment of patients or different tumor histopathology[2-5]. With this study, we aim to elucidate the short and long term effects of eloquent area glioma surgery on cognition by identifying all studies who conducted neuropsychological tests pre- and postoperatively in glioma patients.

Methods

We systematically searched the electronical databases Embase, Medline OvidSP, Web of Science, PsychINFO OvidSP, PubMed, Cochrane, Google Scholar, Scirius and Proquest aimed at cognitive performance in glioma patients pre- and postoperatively. All titles and abstracts were reviewed by the first author (DS). Firstly, irrelevant studies were excluded. Then any study reporting on cognition was included for full-text screening. Subsequently we eliminated studies describing patients treated with biopsy, neurological status, heterogeneous tumors (and metastases) and heterogeneous treatment. Publications included in our study concerned an adult patient population with gliomas treated for extensive surgery in eloquent areas who underwent neuropsychological testing (with standardized tests) both before and after surgery. Difficult cases were discussed with 2 co-authors (EV and CD).

Results

The electronic search resulted in 3130 publications and three articles were identified by “hand-search”. After title and abstract screening, 162 were duplicates and 1875 concerned

irrelevant articles. Three-hundred fourteen articles discussed glioma surgery, but not cognition. Six-hundred-seventy six articles were excluded due to: neurological or intraoperative report, no group analyses/case study, focus on neuroimaging, conference abstract, letter to the editor, other language than English or Dutch. Hundred-six full-text publications were evaluated. We included 17 studies with tests assessing the cognitive domains: language, memory, attention, executive functions and/or visuospatial abilities pre- and postoperatively. Language was the domain most frequently examined.
The sample size ranged from 7 to 226 patients (of which a subgroup was analyzed). The interval after tumor resection was different. Nine studies investigated cognition in the immediate postoperative phase, of which 7 conducted a follow-up (range 3 days-6 months). Six studies conducted a postoperative examination between 3 months and 12 months, and another 2 conducted a prognostic study. Eleven studies compared a postoperative follow-up moment to preoperative baseline level. Follow-up moments ranged from 1-5 days to 3 years (the latter not clearly described). The most common times of measurement were immediately postoperatively and 3-6 months later. Two studies did not report on the exact follow-up time.
The general finding is that cognitive status deteriorated directly after surgery, particularly in the language domain. In the follow-up period at 3-6 months postoperatively, both improvements and deterioration were observed in the domains of language, memory and attention and executive functioning with the following tests: naming, verbal fluency, verbal memory and Trail Making Test (TMT) A, B. In addition, a decline in famous face naming, naming time and spontaneous speech was also found.

Discussion

This review provided an important overview of the sensitivity of tests for cognitive change as well as the (immediate and longer term) effects of glioma surgery on cognition. Our results are in contrast with the general assumption that cognition fully recovers within 3 months, as the more extensive neuropsychological protocols still found deterioration in one or more cognitive domains around 3 – 6 months postoperatively[6-9]. In particular the following tests were sensitive: naming, verbal fluency (language); verbal word learning (memory) and TMTB (executive functioning). These results point out the necessity of the administration of tests in the main cognitive domains, language, memory and executive functioning at longer term.
The language domain appeared to be the most dynamic, with both improvements and deteriorations in naming and verbal fluency and a decline in famous face naming, naming time and spontaneous speech. This suggests that intraoperative language testing at different levels should be carefully conducted, which may lead to less severe postoperative language disturbances.
Although we homogeneously selected the included studies based on pre- and postoperative neuropsychological testing, this review underlines the need for more consistent neuropsychological research in glioma patients. A number of heterogeneous factors may

have interfered with our results, such as, bias to the language domain and different test-intervals (e.g. unclear, wide range or it did not exceed 3-6 months). More strict exclusion criteria however, would have resulted in too few publications for a systematic review.
In conclusion, we demonstrated that cognitive recovery to preoperative baseline level is possible to a certain extent, but that the results are still too arbitrary to draw definite conclusions. Most outcome results were based on language tests and on a postoperative test-moment at 3-6 months. Prospective follow-up studies exceeding this period investigating all cognitive domains with the sensitive tests for change are crucial to elucidate the more permanent effects of glioma surgery.

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Non-Organic Language Disorders after Awake Brain Surgery

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Introduction

Awake surgery with Direct Electrical Stimulation (DES) is the 'gold standard' to resect brain tumours in the language dominant hemisphere (1). Milian et al. (2) stated that most patients tolerate the awake procedure well and would undergo awake surgery again if necessary. Intraoperative pain is reported in 30%, strong anxiety in 10-14% of the patients. Post-traumatic stress disorders were not found in the early postoperative phase (3) nor during longitudinal follow-up (4). However, postoperative psychological symptoms such as recurring distressing dreams related to the awake surgery and persistent avoidance of stimuli associated with the awake procedure were recorded (4,5). To the best of our knowledge, psychogenic language problems after awake brain surgery have never been described. In general, non-organic language disorders (language symptoms that cannot be explained by any underlying organic disorder, or that are not proportional to the extent of the underlying pathology) have been rarely reported in the literature (6). We report a patient with a tumour in the left anterior temporal lobe resected under local anaesthesia. The postoperative (atypical) linguistic symptoms were incompatible with the lesion location, suggesting a psychogenic origin. The language and behavioural characteristics of this patient are described and compared with the findings of De Letter et al. (6). Additionally, the etiology of the psychogenic language disorders is discussed.

Methods

Subject

The patient is a 28-year-old right-handed man (EHI +100) (7) with an educational level of 12 years (welder). He had a history of learning disabilities and was described by his father as a 'very anxious child'. Neuropsychiatric investigations revealed ADHD which was treated with methylphenidate. He has a good personal relation with his grandmother who developed comprehension problems following a stroke. Because of persistent complaints of severe headaches and earaches at the right side, a MRI was conducted revealing a tumoural mass deep in the left anterior temporal region (figure 1A). A neurocognitive and neuroradiological work-up (with fMRI, DTI) was performed and the tumour was resected under asleep-awake-asleep conditions with DES.

Language assessments

Extensive linguistic investigations were carried out before and after surgery on the basis of standardised test batteries: the Akense Afasie Test (Token Test) (8) and the Dutch Linguistic

Intraoperative Protocol (DuLIP) (9). A selection of tasks from DuLIP was used to map language intraoperatively. In the postoperative phase spontaneous speech and behavioural phenomena were video-recorded.

Results

Preoperative fMRI showed left language dominance and DTI indicated that the Arcuate Fascicle (AF) and the Inferior Longitudinal Fascicle (ILF) were situated near the tumour. In-depth language testing did not reveal any language or speech problems. However, due to stress, timed language tests such as fluency tasks were slightly impaired.
Intraoperatively, the patient awakened roughly causing a release of the head from the Mayfield clamp. The patient could be easily repositioned. Repeat cortical stimulation of the precentral gyrus induced speech arrests and facial contractions. One out of 3 stimulations of the anterior temporal gyrus triggered a delay in object naming. The cortical incision was performed at the middle temporal gyrus. Subcortical stimulation was done and the tumour was resected untill the lateral ventricle was reached. At the end of the tumour resection there were minor naming problems but spontaneous speech was normal.
Linguistic tests in the first weeks postsurgery, however, disclosed language characteristics that were incompatible with the lesion location. The patient was able to speak fluently, repeat, read, name high and middle frequency words but auditory comprehension and naming of low frequency words was severly disrupted. In test conditions he often responded to questions in a theatrical way with comments such as “What do you say, I have difficulties to comprehend”. The linguistic symptoms were inconsistent and fluctuated over time. When the patient was distracted, no comprehension problems were found. At six weeks postsurgery the naming problems were still present but resolved after six months. Auditory comprehension remained normal. Postoperative MRI showed the resection cavity in the anterior temporal area (figure 1B). Anatomopathological analysis revealed an astrocytoma grade II with grade III foci.

Discussion

In this case study multiple findings support the hypothesis of a postoperative non-organic language component. First, the postoperative linguistic symptoms did not fit typical anatomoclinical expectations. In Mandonnet et al. (10) anomia was elicited after anterior temporal lobe stimulations, whereas at the subcortical level no language deficits were found. In our case the naming problems represent a possible postoperative finding while the auditory comprehension problems are hard to explain. Since the semantic network is distributed via parallel pathways (ILF, IFOF) and bilateral regions, the anterior subcortical temporal region is functionally dispensable (10,11).
Second, the linguistic characteristics were inconsistently present and strongly changed over time and condition which is a highly atypical phenomenon for an aphasic disorder. Third, comments indicating a good insight in the disorder are uncommon in patients with comprehension problems who often suffer from anosognosia. Finally, the patient witnessed comprehension problems in an aphasic relative. In the study of De Letter et al. (6) similar findings were mentioned; however, no comprehension problems were found.
As a possible explanation for the "psychogenic language problems" the following hypotheses will be discussed: 1) psychogenic language problems may be part of an acute stress disorder (the awake

setting); 2) psychological decompensation might have occurred since the patient was clearly informed that the tumour was situated near language regions; 3) language disturbances attract a lot of attention in the hospital and feeling of anxiety might have existed to return home;
4) unintended imitation of a witnessed aphasia in a relative might have played a role.
Careful evaluation and selection of the patients and good preoperative preparation seem to be fundamental for good tolerance during awake surgery. Moreover, in the postoperative phase assessments are necessary to diagnose patients with organic and non-organic language disorders in order to set up an appropriate treatment.

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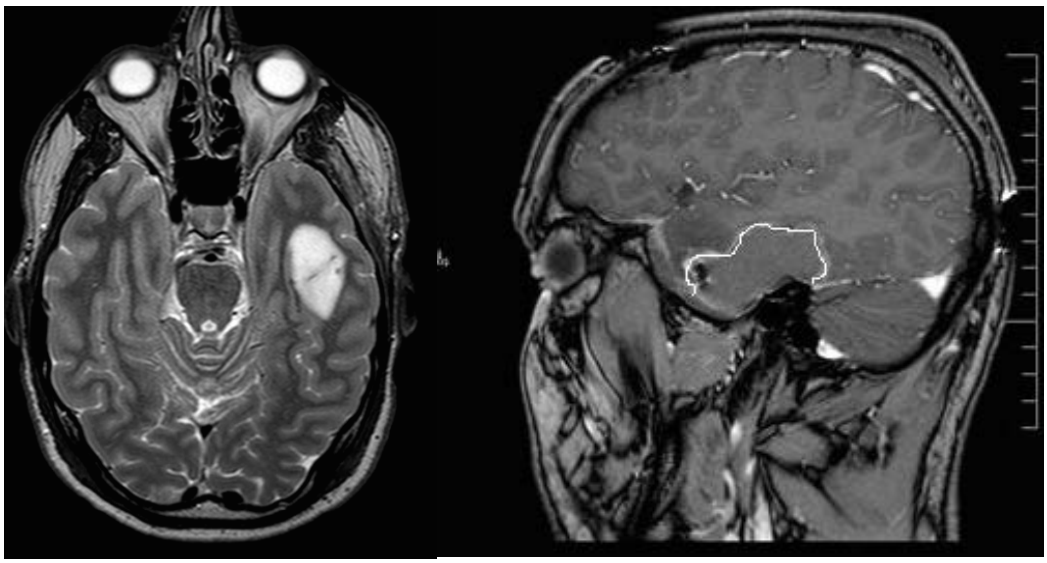
Figure 1



A B

The effects of direct and indirect speech on English discourse comprehension in aphasia

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Introduction

The distinction between direct speech (e.g., '*John said: "I am leaving"*') and indirect speech (e.g., '*John said (that) he was leaving'*) exists in many languages and has been an important focus in linguistic studies. Direct speech constructions are perceived as more vivid and perceptually engaging than their indirect speech counterparts (Wierzbicka, 1974; Macaulay, 1987), and have been claimed to be an effective device for storytelling (Li, 1986; Mayes, 1990; Wierzbicka, 1974). In a previous study, narratives containing direct speech constructions were shown to be easier to comprehend than narratives with indirect speech constructions for Dutch listeners with and without aphasia (Groenewold, Bastiaanse, Nickels, Wieling & Huiskes, in press). Two candidate explanations were proposed for these findings. First, the difference may be caused by the increase in liveliness that goes along with direct but not indirect speech. Second, the effect may be related to differences in grammatical complexity: In Dutch, the grammatical construction of indirect speech is more complex than that of direct speech, because the use of a complementiser is obligatory and the word order of the embedded sentence is non-canonical. Embedding has been shown to negatively affect sentence comprehension, at least in individuals with agrammatic aphasia (Abuom, Shah & Bastiaanse, 2013). The current study serves to disentangle the two candidate explanations by carrying out the same experiment in English, a language in which the difference between the two construction types is less marked grammatically.

Methods

We developed an English version of the DIrect Speech COmprehension test (DISCO, Groenewold et al., in press). Twenty native English speakers with aphasia and 19 neurologically healthy control participants were presented with spoken narratives that contained either direct or indirect speech constructions. Just like in the Dutch version of the study, the narratives were presented audiovisually on an iPad, and comprehension was assessed with yes/no-questions. Generalized linear mixed-effects regression modeling (GLMER) was used to analyse the English and Dutch data together. The following predictors were included: language (Dutch versus English), group (non-brain-damaged (NBD) versus aphasia) and condition type (direct versus indirect speech). Following Groenewold et al. (in press), we assessed whether random intercepts for participant, question and story were necessary. Furthermore, the necessity of random slopes was assessed to account for possible variability in the effects of certain predictors. In addition, an analysis focusing on only the individuals

with aphasia was conducted using Token Test error scores (Aachen Aphasia Test, Graetz, de Bleser, Willmes & Heeschen, 1992) as predictor in the model.

Results

First, the analysis showed a main effect of group on performance, indicating that, unsurprisingly, NBD participants performed better than participants with aphasia (β = 1.33, z = 6.34, p < .01). Second, there was a main effect of language, showing that English-speaking participants performed worse than Dutch-speaking participants (β = 0.47, z = 2.50, p < .05). Third, a main effect of condition was found, demonstrating that narratives containing direct speech were easier to comprehend than narratives with indirect speech constructions (β = 0.26, z = 2.59, p < .01). There were no significant interactions between predictors. A subsequent analysis including only individuals with aphasia showed that a higher Token Test error score had a negative impact on the probability of answering a DISCO question correctly (β = -0.04, z = -4.43, p < .01). Furthermore, for the English-speaking individuals with aphasia there was no effect of condition (p = 0.67), whereas for the Dutch-speaking participants with aphasia the direct speech condition was significantly easier than the indirect speech condition (β = 0.40, z = 2.46, p < .05).[1]

Discussion

The findings of the Dutch version of the DISCO study (Groenewold et al., in press) were expanded in the current study: narratives containing direct speech are easier to comprehend than narratives containing indirect speech for both Dutch- and English-speaking participants. However, subsequent analyses focusing on the individuals with aphasia only showed that this general pattern did not hold for the English-speaking participants with aphasia. Therefore, it seems unlikely that liveliness is the crucial factor for the differential effects of direct versus indirect speech constructions on discourse comprehension since the difference in liveliness between conditions is similar across languages. The finding that liveliness is not the decisive factor for comprehension success is in line with results of previous research: Groenewold, Bastiaanse, Nickels & Huiskes, (in press) showed that both aphasic and NBD communication is perceived as more lively when it contains direct speech than when it does not, but yet is not more comprehensible. Instead, the differential patterns favor a grammatical explanation. In Dutch direct speech, after the finite verb ‘says’ it is immediately clear that the object should be interpreted as a direct quote, and in Dutch indirect speech the object embedded sentence is unambiguously an indirect speech quote, introduced by the complementiser ‘that’. Hence, in both condition types the structure of the sentence is immediately clear to the listener. In English, however, if the complementiser introducing indirect speech is omitted, as is common practice in colloquial English (Biber, Johansson, Leech, Conrad & Finegan, 1999) and the case in our narratives, the status of the object remains ambiguous: it can either be a direct speech quote or an embedded object in indirect speech. This ambiguity makes the sentence harder to parse, and the extra parsing effort may nullify the lack of embedding in the direct speech condition for listeners with aphasia.

[1]There was not enough support to distinguish the English-speaking participants with aphasia from the other groups in the overall analysis including the NBD participants.

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Facilitation effect in proper and common noun naming

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Introduction

Proper and common nouns have long been recognised as different lexical-semantic categories within the lexical-grammatical class of nouns. Empirical studies have shown smaller numbers of tip-of-the-tongue (TOT) states for common nouns, in comparison to proper nouns, in non-brain-damaged speakers (e.g., Valentine & Moore, 1995), and higher retrieval success rates for common nouns relative to proper nouns in people with aphasia (e.g., Semenza, 2009). However, the underlying causes of such discrepancies are yet to be confirmed.

In order to explain differences between proper and common nouns, some authors refer to their logical properties (e.g., Semenza, 2009). That is, common nouns refer to a category of beings or objects that share certain semantic properties, while proper nouns designate specific individual beings or objects with unique features. Under this account, proper and common noun processing is very likely to be accounted for by two separate mechanisms. Meanwhile, other authors attribute the distinction in processing to a number of statistical properties that differ across common and proper nouns, such as frequency, familiarity, and age of acquisition (Kay, Hanley, & Miles, 2001). Hence, the proponents of this account advocate for a single noun processing mechanism for these two noun classes, arguing that the differences in speech production can be accounted for solely by the statistical properties of the words.

The present study aims to contribute to our understanding of proper and common noun processing, using data from people with aphasia, and facilitation as a research tool. Facilitation refers to performing a task (repetition of a word) once, and examining its effects on later performance of another task (naming). Facilitation is suggested to be effective through the same mechanism as repetition priming. As suggested by Wheeldon and Monsell (1992), the repetition priming effect is grounded in the links between semantics and phonology. Impairments at the semantic level excluded, the damage in these links very often represents the underlying level of word-finding problems in people with aphasia. Moreover, temporary breakdown at this same level of processing causes TOT states in non-brain-damaged speakers. Hence, repetition facilitation presents a valid tool for investigating the differences between proper and common nouns.
The current study focuses on the following research questions: 1) Does facilitation of a target word influence subsequent word retrieval success rates for proper and common nouns? 2) If there is a facilitation benefit, is the size of this effect equal for proper and

common nouns? If the size of the facilitation effect for proper and common nouns proves to be different, this will support the claim of two different processing mechanisms for these two word classes. If, however, proper and common nouns are equally affected by facilitation, this can support either a single or dual processing mechanism: two separate mechanisms could be equally well facilitated with the same technique, or one single processing mechanism is facilitated for both proper and common nouns.

Methods

Participants

Four people with aphasia (one female) participated in the experiment. The participants' age range was 60-82 years: M = 72.25 (SD = 7.89). They were all more than 6 months post-onset, of mild to moderate severity, and all had word-finding difficulties. No selective impairments in proper or common noun production were observed. All participants had preserved repetition skills.

Procedure

A total of 239 pictureable common and 93 pictureable proper nouns of 1-4 syllables were selected for the study. The experiment consisted of the following stages. 1) *Naming pre-test*: participants were asked to name colour pictures of proper and common nouns. 2) *Recognition task*: those items that were not named on the first attempt were presented again and participants were asked whether they recognised the items. Only those items not named but recognised by participants were retained in the experiment. 3) *Facilitation*: half of the proper nouns and half of the common nouns were randomly selected for facilitation. Participants were asked to repeat the word after the experimenter in the presence of the picture. 4) *Post-facilitation naming*: both facilitated and unfacilitated items were presented for naming again. 5) *Familiarity judgments*: participants were asked to judge how familiar items were to them on the scale from 1 (completely unfamiliar) to 7 (very familiar). Individual familiarity ratings were used as subjective frequency measures in subsequent analyses.

Results

Three of the four participants (JS, JG, MR) demonstrated significant facilitation effects for both proper and common nouns (Fisher Exact, $p < .05$, all participants), with one (TB) showing significant improvement only for common nouns. The size of the facilitation effect for proper and common nouns was equal for each participant: JG (homogeneity test, $\chi^2(1) = 2.2$, $p = .14$, n.s.), MR ($\chi^2(1) = 0.06$, $p = .8$, n.s.), JS ($\chi^2(1) = 0.08$, $p = .78$, n.s.) and TB ($\chi^2(1) = 2.74$, $p = .1$, n.s.). There were significant overall facilitation effects for proper and common nouns combined across all the four participants for both common (Combined S test, $z = -6.6$, $p <. 0001$; see Leach, 1979) and proper nouns ($z = -4.75$, $p < .0001$). However, homogeneity tests found there was no evidence that the size of facilitation effects for proper nouns ($\chi^2(3) = 6.77$, $p = .08$), or common nouns ($\chi^2(3) = 4.53$, $p = .21$) differed across participants. Nor was there a significant difference in facilitation between proper and common noun conditions across participants ($\chi^2(1) = 1.69$, $p = .19$). See Figure 1. Further analysis is in progress evaluating potential effects of familiarity on facilitation.

Discussion

Preliminary results show that the size of the facilitation effect for proper and common nouns is equal. Therefore, we have no evidence to favour one or two processing mechanisms for proper and common nouns. However, what is clear is that proper nouns seem to respond in the same way as common nouns to facilitation, implying that treatment techniques based on repetition priming (e.g., repetition in the presence of a picture) should be equally successful for both noun types. More research is required to determine the exact role of logical properties in proper and common noun processing.

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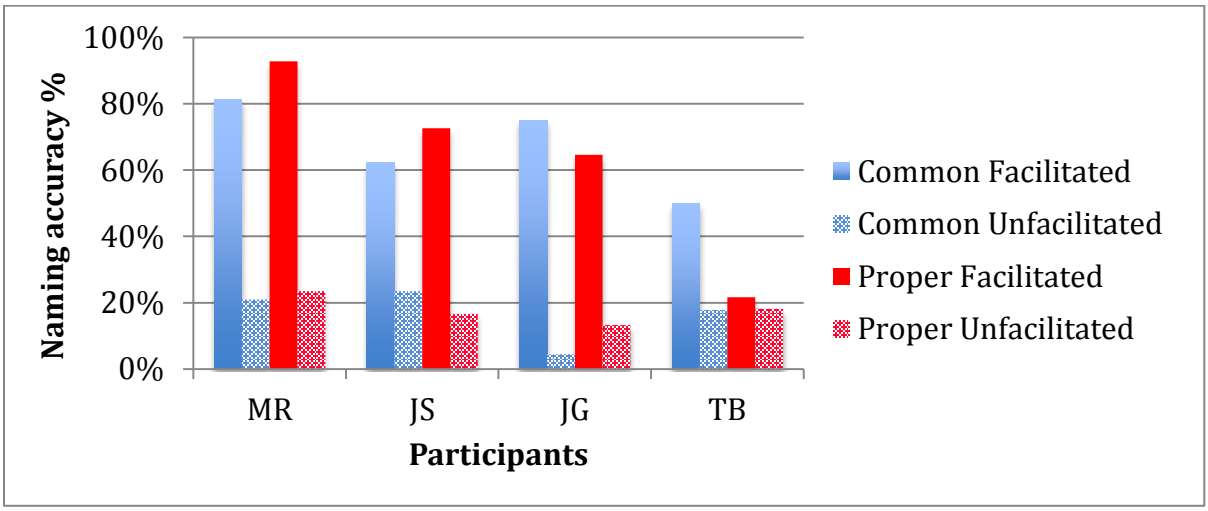

Figure 1: Accuracy of naming of facilitated and unfacilitated common and proper nouns (post-facilitation naming stage)

Relationship between semantic transparency of compound words and semantic processing skills in aphasia: Data from compound word reading

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Introduction

Studying complex words (e.g., compounds) provides a useful avenue to test theoretical constructs regarding the organization of mental lexicon, ways constituents are retrieved and produced, and ways by which cognitive mechanisms influence their processing and production (Li, Gagne & Spalding, 2011; Libben, 1998; Libben & Jarema, 2006). Research investigating the influence of semantic transparency (i.e., in context of compound words, the extent to which the meaning of the constituents is related to the meaning of the whole compound) on compound word processing in healthy adults has shown a facilitatory effect on word recognition for transparent compound (e.g., *blackboard*) over opaque compound (e.g., *hogwash*). It has been argued that for transparent compounds there is no conflict between the meaning of the constituents and the whole compound meaning. For opaque compound, there is an "integration cost" which arises due to the mismatch between the meaning of the compound and its constituents (Ji et al., 2011). Individuals with brain damage, such as, people with aphasia (PWA) provide an opportunity to test the locus of the "integration cost" in opaque compound, i.e., at what level of semantic processing (i.e., conceptual vs. lexical) is the effect originating. In this ongoing research, we tested the relationship between the semantic processing skills (assessed using various measures of conceptual and lexico-semantic processing) and ability to produce compound words with different semantic transparencies (i.e., transparent vs. opaque). To this end, we compared reading aloud performance (percent accuracy) for five PWA and 15 healthy age-matched adults on monomorphemic words (e.g., *giraffe*) and compounds words with varying semantic transparencies (e.g., transparent, *meatball* vs. opaque, *smallpox*).

Method

Participants and background semantic testing battery

Participants were five monolingual (two female, three male) British English speaking PWA in the age range 41 to 68 years (Mean age= 58.6 years; SD= 10.36), and were at least eight months post-onset to a single left hemisphere CVA. Along with aphasia examination to identify the type and severity of aphasia, each PWA was tested on several tests to measure conceptual and lexical semantic processing. The Pyramids and Palm Tree three written word version (PPT, Howard & Patterson, 1992) and several subtests from Psycholinguistic Assessment of Language Processing in Aphasia (PALPA, Kay, Lesser, & Coltheart, 1992) were used. Specifically, Reading Aloud of Words with varying imageability and frequency (PALPA 31), Written-Word Picture Matching (PALPA 48); Written Synonym Judgment (PALPA 50) and Word Semantic Association (PALPA 51) were administered. Four of the PWA participants demonstrated mild-moderate Broca's aphasia and one PWA was Transcortical Sensory aphasia.

Stimuli and Task

The stimuli from experiment 3 of Ji et al., 2011 were used for the present study. It was consisted of thirty triples of items that were selected from the CELEX database (Ji et al., 2011, Baayen et al., 1993) and consisted of monomorphemic word (e.g., *giraffe*), transparent compounds (e.g., *sunrise*) and opaque compounds (e.g., *dumbbell*). Classification of compound as opaque or transparent was based on Ji et al. 2011. Each triple was matched on lemma frequency, surface frequency, number of letters, and number of syllables. Constituent frequency of both constituents did not differ for the opaque and transparent compounds.

The participants were required to read aloud the words when they appeared on a laptop screen. Each word was presented for five seconds before automatically changing to a blank screen for one second. The responses were scored for accuracy and a percentage correct score was derived. The semantic transparency effect was defined as accuracy difference in score between transparent and opaque compound.

Results and Discussion

Table 1. Reading aloud performance (mean accuracy, % correct and standard deviations) for People with Aphasia (PWA) and healthy control speakers on monomorphemic, opaque and transparent compound words.

	Monomorphemic word	**Opaque compound**	**Transparent compound**
PWA (N= 5)	M= 98, SD= 1.83	M= 65.33, SD= 20.90	M= 94.66, SD=5.06
Healthy Control (N=15)	M= 100, SD= 0	M= 100, SD=0	M= 100, SD=0

Table 1 presents the mean percent accuracy on reading aloud of monomorphemic, opaque and transparent compounds by PWA and healthy control speakers. Due to lack of any variability in healthy speakers' data, we performed ANOVA only on PWA's data. A one-way ANOVA on PWA data showed a significant effect of word type [$F(2, 12) = 10.41$, $p<0.001$]. The post-hoc analysis revealed a strong semantic transparency effect for the compounds (i.e. Transparent – Opaque), transparent compounds were read significantly more accurately than opaque compounds ($p<0.01$). This illustrates in comparison to healthy control speakers (who showed no difference in the mean), PWA found it more difficult to produce opaque compound words and highlight a high "integration cost" in producing them. Another aim of this research was to understand the semantic transparency effect to the underlying semantic processing skills. Due to the small number of PWA, at this moment, we precluded statistical analysis. However, we noted the following trends in the data: PWA with greater semantic transparency effect showed lower performance on conceptual semantics (e.g., PPT) and greater imageability effects on (PALPA 31 and 50). Semantic transparency effect was not sensitive to simpler lexical-semantic tasks (e.g., Written-Word Picture Matching, PALPA 48). We are continuing this line of research by including larger number of participants with varying range of semantic difficulties as well as using other tasks (e.g., lexical decision) to pinpoint the locus of integration cost in neurologically impaired speakers with difficulties in semantic processing.

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Imageability and phonological neighborhood density effects in speech processing

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Introduction

The present paper aims to investigate how two different psycholinguistic factors (imageability and phonological neighborhood density) affect speed and accuracy in speech processing. Three speakers with aphasia, and 30 speakers without any known linguistic and cognitive impairments were tested in naming and recognition.

Previous research has shown that both high imageability (i.e. how easily a word gives rise to a sensory mental image) and high phonological neighborhood density (how many words that differ from a given word by only one phoneme) (PND) have a positive effect on lexical retrieval (Simonsen et al., 2013, Middleton and Schwartz, 2010), in terms of shorter reaction times and higher accuracy in naming studies. The same positive effect of high imageability has been seen in perception studies, whereas a high PND has shown opposite effects in recognition tasks, where it is argued that words with many phonological neighbors are competing against their neighbors for activation (Westbury and Moroschan, 2009).

Based on previous research the expected results would be that high imageability words would be recognized and produced faster than the low imageability ones. High PND words should follow the same pattern in production, but would be expected to have longer response latencies than low PND words in perception. These results should be similar for the informants with and without aphasia.

Methods

To investigate the combined effects of imageability and PND in speech production and -perception, two separate experiments were devised, one picture naming task and one lexical decision task. The participants were tested on a set of words that varied in both imageability and PND.

First a word list was devised, taking frequency, word length, part of speech, number of phonological neighbors and imageability into account. The words were then divided into four subgroups for testing: high-imageability and high-PND words, high-imageability and low-PND words, low-imageability and high-PND words, and low-imageability and low-PND words. Words from all four groups were tested in both the production and the perception task.

Production

All participants were tested on a picture naming task, executed on a computer. The answers were recorded and the results were scored for reaction time and accuracy. The pictures were simple color drawings and carefully selected to elicit only one response.

Perception

To test for imageability and PND effects in perception, an auditory lexical decision task was designed. The participants were given a forced choice task where they had to distinguish

between real and nonce, but phonologically possible Norwegian words. As for the picture naming task, the participants were judged both on accuracy and reaction times.

Results

The results from the two tests show that the speakers with and without aphasia follow the same response patterns, both in the picture naming and the lexical decision task, although the informants with aphasia have longer response latencies and less accurate answers than the informants without aphasia.

The results from the lexical decision task show that the groups have exactly the same time response latency hierarchy: High imageable words with many phonological neighbors are recognized faster than high imageable words with few phonological neighbors, followed by low imageable low PND words, and as last low imageable words with high phonological neighborhood density.

Similar to the results seen in the lexical decision task, the results from the picture naming task are comparable across informant groups, especially when it comes to accuracy. Overall, all informants made gave more non-target responses for words with low imageability and high PND, followed by the low imageability low PND word group. Most correct answers were given for words from the high imageability, low PND word group. As a group, the control subjects named words from high imageability, low PND environments faster than high imageable high PND words, followed by low imageable low PND words, and the least accurate word group by both informant groups (informants with and without aphasia) were the low imageable high PND words.

Discussion

Although the results showed no statistically significant interaction between imageability and phonological neighborhood density in either speech production or perception, for either of the informant groups, there is a tendency for high imageability words to be recognized and produced faster than low imageability words. Also, when the imageability is low, high PND does slow down not only the recognition, but also the production of words. The similar patterns observed across word groups and informant groups show us that there is a reason to study normal and atypical language behavior together. The results from this study can be taken to suggest that the fundamental similarities observed between the informants with and without aphasia speech processing is controlled by the same mechanisms in speaker with acquired language impairments and neurologically healthy speakers.

The significant differences between high and low imageability words, but not between imageability and PND, show us that imageability is a semantic/conceptual factor that affects the processing speed and accuracy for both neurologically healthy and language impaired speakers

One remarkable result was that words with high PND and high imageability were faster and more accurately recognized than words with low PND and high imageability in the auditory lexical decision task, although one would expect the high-PND words to have longer reaction times than low-PND words. For both the informants with aphasia and the control group imageability behaves according to the predictions, but phonological neighborhood density show a different pattern than what was expected. One possible explanation for this is that the word's imageability is more important for processing than its phonological properties.

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Foreign Accent Syndrome: a typological overview

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Introduction

Foreign Accent Syndrome (FAS) is a motor speech disorder which causes patients to speak their native language with an accent different from speakers belonging to the same language community: the patient lacks the ability to make the phonemic and phonetic contrasts of his/her native language and demonstrates suprasegmental alterations which cause listeners to perceive the accent as distinctly 'foreign'. In 1982, Whitaker proposed 4 diagnostic criteria for FAS: 1) the accent is considered by the patient, acquaintances and investigators as foreign, 2) it is unlike the patient's accent before the insult, 3) the accent is clearly related to central nervous system damage, 4) there is no evidence in the patient's background of him/her being a speaker of a foreign language (pp. 197-198). Although FAS of "acquired neurogenic origin" is the most common variant of the disorder, there exists a "developmental", "psychogenic" and "mixed variant" as well (Verhoeven and Mariën, 2010).

In FAS of *neurogenic* origin the foreign accent is incited by a lesion affecting the central nervous system, often a stroke or brain trauma. However, FAS has also been attested in relation to MS (Villaverde-Gonzalez et al., 2003), tumor (Masao et al., 2011; Tomasino et al., 2013; Abel et al., 2009), as well as other pathologies affecting the CNS. *Developmental* FAS can be regarded as a subtype of neurogenic FAS; only here it is developmental in nature, affecting speech as it develops. In the *psychogenic* variant, a psychological/psychiatric disorder incites FAS, whereas the *mixed* variant is originally neurogenic in nature, but the accent change has such a profound effect on the patient's psychological status that he/she internalizes it by further developing the accent in order 'to create a more "believable" personality' (Verhoeven and Mariën 2010, p. 600)

Methods

We examined the over 100 published authentic case studies stretching a period from 1907 to 2013 in order to present a general overview of the typology of FAS. The three main subtypes – *neurogenic* (with inclusion of the developmental variant), *psychogenic* and *mixed* FAS – are exemplified and compared by means of three illustrative case studies, including two new ones: a case of psychogenic FAS and developmental FAS.
RC is a 41-year-old, right-handed, monolingual English-speaking woman from the UK who started talking with a Polish/Croatian accent after a long period of migraine. JD is a 17-year-old, right-handed, monolingual Dutch-speaking Belgian boy who developed FAS in the context of developmental articulation disorder: childhood apraxia of speech. Both patients received a complete neuroradiological, neurological, neurocognitive and neurolinguistic work-up, which allows to further digress on the diagnosis, pathological substrate(s),

comorbid speech- and language disorders, as well as the segmental and suprasegmental characteristics associated with FAS.

Results

Analysis of the literature reveals that 83% of the published cases (*n*=89) presented neurogenic FAS, whereas 12% of the patients (*n*=13) developed psychogenic FAS. Only 2% of the cases (*n*=2) match 'mixed FAS'. For three cases (3%) authors did not state a clear aetiology (*n*=3). With respect to the diagnosis, the criteria presented by Whitaker (1982) only hold for cases of *neurogenic* FAS. Whitaker's last criterion, concerning the 'second language history' of patients, seems to be outdated in a largely multilingual society. We know of FAS patients whom gave proof of a '*reversed accent*' (e.g. Roth et al., 1997; Verhoeven and Mariën, 2010; Levy et al., 2011).

Neurogenic FAS often occurs as a result of a stroke (87%, *n*= 77), or a brain trauma (13%, *n*= 12) commonly affecting the left prerolandic motor cortex, frontal motor association cortex or striatum of the language-dominant hemisphere (Lewis et al., 2013; Verhoeven and Mariën, 2010; Dankovičová et al., 2001). In psychogenic FAS, the motor speech disorder is often incited by a conversion disorder (Verhoeven et al., 2005; Jones et al., 2011; Haley et al., 2010, Tsuruga et al., 2008; *n*= 4), schizophrenia (Reeves and Norton, 2001; Reeves et al., 2007; *n*=2), bipolar disorder (Poulin et al. 2007; Reeves et al., 2007; *n*=2), mania (Lewis et al., 2013; *n*= 1) or an obsessive-compulsive disorder (Polak et al., 2013; *n*=2).

C had an unremarkable medical history. She underwent structural imaging (MRI), as well as a Tc-99m-ECD SPECT, which both appeared normal. Neurocognitive work-up revealed that she had a normal IQ and normal neuropsychological profile. Clinical psychological investigations through administration of Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ; Livesley and Jackson, 2009), Minnesota Multiphasic Personality Inventory-II (MMPI-2; Butcher et al., 1989) and Defense Style Questionnaire-60 (DSQ-60; Trijsburg et al., 2003) did not disclose any clinical syndrome (DSM-IV-TR Axis I) or personality disorder (DSM-IV-TR Axis II) that could be objectively asserted with enough certainty, although conversion disorder was suspected: four out of the six DSM-IV-TR criteria for conversion disorder were met (APA, 2000). The patient mentioned that she suffered from migraine attacks, which aggravated her accented speech and severely diminished speech fluency, as well as intonation. She did not present any supplementary comorbid speech or language disorders, such as dysarthria (e.g. Graff-Radford et al., 1986; Monrad-Krohn, 1947; Berthier et al., 1991), aphasia (e.g. Ingram et al., 1992; Ardila et al., 1988; Gurd et al., 1988) or apraxia of speech (e.g. Ingram et al., 1992; Aronson 1980) as often found in neurogenic patients, which further corroborated the hypothesis of a psychogenic origin.

JD's medical history was also unremarkable. Except for his articulatory development, all developmental milestones were acquired within the accepted timespan. JD received speech-language therapy as of the age of five, and had always presented with a French accent. He underwent EEG, MRI and Tc-99m-ECD SPECT, but no abnormalities were detected. Neurocognitive work-up demonstrated verbal and performance IQ levels within the normal range. During neurolinguistic exam, JD gave proof of a deviant pronunciation, characterized by wrong accent

placement (words), omissions and substitutions of consonants, and phonematic errors. Based on these clinical observations JD was diagnosed with a verbal dyspraxia.

Discussion

In this contribution we describe recently acknowledged FAS typology by means of two representative cases: a patient with psychogenic FAS and an example of developmental FAS. Our study provides evidence that the FAS criteria proposed by Whitaker are questionable and in need of review. Secondly, clinical evidence was found to confirm that FAS may occur on a developmental basis (Mariën et al., 2009). JD indeed presented FAS in a context of a developmental motor speech disorder, namely childhood apraxia of speech, as was determined after a clinical neurolinguistic investigation. As such, this case plays an interesting part in the on-going debate relating to the semiological resemblances between FAS and AoS; a hypothesis that has been supported by several researchers (Whiteside and Varley, 1998; Fridriksson et al., 2005; Mariën et al., 2009), but has also been contested (Pyun et al., 2013; Blumstein and Kurowski, 2006). For the case of RC the linguistic data, course and outcome of accent were highly indicative of a psychogenic aetiology, regardless of the fact that psychological testing could not lead to the diagnosis of a 'demonstrable' psychological/language disorder.

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The Italian version of the Communication Outcome after Stroke (COAST) scales for patients and caregivers

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Introduction

Recent years have witnessed increasing attention to social well-being and its inclusion in the notion of health, defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). Communication fits this scenario, as it resides at the core of our social lives and its impairment often results in a significant loss in terms of quality of life and costs for the affected persons, their families and the society at large. Hence the need to develop adequate tools to measure the disabilities affecting daily communicative tasks, and the consequence in terms of caregivers' burden.
Attempts to measure communication beyond competence in structural and formal aspects of language are reported since the early Eighties. A number of tests were developed targeting the so-called pragmatic abilities, context-dependent uses of language (Adams 2002). Although very useful, these tests usually measure communicative competence at a high level of linguistic sophistication (e.g., figurative language comprehension and features of discourse production), rather than language-related activities in social contexts.
Other scales more specifically target what has been called "functional communication", i.e., "the ability to receive or to convey a message, regardless of the mode, to communicate effectively and independently in a given natural environment" (ASHA 1990). Among these, the Communicative Effectiveness Index (CETI, Lomas et al. 1989), the Quality of Communication Life Scale (ASHA QCL, Paul et al. 2004), and the Communication Outcome After Stroke scale (COAST, Long et al. 2008).
In this study we aimed at providing Italian clinicians with a tool to measure functional communication, since none is currently available. Towards this end, adapting the COAST scale appeared as the best choice, since (i) it is applicable to several clinical populations affected by communication deficits, (ii) it has a specific focus on the quality of life and (iii) it is coupled with a scale for caregivers (Carer COAST; Long et al. 2009).

Methods

Patient sample

The COAST scale was administered to 30 patients with stroke (n=22), meningioma (n=3), or traumatic brain injury (n=5). All patients received a diagnosis of aphasia, with different

degrees of severity, based on the AAT test (Luzzatti et al. 1996). Time from the acute event ranged from 3 months to 4 years. The Carer COAST scale was administered to 28 caregivers.

Materials

The COAST scale is designed to measure the patient's communicative effectiveness from the point of view of the patients themselves, and includes three subscales: interactive communication (questions 1–12), overview of communication (questions 13–15), and impact of communication problems on the patients' quality of life (questions 16–20). Each of the 20 question items comprised a 5-point Likert response scale. The Carer COAST has the same structure, with the third part assessing the impact of the patient's communication on the carer's own quality of life.

Translation procedure

The translation was completed by two linguists, native speakers of Italian. One major modification concerned the structure of the questions: while English employed quantificational elements (e.g., "In the past week or so, *how well* could you have a chat with someone you know well?"), for Italian more natural constructions were adopted, with no quantification in the question, in order to assure the understanding for the parents or caregivers (e.g., "Nei giorni scorsi, riusciva a chiacchierare con le persone che conosce bene?"). Special care was devoted to adapting the verbalization of the 5 point scale. The draft of the scales underwent back-translation to avoid misinterpretations. Based on this feedback, further adjustments were adopted. Pictures accompanying the question items were modified according to the Italian socio-cultural context.

Results

The Italian version of the COAST scale showed very high internal consistency ($\alpha = 0.94$ both at visits I and visit II) and test-retest reliability ($r = 0.80$). The COAST Carer showed similar psychometric properties for internal consistency ($\alpha = 0.94$ at visit I and 0.95 at visit II) and test-retest reliability ($r = 0.89$). The two scales showed a good overall correlation ($r = 0.70$ at visit I and 0.72 at visit II).

Discussion

The results indicate that the Italian versions of the COAST scales are valid and reliable tools to assess the patient's perception of the communicative deficit and its impact in daily-life activities. Including the caregivers' perspective represents a major step toward a more serious consideration of the burden following aphasia and communication disorders, in terms of quality of life. Furthermore, the scales are easy and rapid to administer. We thus believe that the COAST scales could be easily introduced in the clinical practice, complementing traditional language assessment with a more integrated perspective on communication.

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Assessment of Aphasia in Portugal: Past, present and future

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Introduction

Aphasia is a common consequence of stroke, affecting one third of the stroke population (Darrigrand et al., 2011; Kelly, Brady & Enderby, 2010). In Portugal, stroke is the first cause of death (DGS, 2008) and disability (DGS, 2010; Martins, 2006). Due to the increased survival and growth of the elderly population in Portugal, its prevalence has been increasing, causing a tremendous impact not only on the individual but also in their own family and in general society (DGS, 2006).

According to the *International Classification of Functioning, Disability and Health* (ICF) (WHO, 2001) framework, health professionals need to consider, in their intervention with an individual, the consequences of a disease in its different domains, including in their *Body Functions and Structures*, *Activities* and *Participation* in daily real life situations. Considering that the choice of goals and intervention approaches to use in therapy with people with aphasia (PWA) is strongly influenced by the initial assessment performed (Kagan & Simmons-Mackie, 2007), assessment of aphasia should include measures that evaluate each component of the ICF framework. Failure to consider these components may result in under or overestimation of how individuals with aphasia are functioning in their daily environments and relationships (Murray & Coppens, 2013).

Overall, there is increasing interest in the usage of aphasia assessments in clinical practice in acute and rehabilitation settings (Rose et al., 2014; Simmons-Mackie, Threats & Kagan, 2005; Verna et al., 2009; Vogel et al., 2009). Many aphasia assessment tools have been developed and described in literature considering the ICF framework (Brown, Dijkers et al. 2004; Long, Hesketh et al. 2007; O'Halloran, Worrall et al. 2004; Simmons-Mackie, 2011; Swinburn & Byng 2006). In Portugal, the existing literature on the topic of assessment of aphasia is scarce. The existing tools used by speech and language therapists (SLTs) in clinical practice with PWA don't enable therapists to assess all the ICF framework components, which may limit a broader intervention that integrates these directives (Matos, 2012). However, in the

last decade, there have been many research studies that have been undertaken with the aim of filling the gap of assessment tools in this field in Portugal, particularly projects aimed at translating and adapting different language assessment tools to the Portuguese reality.

Aim

The aim of this work is to explore the aphasia assessment tools available in Portugal.

Methodology

In order to answer this question, a literature review was conducted to identify all the studies that report the development and/or translation and adaptation of aphasia assessment tools to European Portuguese. A search was conducted in the following databases: Medline; Pubmed; B-on; Scielo; Databases of Portuguese journals related with health and social sciences; and the National (scientific) open access repository. Papers published in English or European Portuguese were considered. Searches were conducted using the following keywords: “aphasia”; “assessment”; “assessment of aphasia”; “translation and adaptation of assessment tools”; “aphasia assessment in Portugal”; and “aphasia screening test in Portugal”. The same words and equivalent expressions were used in European Portuguese.

Results

A total of 20 assessment tools were identified (see Table 1). Ten (10) of these tools are impairment-based namely: BAAL (Castro-Caldas, 1979; Damásio, 1973; Ferro, 1986); PAAT (Lauterbach, Martins & Ferreira, 2004); PAL-PORT (Festas et al. 2008); SADQ Portuguese Version (Rodrigues, Santos & Leal, 2006); PALPA-P (Castro, Caló & Gomes, 2007); Bateria de Evaluación de la Afasia e Transtornos Relacionados (Pestana, Maia, Leite & Silva, 2008); MMSM (Matos, 2012; Matos & Jesus, 2011b); PLINC (Santos, Neto, Loff, Velez & Leal, 2013); BL Portuguese Version (Cruz, Santos, Reis & Faisca, 2014); Token Test (Renzi & Faglioni 1978) – Versão Portuguesa (Jesus & Aguiar 2014). Four (4) assess activity limitations, namely: EFA (Leal et al. 2006); ASHA-FACS Portuguese Version (Leal & Sancho, 2013); FAI – Portuguese Version (Jesus, Marques, Roberto, Rosa, & Patrício, In Press; Martins, 2006; Martins, Ribeiro & Garrett, 2003); BI – Portuguese Version (Jesus, Marques, Roberto, Rosa, & Patrício, In Press). Four (4) assess activity limitations and participation restrictions: POPS – Portuguese Version (Matos, 2012; Matos & Jesus, 2011c; Matos, Jesus, Cruice, & Gomes 2010b); TAPP (Matos, 2012; Matos & Jesus, 2011d; Matos, Jesus, Cruice, & Gomes 2010a); COAST – Portuguese Version (Jesus, Silva & Patrício, In Press); CDP – Portuguese Version (Matos, 2012; Matos & Jesus, 2011a; Matos, Jesus, Cruice, & Gomes 2010b). The CDP also assesses contextual factors. One instrument assesses barriers and facilitators (Matos & Jesus, 2013).

Finally, one tool (beyond the ICF), the SAQOL 39 – Portuguese Version (Rodrigues & Leal, 2013), assesses quality of life.

Discussion & Conclusions

According to Leal et al. (2014), the most used assessment tools by Portuguese SLTs (N= 55) to evaluate aphasia are the BAAL, the AAT Portuguese version, the EFA, and the PALPA-P. SLTs also use informal assessment tools developed or translated by themselves. However, based on the current review, ten (10) of the available aphasia assessment tools in Portugal were translated and adapted and/or created after 2008, which may explain these results (data presented by Leal et al. (2014) was collected in 2007). According to the same study (Leal et al. 2014), Portuguese SLTs' practice is characterised by the Rehabilitation Model (Worrall & Hickson, 2003) and focuses on the activity level, and future reviews of practice in coming years are likely to reflect assessments usage that supports this. The results in our study show a change in the focus of intervention of Portuguese SLTs with people with aphasia, considering the consequences of aphasia in a broader perspective, as suggested by the ICF. The most recently developed assessment tools are centred in activity limitations, participation restrictions, contextual factors and quality of life. Many of these assessment tools' psychometric properties are still being studied.

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Lexical-semantic deficits in Mild Cognitive Impairment: the case of abstract vs. concrete nouns

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Introduction

The term Mild Cognitive Impairment (MCI) refers to a condition between normal aging and dementia (Chertkow, 2002). When MCI individuals demonstrate impairments in other-than-memory domains, including language, they are more likely to develop dementia than are those with pure memory impairment (Petersen, 2003). Thus, understanding the nature of language impairment and possibly identifying sensitive measures of linguistic impairment constitute a vital tool in early detection of dementia. While there exists plentiful evidence of language deficits in MCI mainly from standardized assessment tools (for a review see Taler & Phillips, 2008), psycholinguistic studies of language processing are scarce. The few studies that have employed psycholinguistic methodology have revealed disturbances in performance mainly at the *lexical-semantic level* (Olichney et al, 2002; Puregger et al, 2003; Davie et al, 2004; Taler & Jarema, 2004; 2006; Duong et al, 2006) reflecting an impaired semantic network in this population. One important dimension of previous research is that, with few exceptions, most studies have employed off-line measurements, thus, only targeting "controlled" and not automatic processing.

In this context, the present study examines aspects of automatic lexical processing in MCI patients by looking at their performance in processing concrete and abstract words (e.g. *table* vs. *love*) in Greek. The goal of the study is to detect whether there is an advantage in processing concrete words as it is the case with healthy populations (James, 1975, Kroll & Merves, 1986, Degroot, 1989) and other brain-damaged populations (Franklin et al., 1994, Hoffman & Lambon Ralph, 2011) or if there is a reversal of concreteness effects Breedin et al., 1994, Grossman & Ash, 2004, Macoir, 2009, Papagno et al., 2009). Results will shed light into the alleged decay of lexical representations of this population, thus contributing to the establishment of the nature of linguistic deficits seen in MCI. Moreover, by employing on-line chronometrized tasks we attempt to detect differences between MCI and healthy populations in more subtle aspects of pseudo-word processing.

Methods

Participants

So far, 2 male healthy volunteers (age 59 and 58) and 4 female individuals with MCI (aged 57-84) participated in the study. Testing is still being carried out targeting a total of 15

participants for each group. Patients were recruited from the Memory Clinic of the University Hospital in Patras. All of them were diagnosed by a neurologist or a neuropsychologist at the Memory Clinic. Their performance was examined by a variety of neuropsychological tests translated and adapted for Greek. All patients performed below the proposed cut-off scores (average MMSE: 25.2), indicating the presence of cognitive disturbances.

Materials and procedure

Materials comprised a total of 240 words, out of which 60 were concrete primed either by their synonyms (A), or by a control (B) and 60 were abstract primed either by their synonyms (C) or by their controls (D). The stimulus set also included 64 fillers (E) and 64 non-words (F). All words were matched for frequency, length, phonological and orthographic neighbors.
A. **concrete primed by synonym** (*lithos > petra* "stone") (n=30)
B. **concrete primed by control** (*kapelo "hat" > petra "stone"*) (n=30)
C. **concrete primed by synonym** (*talento > xarisma* "talent") (n=30)
D. **concrete primed by control** (*trapezi* "table" > *xarisma* "talent" (n=30)
E. **Fillers** (*koubi* "button" > *kladi* "branch") (n=64)
F. **Non-Words** (*koubi "button" > *kradi* "branch") (n=64)
All stems of pseudo-words were matched on average for frequency and the actual pseudo-words were also matched for length and number of syllables. Materials were divided into two lists so that each participant saw all targets just once.

Study 1 – lexical decision task with semantic priming: The experiment was run on an IBM computer using E-prime professional. Stimuli were presented at the center of a computer screen in black font on a white background and were randomized for each participant. Participants first saw an asterisk (*) at the centre of the screen for 200ms, then the prime for 250 ms followed by a pause of 100ms and then the target for which they had 3000ms to reply.

Study 2 – lexical decision task with repetition priming: The experiment was run on the same computer with the same procedure as experiment 1. The only difference was in conditions A and C above where targets were primed by themselves, e.g. *petra > petra* "stone", *talento* "talent" > *talento* "talent".

Predictions

For both experiments we predict longer RTs for the patients compared to controls given their degraded semantic memory and processing resources required for the lexical decision task. Regarding the distinction between concrete and abstract in *semantic priming* (study 1), we predict either no benefit for either category (based on Nakamura et al., 2000 and Ober & Shenaut, 1988) which would reflect patients' inability to benefit from semantic cues or a bigger facilitation for the less impaired category, presumably concrete words.

In case of *repetition priming* (study 2)*,* we expect the reverse pattern, that is bigger facilitation for abstract words given that this category appears to be more impaired in populations with semantic deficits. This prediction is based on Cumming et al (2006: 224), according to who more impaired categories benefit from immediate repetition.

Results

Semantic Priming: Priming effects in ms are displayed in Table 1. While for controls there was facilitation for both types of stimuli, for patients significant facilitation is observed only for *abstract* targets but not for concrete. **Repetition Priming:** Priming effects are displayed in Table 2. Equal facilitation is observed for both groups of participants and for both groups of target words.

Discussion

Combined results from both studies shed light into the issue of mental representation of concrete vs. abstract words by providing evidence from on-line processing. While *repetition priming* revealed no difference between these two categories (both of them benefited by immediate presentation), *semantic priming* showed an advantage for abstract nouns compared to concrete ones. This is an indication that abstract features might have been better retained and, consequently, they are more easily accessible to patients. If this is the case, then we have an indication for a reversal of concreteness effect in MCI.

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Semantic Priming: Priming Effects in ms		
Prime >Target	Abstract Target	Concrete Target
MCI	74*	28
Control	46*	45*

Table 1: priming effects in Semantic Priming

Repetition Priming: Priming Effects in ms		
	Abstract Target	Concrete Target
MCI	93*	122*
Control	56*	67*

Table 2: Priming effects in Repetition Priming

Outcome of computer-assisted treatment in a case of non-fluent primary progressive aphasia with apraxia of speech.

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Introduction

Primary progressive aphasia (PPA) is a clinical syndrome first describes in 1982 by Mesulam in which patients present a progressive language alteration despite preservation of other cognitive functions. Among the different signs and subtypes of PPA a progressive apraxia of speech can also occur. One central question is whether neuro-rehabilitation may have a positive impact despite the fact that progressive worsening characterises these neurodegenerative syndromes. Some studies focused on treatment of patients with PPA (Beeson et al., 2011; Henry et al., 2013; Henry, Beeson, & Rapcsak, 2008) and only few studies explored therapies approaches to improve speech production in individuals with progressive apraxia of speech (Henry et al., 2013). These studies show a positive impact of treatment with improvement in targeted language functions. The purpose of this research is to investigate the outcome and the event-related electrophysiological (ERP) correlates of a computer-assisted naming and reading treatment in a woman with an 8 years history of non-fluent primary progressive aphasia with apraxia of speech (PPA-AOS).

Method

Case study

IF is a right-handed 67 year-old French-speaking woman, retired social worker. She reported some "struggling" on words that started insidiously about eight years ago especially in stressful situations as public talk and increased during the last 2 years. Neuropsychological examination (6 months before treatment) showed mainly phonetic transformations in spontaneous speech, effortful oral production with phonemic errors in repetition and reading aloud tasks of words and sentences and a discrete oro-facial apraxia with a low verbal diadocokinetic rate. To a lesser extent, words finding difficulties in picture naming were also observed with long latencies, semantic and phonological paraphasias and successive approximations. Other language tasks and cognitive functions were preserved. Cerebral MRI showed left frontal-peri-insular atrophy with an anterior-posterior gradient. A probable non-fluent progressive aphasia associated with a progressive apraxia of speech is suspected.

Assessment and treatment

The assessment material consisted of two matched lists of 60 abstract tri-syllabics and quadri-syllabics words (reading task) and two matched lists of 50 concrete imageable 2-, 3- and 4-syllable words and their corresponding pictures (picture naming task). Assessments session occurred at baseline (pre-test) and after each training period (post-test 1 and 2). Each assessment sessions was coupled with EEG recording during word reading and picture naming. The patient was involved in two one-month lasting twice a week treatment periods: the first one consisted on the production of one list of 60 tri and quadri-syllabics words elicited with a reading task. After the first post-treatment assessment, she underwent a second treatment period on the second reading list as well as on one of the two picture naming lists. The period ended with the third assessment on the whole reading and naming stimuli.

Results

Results (see Figure 1) showed a reduction of production errors in the reading task after each of the two training periods (Mc Nemar test; *p=.02*). Accuracy in the naming task were unchanged after the first period where naming was untreated and improved after the second training period (Mc Nemar test; *p=.04*). Similar results were observed on production latencies with reduction in reading after the first training period only (t(116)=2.94, *p<.01*) and in naming after training (second period, t(56)=3.26,*p<.01*).

Discussion

Behavioural results showed a specific effect of both treatment tasks (naming and reading aloud) in a patient presenting PPA with a significant reduction of both lexical and phonetic errors and decrease of RT after training. This confirms that patients with degenerative disease such as progressive aphasia with apraxia of speech can benefit from home-delivered computer-assisted treatments. ERP results and follow-up assessment are currently being analysed to better understand the dynamics of the observed behavioural changes.

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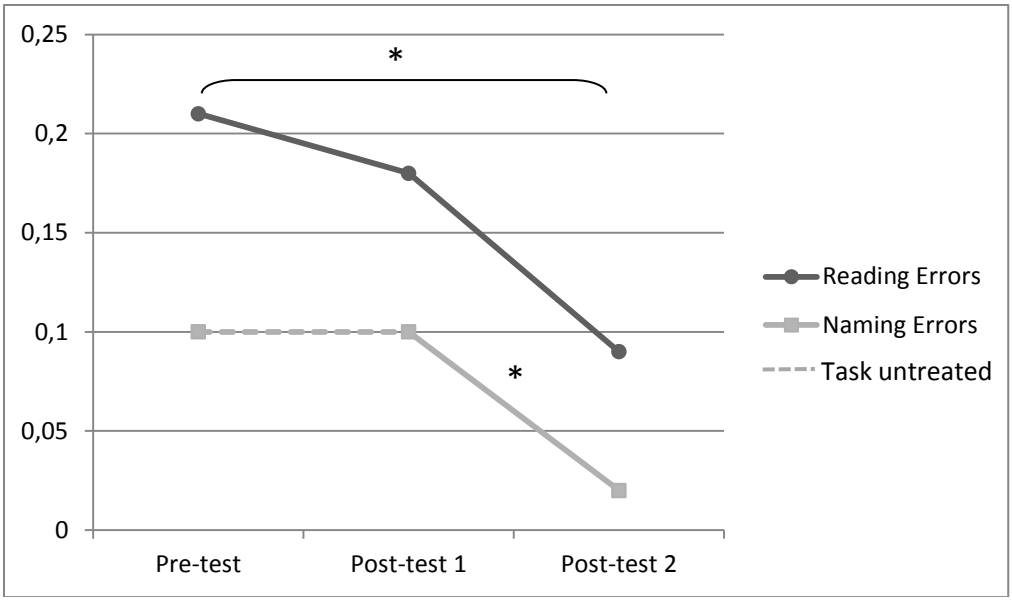

Figure 1. Mean error rates in naming and reading aloud tasks at each assessment session

Associative learning and retention of novel labels for novel visual referents in patients with chronic aphasia

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Introduction

The acquisition of novel words is an essential aspect of language learning; it encompasses different cognitive abilities and entails learning the association between the perceptual features of objects and the phonological form of words (Gupta & Tisdale, 2009; Rodríguez-Fornells et al., 2009). The investigation of novel language learning is crucial to further understand the mechanisms underlying lexical and semantic re-learning in chronic aphasia. Only few studies using both novel words and referents have demonstrated that some patients with aphasia can learn novel vocabulary after training (Kelly & Armstrong, 2009) and maintain these novel vocabulary traces in the long-term (Tuomiranta et al, 2012; 2014). Yet, previous investigations have examined novel word learning ability only in the context of single word-object pairings.

We aimed to examine associative learning of novel word-referent mappings in people with chronic aphasia using a more natural language learning approach. We used a word learning paradigm that presents novel words combined with a limited set of different possible referents, calling for evaluation of these word-object relationships on the basis of contextual feedback. Additionally, we studied the involvement of language processing abilities and short-term memory (STM) in this form of novel language acquisition.

Methods

Participants

The full sample consisted in three groups: 45 young adults recruited to validate the experimental task, 14 participants with stroke-induced chronic aphasia and 14 healthy controls matched for gender, age and education.

Aphasia was diagnosed using versions of the Boston Diagnostic Aphasia Examination (BDAE; Goodglass, Kaplan, & Barresi, 2001) and the Western Aphasia Battery-Revised (WAB-R;

Kertesz, 2006). Additional subtests of the Temple Assessment of Language and Short-term memory in Aphasia (TALSA; Martin, et al., 2010) were used to evaluate phonological discrimination, repetition and STM in 11 patients with aphasia.

Experimental task

The experimental task was similar to that reported by Mirman et al. (2008). The stimuli were six trisyllabic pseudowords and six black and white outline drawings of novel objects from the Ancient Farming Equipment test (Laine & Salmelin, 2010). In each trial, the participant was presented with two novel objects (target and foil) and a spoken word that corresponded to one object of the pair, and needed to decide whether the word was the label for the object on the left or right side of the screen by pressing a button. Visual feedback was provided after the response: a happy face for correct word-object associations and a sad face for incorrect associations. The task consisted of 210 trials distributed across 7 learning blocks. The 30 learning trials within each block resulted from the combination of each object with the remaining 5 objects yielding 5 object-pairs. These object-pairs were exhaustively associated with the 6 to-be-learned words. The position of the target object was counterbalanced across trials, and trials were pseudo-randomized for each participant. Recall was measured immediately after learning and 1 week apart (these assessments consisted of an additional block of 30 randomized trials without feedback).

Results

The standard level of word learning across blocks was verified for the young adult group at the end of the learning phase (M = 97.9 ± 3.2 %). The mean correct performance of the aphasia group at immediate recall testing (M = 60.5 ± 17.87 %) was significantly below the performance of the elderly controls (M = 87.9 ± 11.8%) [t (26) = -4.77, p <.001]. The mean recall performance at 1 week was 58.3 % (SD = 15.9 %) for the aphasia group and 82.62 % (SD = 11.9%) for the control group. Paired-samples t-test revealed a significant difference in performance between immediate recall and recall at 1 week for the elderly controls [t (13) = 3.14, p =.008]. This difference did not reach statistical significance in the aphasia group [t (13) = .82, p >.05]. The performance of the aphasia group at immediate recall testing was significantly associated with phonological discrimination (r = .641; p = .046), repetition ability (r = .672; p =.023) and STM capacity (r = .848; p = .001).

A binomial exact test identified five participants with aphasia with significantly above-chance performance at immediate recall testing. The analysis of individual versus control group performance (Crawford & Garthwaite, 2002) indicated that these participants did not significantly differ from the control group in the number of correct object-word associations retained after the learning phase (p >.085 in all cases) (Figure 1). The mean correct performance of this subgroup of participants with aphasia was 80% (SD = 10.54 %) at immediate recall testing and 72% (SD = 15.74 %) at 1 week follow-up. The performance difference between the two tests did not reach statistical significance [t (4) = 1.86, p >.05].

Discussion

Participants with aphasia as a group showed some ability to learn the small novel lexicon. More importantly, case-by-case analyses revealed that five participants with aphasia were able to learn the novel word-object associations on par with the elderly controls and could successfully maintain the object labels at 1 week without the support of immediate feedback. In addition, correlative analyses within the aphasia group showed that success in word learning was related to preserved phonological discrimination, repetition and STM capacity. These language and cognitive abilities have been previously related to vocabulary learning (Baddeley et al, 1998; Service et al, 2007). Our findings contribute to the existing evidence of the preserved ability to acquire and retain novel vocabulary in some people with aphasia.

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Figure captions.

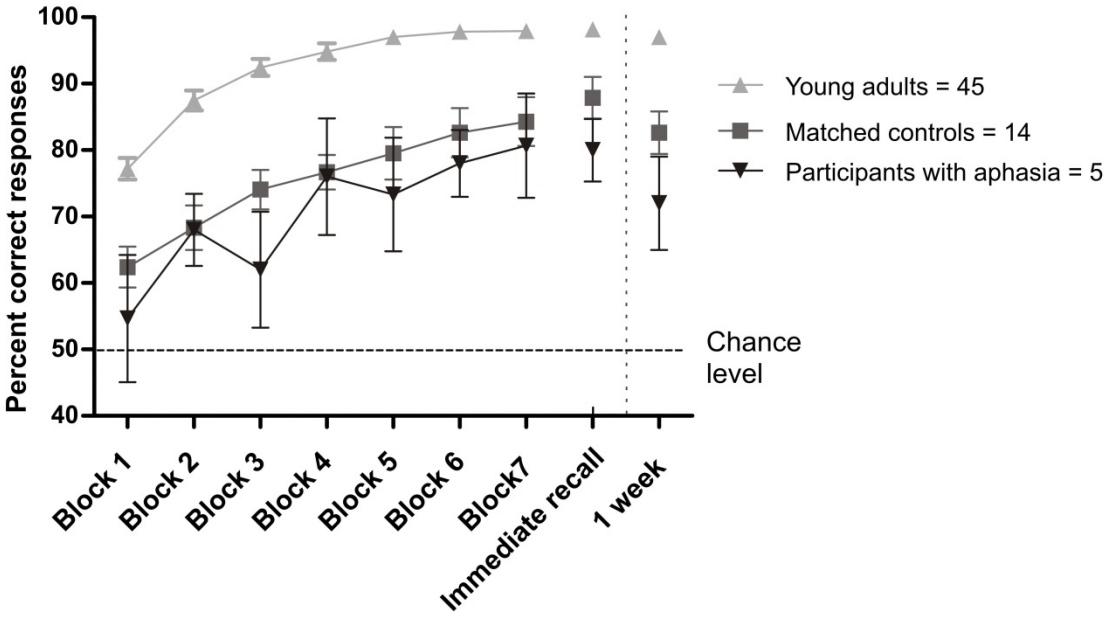

Figure 1. Performance of participants with aphasia with high learning performance. The mean percent of correct responses and SEM are depicted for good learners in the aphasia group across learning blocks 1 to 7 and testing blocks. The learning curves of the control group and the young adults are also represented for comparison. Sessions 1 and 2 are separated by a gray dotted line.

Production of verbs with alternating transitivity by patients with Primary Progressive Aphasia

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Introduction

Research on the production of transitive and unaccusative verbs in stroke induced aphasia showed a robust cross-linguistic pattern with most aphasic patients having more problems with the production of unaccusative than of transitive verbs (Bastiaanse & van Zonneveld, 2005; Thompson, 2003). Recent evidence from Greek, a language with rich morphology but without A-movement, confirmed these cross-linguistic findings. In addition, it revealed the crucial role of voice morphology in the production and comprehension of unaccusative verbs (Stavrakaki et al., 2011). Specifically, Greek allows two morphological patterns for unaccusative verbs: the N-active (non-active pattern) (*vithist-ike,* 'it sank') and the active one (*anix-e,* 'it opened'). The morphological feature of active voice in unaccusative verbs is not associated with an agentive voice head at the level of syntax in contrast to transitive verbs (Alexiadou & Anagnostopoulou, 2004). Stavrakaki et al. (2011) found that unaccusative verbs with N-active morphology were retrieved more easily than unaccusatives with active morphology and concluded that N-active morphological marking of unaccusative verbs facilitated verb retrieval.

The present study aims at contributing to the better understanding of transitive vs. unaccusative verb processing in aphasia by testing patients with Primary Progressive Aphasia (PPA), a degenerative condition characterized by deterioration in language for at least 2 years without deterioration in other cognitive domains other than praxis. There are three clinical variants of PPA that is, non fluent, agrammatic PPA (PPA-NF/A), semantic (PPA-S), logopepic (PPA-L) (Gormo-Tempini et al., 2011). A crucial question raised by Thompson et al. (1997, 2012) is whether patterns of language decline in PPA resembles impairments attested in stroke induced aphasia. We re-address this question by testing patients with PPA on the production of verbs entering into transitivity alternations (e.g. *anixa tin porta*, 'I opened the door'; *I porta anixe*, 'the door opened') and comparing their performance to that of stroke-induced aphasic patients tested by Stavrakaki et al. (2011).

Methods

Participants

Up to now, three patients (two females) diagnosed with PPA, (aged 73, 55, 57 at the time of testing), were included in the study. Two of them were diagnosed with PPA-S while one with PPA-NF/A. They were recruited from the 2nd neurological clinic of the AHEPA hospital in Thessaloniki. All of them fulfilled the currently diagnostic criteria for PPA (Gorno-Tempini et

al., 2011). Their aphasic symptoms were first clearly noted at least two years prior to testing. Two of them were diagnosed with PPA-S while one with PPA-NF/A on the basis of clinical observations and scores from psychometric tests including the Greek versions of the Addenbrooke's Cognitive Examination-Revised (Konstantinopoulou et al., 2011) and Boston Aphasia Examination (Tsapkini et al., 2009/2010). The neuroimaging data indicated that all patients showed brain atrophy. Each participant was matched to 3 control participants on the basis of age, gender and educational level.

Experimental material and procedure

The experimental material consisted of 30 verbs in total. There were 15 transitive and 15 unaccusative verbs. With respect to unaccusatives, five of them were with active morphology, the other five were with N-active morphology, whereas the remaining five verbs could appear with active or N-active morphology. We used an elicited production method employed by Stavrakaki et al. (2011), initially developed by Bastiaanse & van Zonneveld (2005), and adjusted for Greek. Participants were presented with a picture that showed an activity that can be described by a transitive verb or an event that can be described by an intransitive verb. At the same time, they were visually and orally presented with a verb and asked to use this verb in one sentence to describe what was happening in the picture.

Results

All controls showed a ceiling or near ceiling performance on the production of transitive and unaccusative verbs. The results for the patients' performance are presented in Table 1. These preliminary findings show that patients performed significantly better on the production of transitive than of unaccusative verbs (t (2)=11.13, p=0.008). Furthermore, the patients' performance on unaccusative verbs with N-active morphology was significantly better than their performance on unaccusative verbs with active morphology (t (2)=7.79, p=0.016), as all patients performed almost at ceiling on the N-active unaccusative condition.

Discussion

The above preliminary findings allow us to make the following observations. First, unaccusative verbs are more difficult than transitive ones for patients with PPA. Second, within the group of unaccusatives, there is a significant effect of voice (active vs. N-active) on patients' performance with active voice being more problematic. Finally, it appears that there is no different performance depending on the type of PPA (semantic vs. non fluent/agrammatic) suggesting that the verb features under investigation are equally affected by both types of the disease.

The difficulties shown by patients with PPA resemble the performance of stroke induced non-fluent aphasics (Stavrakaki et al., 2011), who also performed better on transitives than on unaccusatives. In addition, the performance by both groups was better in unaccusatives with N-active voice than with active. However, in patients with PPA this tendency was

stronger (90.91%) as stroke induced aphasic patients produced correctly unaccusatives with N-active morphology in a lower percentage (62.5%). This finding indicates a better preservation of unaccusative verbs with N-active morphology in patients with PPA than in patients with induced stroke aphasia. This subclass of unaccusatives is less affected in the course of gradual decline of language abilities in PPA.

When looking at error patterns, we found that when patients failed to produce active unaccusative verbs, they produced transitive structures, associating the morphological active voice with an agentive voice head at the level of syntax. Notably, the same error pattern was shown by stroke induced aphasics (Stavrakaki et al. 2011).

In conclusion, this study indicated selective deficits for unaccusative verbs in PPA as the active pattern was mainly impaired. In addition to similarities with the performance of stroke-induced aphasic patients, it revealed a distinct performance pattern, in particular, preservation of unaccusative verbs with N-active morphology to a great extent, highlighting the unique character of PPA.

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Table 1. Correct performance by patients with PPA (%): Individual and mean scores.

Participant	Gender /age (yrs)	PPA type	Transitives	Unaccusatives	Unaccusatives with active voice[1]	Unaccusatives with passive voice[1]
01	m/73	S	100	55	18.89	81.81
02	f/55	NF/A	100	55	9.09	90.91
03	f/57	S	93.33	35	0	100
Mean performance			**97.78**	**48.33**	**9.09**	**90.91**

[1] Correct responses (%) out of the total number of correct responses for unaccusatives

Speech disorders and speech postoperative outcome in patients with simptomatic epilepsy

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Introduction

Speech disorders are common in patients with symptomatic epilepsy (Engel et al., 2008). Postoperative speech decline is one of the main problems in the neurosurgical treatment of epilepsy. In this study we attempt to investigate the role of such factors as lateralization and localization of brain tumors and seizure frequency in postoperative speech outcome.

Methods

Subjects:

The results of treatment were analyzed in 36 right-handed patients (21 female) aged 17 to 64 years who had been operated on symptomatic epilepsy. Among them there were 16 patients with seizures occurring more often than twice a week, 26 patients with tumors in the left hemisphere (16 in the frontal lobe and 10 in the temporal lobe) and 10 in the right hemisphere (5 in the frontal lobe and 5 in the temporal lobe).

Methods

All patients performed pre- and postoperatively (2 weeks after surgery) several subtests from “The Speech Assessment in Aphasia” (Tsvetkova, Pylaeva, Akhutina, 1981) including object naming, action naming, sentence production, sentence comprehension and word comprehension tasks.

Results

Preoperative speech impairment was detected in all 26 patients with tumors in the left hemisphere. Preoperative speech decline in patients with tumors in the right hemisphere were detected only in case of frequent seizures (occurring more than twice a week). Patients with tumors in the left temporal lobe tended to have more severe speech impairments than patients with tumors in the left frontal lobe ($\phi crit=1.524$, $p=0.06$). Postoperative significant speech decline was observed only in patients with tumors in the left frontal lobe ($df = 15$, $Z = 2.652$, $P = 0.008$) and wasn’t in patients with tumors in the left temporal lobe ($df = 9$, $Z = 0.593$, $P = 0.553$) and in the right hemisphere ($df = 9$, $Z = 1$, $P = 0.317$).

Discussion

The results of this research allow us to suppose that:
1) In case of tumor localization in the right hemisphere the high seizer frequency plays the crucial role in the speech decline.
2) Patients with tumors in the left frontal lobe have higher scores according to the preoperative speech assessment and show more severe speech decline postoperatively than patients with tumors in the left temporal lobe. This fact could be explained in terms of brain plasticity: compensatory changes in the brain are more efficient in patients with tumors in the left frontal, than in the left temporal lobe, but these new compensatory mechanisms of the left frontal lobe are very easily can be damaged during tumor resection.

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Verbal Agreement Inflection in Wernicke's and Broca's Aphasia – a comparison

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Introduction

Inflectional morphology is a vulnerable domain for people with aphasic disorders. In non-fluent as well as fluent types of aphasia errors with inflectional morphology can be observed. It has been proposed that non-fluent Broca's aphasia (commonly associated with an underlying morphosyntactic deficit) differs from fluent Wernicke's aphasia (commonly associated with a lexical-semantic disturbance) in two crucial aspects: (i) with respect to the quantity of errors produced, as Broca's aphasics are said to produce more inflectional errors than Wernicke's aphasics (Ullman et al. 2005) , and (ii) with respect to the quality of error types assuming that Wernicke's aphasics produce more substitutions than omissions while Broca's predominantly omit bound inflectional morphemes or use unmarked forms instead (cf. De Bleser 1987, Kolk & Heeschen 1992). However, according to researchers who have studied both aphasia types in languages morphologically richer than English, the error profiles observed in these two types of aphasia are rather similar. Consequently, the contrast between the core symptoms *agrammatism* and *paragrammatism* attributed to Broca's respectively Wernicke's aphasia has been considered to be "greatly exaggerated" (e.g. Bates et al. 1991:137, De Bleser 1987). To enlighten this still controversial issue, we report and compare data that come from two elicitation studies investigating verbal inflectional morphology and from an analysis of spontaneous speech data conducted with a group of German Wernicke's and Broca's aphasics.

Methods

Subjects

A group of six German Wernicke's aphasics with typical paragrammatic speech participated in the study as well as a group of five German agrammatic speakers.[1] All aphasic subjects suffered a CVA and were diagnosed by the Aachen-Aphasia-Test battery as Wernicke's respectively Broca's aphasics encompassing mild, moderate and severe cases.

Experimental design

We report data from spontaneous speech production and from two experimental tasks testing verbal agreement inflection. In task 1 subjects had to complete a sentence presented on a card with a finite present tense verb form. We elicited 66 sentences, i.e. 11 sentences for each of the six subject pronouns in German. For example, the sentence *Wir_____ nur*

[1] The data collected from the subjects with Broca's aphasia in the two elicitation tasks have been published in Janssen & Penke (2002).

morgens unsere Zähne (‚We only _____our teeth in the morning') had to be completed by the verb *putzen* (‚brush'). Subjects were asked to read the whole sentences and to fill in the required verb form. Task 2 was a picture description task. Subjects were asked to produce short sentences by combining a given subject pronoun and an activity presented on a picture card (e.g. subject phrase *er* (‚he') plus a picture with a man who is smoking → *Er raucht* - ‚He is smoking'). We presented 10 pictures for each of the six subject pronouns, resulting in a total of 60 pictures.
In both tasks, test items were presented randomly after a practice phase. All 126 target verb forms were infrequent weak verbs with a completely regular inflection (target suffixes *–e*, *-s(t)*, *-t* and *-n*).

Results

Figure 1 presents the results summarized over the two experiments obtained from the two groups of aphasic subjects, i.e. the proportions of correct reactions of all analyzable utterances and the proportion of errors which are subdivided into omissions and substitutions of verbal affixes and the production of root infinitives (RI). The figure reveals that both subject groups achieve high individual accuracy scores ranging from 78%-100%. There are no significant differences between the two aphasic groups with respect to overall accuracy (mean error rate Wernicke's subjects: 4.6%, Broca's subjects: 7.5%) nor with respect to the correctness scores per verb context (*Mann-Whitney-U-Test*: each $p > 0.05$). In the group of Broca's aphasics 50 verb forms are incorrectly inflected and only four of these errors (8%) are omissions of the required inflectional suffixes while 43 errors (86%) are substitutions of the target suffixes by *–s(t)* ,*-t* or *–n* and in three cases (6%), root infinitives are produced. Similarly, out of the 34 errors of the Wernicke's aphasics, the majority (97%) of the errors are substitutions. The only other error is one root infinitive; inflectional verb endings are never omitted by Wernicke's subjects. An analysis of spontaneous speech data confirms a quantitative and qualitative similarity in accuracy scores and error types for the two groups of aphasic subjects. The data of some Wernicke's aphasics even contain root infinitives ("Und dann…im Krankhaus *gelegen*." - ‚And then… lain in hospital' / "Und jeden Tag Rad *fahren*" – 'and every day cycling'), an error-type that has been considered to be the hallmark of agrammatic speech production in German (cf. Kolk & Heeschen 1992).

Discussion

The high correctness scores obtained by both aphasic groups show first of all that the system of subject-verb-agreement is relatively intact in Broca's as well as Wernicke's aphasia. Crucially, the analysis shows that both groups do not differ with respect to quantity or quality of the errors. Substitutions of inflectional affixes are the predominant error type in both groups.
The results indicate that with respect to bound inflectional morphology the performance in Broca's and Wernicke's aphasia does not dissociate. We neither observe evidence for an inflectional deficit in Broca's aphasia as predicted by Ullman's declarative/procedural model (Ullman et al. 2005), nor do we find different rates of omission and substitution errors in Broca's and Wernicke's aphasia which runs counter to the traditional opposition between

paragrammatic speech production in Wernicke's aphasia and agrammatic speech production in Broca's aphasia. Based on thorough quantitative and qualitative error analysis of both elicited and spontaneous speech data we will discuss if there are differences with respect to the morphological output that can serve as a reliable criterion distinguishing these two syndromes.

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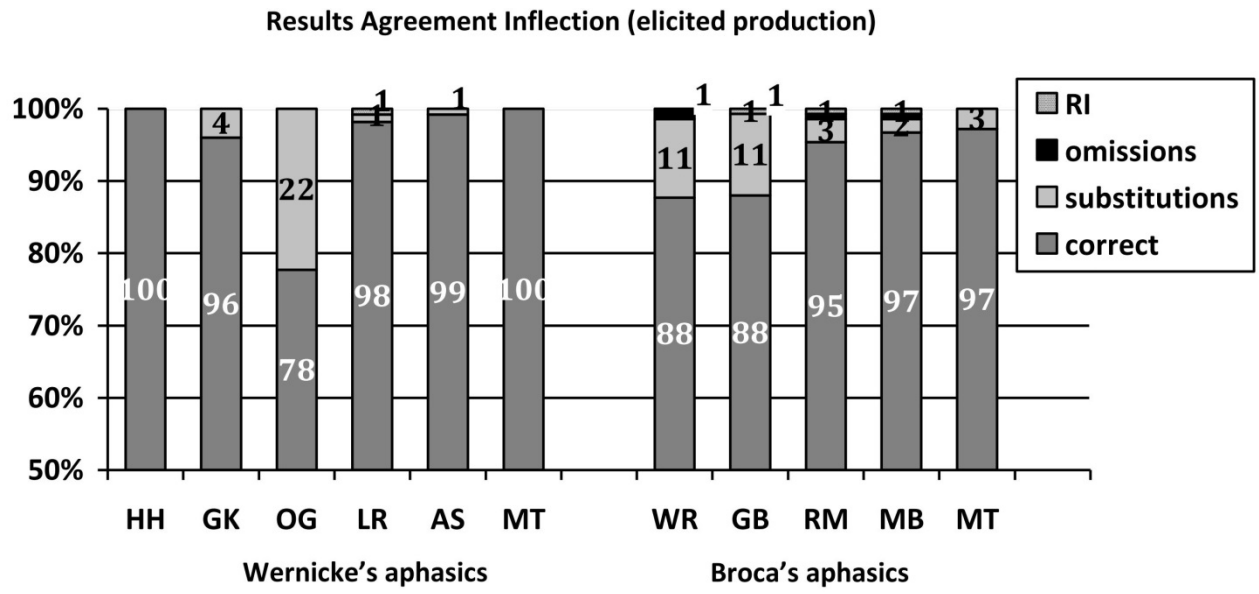
Figure 1



When verbs help naming nouns: a study on derived nominals in aphasia.

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Introduction

Studies of production of grammatical categories in people with aphasia (PWA) mainly focused on the distinction between nouns and verbs (for a review: Crepaldi et al., 2010; Luzzatti et al., 2001). Much less attention was reserved to investigating the continuum of grammatical properties that define the two categories. Problems with verbs may arise at the level of this continuum, however. One important factor may be telicity. Telicity is the property that indicates that an event entails an endpoint (Vendler, 1967; Verkuyl, 1972). It can be expressed at the lexical level (to reach vs. to draw), at the verb phrase level (the semantic-syntactic interface: to draw a circle vs. to draw) and at the morphological level, when a perfective tense is selected.
Yarbay et al. (2009) found, in a sentence completion task, that the perfect aspect on verbs was impaired in Turkish agrammatic people as compared to imperfective aspect. Verbal perfectivity, i.e. telicity at a morphological level expressed in a perfect tense, was shown to be problematic for aphasics at the verb level but no study has been conducted on telicity expressed in nouns. Romagno et al. (2012) recently found that the left posterior middle temporal gyrus shows a higher activation for telic compared to atelic verbs. Encoding telicity, by necessarily entailing a specified endpoint, requires additional processing resources.
Does telicity, a property typical of verbs, modulate the production of Derived Nominals (DNs)? DNs (Alexiadou, 2000) are syntactically nouns, but semantically they may be considered verbs. The selective deficit reported on verbal perfectivity may extend to DNs. If this is true, verbs could be more vulnerable than nouns because they encode telicity.

Methods

Participants

Three Italian Broca's aphasic subjects (TO, CI and PB) participated to the study. They all showed a relative verb impairment (BADA scores: TO: V=21/28, N=29/30; CI: V= 21/28, N=29/30; PB: V=22/28, N=26/30).

Materials

179 Italian DNs were selected across 6 conditions, 3 "lexical level" conditions and 3 "semantic/syntactic" level conditions.
Lexical conditions included:
a) atelic state DNs (*l'abbondanza*, 'the abundance');

b) atelic activity DNs (*il combattimento*, 'the fighting');
c) telic activity events (*l'affondamento*, 'the sinking').
Semantic/Syntactic conditions included DNs that are:
d) telic at a semantic-syntactic level (*il suggerimento + della risposta*, 'the whispering + of the answer');
e) telic at a morphological level, ending in *–(a)ta* (*la raccolta;* 'the collection').

30 additional DNs ending with the derivational affix *–(a)ta*, not describing events, were selected as a control condition (f).
Familiarity, frequency, number of syllables, type of suffixes and kind of event were controlled.

Procedure

The first task required to derive the target DN from the root of the corresponding verb (1a). The second task required to derive the same target DN starting from the infinitive form of the corresponding verb (1b). All inputs were presented in a grammatical context with an article to introduce a plausible nominal context and with a complement to underline the semantic aspect (telicity vs. non-telicity).

(1) a. *L'* ____ *della nave in tre ore*
'the(-S.) ___ of the ship in three hours'
Input: *affond-* (sink) Target: *affondamento* (the sinking)
b. *L'* ___*della nave in tre ore*
Input: *affondare* (to sink) Target: *affondamento* (the sinking)

Predictions

Participants were expected:

- to perform worse with telic DNs, since they are linguistically more marked in comparison with atelic state and atelic activity DNs;
- to perform better in Task2 than in Task1: the verbal nature of the input (a verb infinitive) may help the retrieval of the verbal properties of DNs such as telicity.

Results

Control subjects performed at ceiling. Results are reported in table 1.
In Task1, TO and CI performed well in all conditions except for e (telic DNs ending in *–(a)ta*). This condition significantly differed from all other conditions (a: $z = 5.464$, $p < .0002$; b: 4.551, $p < .0002$; c: $z = 3.509$, $p < .0004$; d: $z = 4.111$, $p < .0002$; f: $z = 3.519$, $p <. 0004$).

PB performed poorly in condition c (lexically telic DNs), differing from condition a ($z = 3.169$, $p < .001$) and condition b ($z = 2.756$, $p < .005$ and f: $z = 2.82$, $p < .004$) but, crucially, not from condition e and d, the other telic DNs.

In Task2, TO and CI's production improved significantly in condition e (TO: $z = 2.335$, $p < .01$; CI: $z = 3.105$, $p < .001$); however their overall DNs production did not improve with

respect to Task1 (TO: z = 1.249; p < .2; CI: z = 1.234, p < .2). PB' performance was instead consistent with that of Task1 (z = 1.474, p < .1).

Errors in Task1 mainly consisted in substitutions of the target DN with a noun, a verb or a neologism. In their most impaired condition (e), TO and CI never substituted the target with a verb in both tasks. Overall, however, TO and CI substituted more frequently the target DN with a noun in Task1 (TO: N= 32/36, V= 4/36; CI: N= 36/37, V=1/37), but with a verb in Task2 (TO: N= 10/27, V= 17/27; CI: N=9/28, V=19/28). PB, instead, substituted the target with a verb (N=9/29, V= 20/29) in both tasks.

Discussion

Telicity, mainly a verbal property, appears to be the impaired feature in the retrieval of DNs as well as retrieval of verbs.

Verbs and nouns share some grammatical and semantic features like telicity that cross the boundaries of the class distinction. This is evident in the nominalization phenomenon.

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Table 1: Row data (n. correct) in the production of DNs in three people with Broca Aphasia.

	TASK 1						
ID	**a State DNs**	**b Lex activity DNs**	**c Lex telic DNs**	**d Sem-Syn Telic DNs**	**e Morph telic DNs**	**f Non-event DNs**	**Tot.**
TO	27/29	25/30	23/30	26/30	18/30	24/30	143/179
CI	28/29	28/30	25/30	25/30	8//30	28/30	142/179
PB	28/29	27/30	19/30	24/30	24/30	28/30	150/179
	TASK 2						
TO	24/29	28/30	28/30	26/30	26/30	20/30	152/179
CI	29/29	26/30	24/30	28/30	20/30	24/30	151/179
PB	22/29	21/30	20/30	23/30	20/30	26/30	139/179

Verbs in Uzbek agrammatic spontaneous speech

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Introduction

In the neurolinguistic literature, spontaneous speech in agrammatic aphasia is characterized as being non-fluent and effortful, with reduced speech rate. Sentences are usually very simple, and mean length of utterance (MLU) is short (Rossi and Bastiaanse, 2008; Thompson, Shapiro, Li, & Schendel, 1995; Vermeulen, Bastiaanse, & Van Wageningen, 1989). Verb morphology is impaired, and there is a preference for non-finite verbs, while inflectional morphemes of verbs are omitted or substituted (Bastiaanse, & Jonkers, 1998; Bastiaanse, Hugen, Kos, & Van Zonneveld, 2002; Saffran, Berndt, & Schwartz, 1989, Rossi & Bastiaanse, 2008). Our study contributes to aphasiology by providing further evidence of features of agrammatism from a language which was not described previously. Uzbek is a language of interest because it is an agglutinative language with a rich morphology. Verb morphology is especially interesting; one verb may have more than 100,000 forms including periphrastic forms (Pulatova, Pulatov, Muminova, 2003). The aim of the current study is to illustrate which kind of features Uzbek agrammatic spontaneous speech share with other languages, and which kind of specific features it has. Based on recent studies we make following predictions:

1. As an agglutinative language with rich and regular morphology Uzbek agrammatic speech will present spared morphology (Knoph, 2011; Alexiadou & Stavrakaki, 2006; Abuom, Obler, & Bastiaanse, 2011);

2. Uzbek agrammatic speakers will use significantly fewer verb forms referring to the past than the present (Bastiaanse, Bamyaci, Hsu, Lee, Yarbay Duman, & Thompson, 2011);

3. Lexical aspect (Aktionsart) which is expressed via actionality constructions is impaired because it requires integration of information from different linguistic levels (Yarbay Duman, Altinok, Özgirgin, and Bastiaanse, 2011).

Methods

Participants

The participants were 2 agrammatic speakers and 10 non-brain-damaged speakers. One male (69 years old, right handed, 11 years post onset) and one female (53 years old, left handed, 7 years post onset) brain-damaged individual, who had a stroke in left hemisphere, participated in our study. The woman is left-handed, however, she was the only left-handed

person in her family. That is why we decided to include her to our study. They are both native speakers of Uzbek, and they used the language as primary language in daily life. Ten non-brain-damaged (NBD) subjects participated in the experiment as a control group (6 females and 4 males, with the mean age 50, age range 39-70). They were matched to the brain-damaged people for education, occupation, gender as closely as possible.

Materials

A spontaneous speech interview was held. The participants were asked three questions:
(a) *Can you tell me about how your speech problems started (agrammatic speakers)/about your most recent illness (for NBDs)?*
(b) *Can you tell me about your current work/hobbies?*
(c) *Can you tell me about your plans for the future?*

Results

Table 1 provides the results of the analysis. Since there were only two agrammatic speakers involved, we used scores outside the normal range as the (very conservative) measure for significance. We can see from the table 1 that the agrammatic speakers' MLU and speech rate were outside the range of the NBD speakers. Even though the groups did not differ in production of noun-tokens, noun-types nor in verb-tokens and verb types (only in MO), variables such as copulas, actionality constructions and non-finite verb forms were outside he normal range for the Uzbek agrammatic speakers. In addition, the number of ungrammatical sentences is higher than that of NBD speakers, but the usage of embeddings is inside the normal range (but NBDs hardly use embeddings either). Time reference through verb inflection did not differ between groups, nor did the use of non-past forms and past forms.

Discussion

In comparison to NBDs' speech, Uzbek agrammatic speech has a lower speech rate, shorter utterances, and a higher percentage of ungrammatical sentences. The use of nouns and verbs is preserved, although in NK the number of verb types is outside the normal range. This result is in line with the findings from morphologically rich languages such as Swahili and Italian (Abuom & Bastiaanse, 2012; Crepaldi, Ingignoli, Verga, Contardi, Semenza, & Luzzatti, 2011). Our prediction regarding the morphology is supported: noun and verb inflection is intact. However, our expectation based on PADILIH was not justified (Bastiaanse et al., 2011). Uzbek agrammatic spontaneous speech did not show selective impairment of reference to the past. Reference to the past and reference to the present are used almost equally often by both groups, contrary to the results reported for Swahili by Abuom and Bastiaanse (2011).
As expected, Uzbek agrammatic speakers were poorer in using lexical aspect (actionality) in their spontaneous speech than NBD speakers. This finding is in line with Nanousi, Masterson, Druks, & Atkinson, (2006) and Stavrakaki & Kouvava (2003), who found aspect impairment in Greek. In agrammatic aphasia, verbs are problematic, and production of lexical aspect requires simultaneous retrieval of two different verbs, of which one is finite and the other one is non-finite. We predicted poor use of actionality constructions based on the

Integration Problem Hypothesis (Yarbay Duman, et al., 2011), which says it is difficult for agrammatic speakers to integrate information from different linguistic levels.

The number of non-finite verbs used by Uzbek agrammatic speakers was outside the lower range of the NBD speakers. This finding contradicts other studies, which reported that non-finite verbs are relatively preserved in agrammatic aphasia (e.g. Bastiaanse & Jonkers, 1998; Rossi & Bastiaanse, 2008; Abuom & Bastiaanse, 2012), but in line with Slobin (1991), who noticed poor usage of non-finite verbs in Turkish, where non-finite verbs are used in grammatically complex structures. In Uzbek, participles or verbal nouns are used in speech as a linguistic unit, the semantics of which belong to the verb while the syntactic features belong to the adjective and noun. Thus, the use of participles and verbal nouns is more complex than the use of a simple verb and simple noun: it requires processing at several linguistic levels (semantics, syntax and morphology). This is exactly what is difficult for agrammatic speakers (Yarbay et al., 2011; Abuom et al., 2013),

To conclude, Uzbek agrammatic speech shares a number of features with agrammatic aphasia in other languages, such as slow effortful speech, short sentences, high percentage of ungrammatical sentences. Uzbek agrammatic aphasia demonstrates relatively well spared inflectional morphology and equally preserved noun and verb word classes. However, Uzbek agrammatic speakers have a problem with non-finite rather than with finite verbs. This is explained by the complex processing which is required for non-finite verbs in Uzbek. Information from different linguistic levels needs to be integrated, which is notoriously difficult for agrammatic speakers.

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Table 1: The comparison of analyzed variables of agrammatic speakers and NBD speakers' spontaneous speech.

	Agrammatic speakers			NBD speakers	
	NK	MO	Mean	NBD's range	Mean
MLU	7.794	5.322	6.558	10.93-20.27	14.15
Speech rate	30	27	28.5	62-108	86
Noun-tokens	57	68	62.5	36-80	53.2
Noun-types	42	48	45	29-61	44.2
Verb-tokens	39	32	35.5	25-59	46.5
Verb types	17	26	21.5	19-44	37.9
Copulas	2	1	1.5	3-9	5.2
Actionality constructions	0	0	0	1-13	6.7
Ungrammatical sentences	22 (65%)	27 (46%)	24.5 (55%)	0-10%	0.4 (2.1%)
Embeddings	0	2(3.38%)	1 (1.69%)	0-16%	2 (7.42%)
Finite verbs	37	27	32	17-38	26.7
Non-finite verbs	2	7	4.5	10-25	16.7
Past forms	11	17	14	10-27	16.6
Non-past forms	26	10	18	8-23	16.3

Predictors of Post-Stroke Aphasia Recovery – A Systematic Review

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Introduction

Prediction of post-stroke aphasia recovery is an important clinical problem. Identifying relevant predictive factors is essential not only for better individual patient clinical care but also for guidance of future studies on assessment of effectiveness of aphasia therapy.

Methods

The Medline, Science Direct, and PsychINFO data-bases were searched for following mesh terms: *aphasia, stroke, prediction* and *prognosis*. The search cut-off date was December 2013. In addition, references from previous review articles covering the same subject were reanalyzed. The search resulted in more than 1000 articles from which we excluded all articles that were focused on stroke outcomes in general, as well as articles that evaluated different types of aphasia treatment, case studies, and articles not written in English. In total, 55 articles fulfilling the above criteria were left for analysis.

Results

The best predictors of the post-stroke aphasia recovery seem to be lesion size and lesion location, as well as initial severity of language impairment. State of glucose metabolism and cortical perfusion measured by Positron Emission Tomography (PET) and functional Magnetic Resonance Imaging (fMRI) early after the stroke were also found to be good predictors of aphasia recovery. Factors found to have some prognostic value were age and gender, while the prognostic values of socio-economic status, education, and cognitive abilities was uncertain.

Lesion size indirectly correlates with level of aphasia recovery. Subcortical lesions have more favorable prognosis than cortical lesions; poor recovery is associated with lesions in Broca's area, hippocampus, and basal ganglia. Initial aphasia severity significantly affects the course, the speed, and the outcome of recovery. PET and fMRI measures of glucose metabolism and cerebral perfusion in left hemisphere measured in the acute stage were positively correlated with the degree of recovery of language.

Aphasia incidence rate increases with age, and patients with Broca's aphasia tend to be younger than ones with Wernicke's. Younger patients generally tend to recover to greater extent than older patients, but results of a number of studies indicate that age is a poor overall predictor of recovery. Women show higher rate of improvement of oral expression and overall greater improvement if affected by global aphasia; except from that, gender has almost no prognostic power in aphasia. Patients with higher socio-economic status and

education have better prognosis, but this seems most likely to be due to their initial advantage over patients with lower socio-economic status and education. Estimated premorbid intelligence does not appear to influence aphasia recovery, although there is a correlation between intelligence level and initial aphasia severity. In addition, overall cognitive status, and post stroke spatial working memory in particular, may predict therapy outcome. Handedness is not found to play any role in aphasia recovery.

Conclusion

The number of studies examining the prognostic factors affecting post-stroke aphasia recovery is still relatively small relative to the significance of the issue. Stroke-related factors, such as size and location of the lesion, severity of functional impairment, and severity of initial language impairment seem to be the most important prognostic factors. However, the relative role of patient-related factors has not been determined satisfactory yet.

Quality of Communication Life in Individuals with Broca's and Conduction Aphasia[2]

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Introduction

There are a few studies concerning communication as a factor of life satisfaction and the impact of communication disorders on quality of person's life. The aim of this study was to determine the influence of language impairment on the quality of communication life in people with aphasia.

Methods

Participants and procedures

Four female aphasic patients participated in this study. The participants had an average age of 58 years (52-68 years) and average education of 14,2 years (12-17 years). All participants were right-handed, with a single left hemisphere CVA, without visual deficits and/or dementia, and they were at least six months post-onset.
Using the Serbian version of the Boston Diagnostic Aphasia Examination (Goodglass, Kaplan and Barresi, 2001), two patients were classisfied in Broca's aphasia and two in conduction aphasia. According to the aphasia severity rating scale, patients were devided in two gropups: 1) severe aphasia (one patient with Broca's aphasia and one with conduction aphasia) and 2) mild aphasia (one patient with Broca's aphasia and one with conduction aphasia).
The Quality of Communication Life Scale – QCL (Paul et al. 2004) was applied to determine the impact of a aphasia disorders on an adult's relationships and interactions with communication partners and on participation in daily life activities.

[2] This study was done as part of the project ,,Treatment evaluation of acquired speech and language disorders " (Project No 179068) funded by the Ministry of Education, Science and Technological Development of Republic of Serbia.

Results

The results have shown that people with Broca's aphasia and people with conduction aphasia have a changed quality of communication and an altered quality of life, in general. At the same time, a significant correlation between the severity of aphasic disorder and quality of life has been shown.

Discussion

The analysis of obtained results point out differences in performance on the QCL scale between tested patients: patients with Broca's aphasia had problems in all examined domains of life and communication (Socialization/Activities, Considered/Self-Concept, Roles and Repsonsibilities, General Well-Being), while patients with conduction aphasia have no problems in the field of Roles and Repsonsibilities. The severity of the language disorder does not significantly affect the quality of communication life in Broca's aphasia, but in conduction aphasia it does. This is in line with the findings of Vuković et al. (2013). The quality of communication life analysis in aphasic patients can assist in choosing aphasia treatment method.

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Language dissolution and restitution in L_1 and L_2

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Introduction

There are many factors that influence the communication process. One of the most important is probably the issue of phonological oppositions. It was Jakobson who stated that for communication the most important "is not the phoneme itself but their oppositions since they bear the meaning" (Jakobson 1968, 68). The problems arise in the moment of language disintegration and there are many reasons of this situation. The most common are: stroke, brain tumours or cancers. They often lead to aphasia which is defined in many ways. For the purpose of this discussion aphasia is treated as the disconnection between thoughts and spoken words. It is an acquired communication disorder that affects a person's ability to process a language at each of its modality but without affecting intelligence.
The main hypothesis of this experiment is that the restitution of L_1 is similar to L_2 in terms of phonological oppositions that exist in both languages and that it is more difficult for the patients to produce L_2 oppositions that do not exist in L_1.

Method

The participants were the patients of Holycross Cancer Center and Provincial Hospital in Kielce, Poland, mainly Neurological and Neurosurgery Wards. Their phonological system of L_1 was shaped and some of them were familiar with L_2. Then their L_1 and L_2 were destroyed because of different reasons (e.g. glioma, stroke, car accident).
To check the hypothesis Blache's test (1975) was used in terms of English phonological oppositions and Rocławski's test (1994) for Polish phonological oppositions. The authors made some modifications of the tests and the oppositions that were estimated as not important were not included. The amount of the pair of oppositions was also shortened because of health reasons of the patients. The participants were presented with a set of minimal pairs, first in Polish, and then in English. In each situation minimal pairs were read by native speakers and recorded. Then the oppositions were played to the patients who listened to them and repeated. The experiment was recorded and then the authors decided which of the oppositions were correct and which not. In this experiment the most important issue was to decide if the patients presented the correct realisation of the oppositions (not pronunciation of the segments).

Results

The analysis of the experiment

The aim of the experiment was to check if it is easier to recover from aphasia for the patients who were familiar with foreign languages before their illness. The experiment investigated restitution of phonological oppositions of L_1 in comparison to L_2 of the patients who took part in the experiment.
The main hypothesis states that the restitution of L_1 is similar to L_2 in terms of phonological oppositions that exist in both languages and that it is more difficult for the patients to produce L_2 oppositions that do not exist in L_1.
Another issue is that the patients who are familiar with L_2 reveal some influences of L_2. They tend to guess the L_2 words although they reveal some problems in acquiring L_2 phonological oppositions in the words presented.
The authors also wanted to check if the oppositions that are typical of most languages in the world were restituted (or even preserved) in aphasia before those ones that are rare and acquired late in the process of language restitution.

Discussion

Although the diagnosis for some patients is the same, different symptoms of aphasia can be observed. It is because the brain works in its individual way. What is more, some other factors are important in language restitution (e.g. age, sex, educational level).
However, after collecting the data, a tendency in language restitution can be noticed. The first is that the phonological oppositions that are typical of English but not of Polish and, in addition, the phonemes that do not exist in Polish phonological system are the most difficult to repeat by the patients (e.g. [θ]:[ð]). Similarly, the pairs of phonological oppositions that are typical of English and are formed by the phoneme that exists only in English and the second member of the opposition appears also in Polish phonological system, are also difficult for Polish patients (e.g. [ð]:[z]).

The context also seems to play an important role in repeating the words that contain phonological oppositions. Some patients, especially those who learnt English before the stroke (even very little) sometimes guessed the meaning of the words.
Moreover, some patients repeated the second word of the pairs as the first one and then the first word of the pair appeared. It can suggest that the operating memory is not good yet and the second word helps to recover the first one.
The authors would like to stress the fact that the phenomenon of transfer exists when we talk about two or more languages and want to check in what way it influences language recovery if the patient learnt foreign language before the aphasia or not.
It is also worth mentioning that although the patients have many problems with repeating the phonological oppositions, they can communicate probably thanks to the context of different situations.

The authors aimed to check if the order of the acquisition of phonological oppositions in L_1 went in the opposite direction than the dissolution as it was suggested by Jakobson (1968) and also to compare the results with L_2 learning and dissolution. The experiment revealed that L_1 and L_2 restitution did not go in the same way. Furthermore, it is also important to decide if the sounds that are restituted are accidental in character (like in children who are at the beginning of the process of language acquisition because the lack of control of the vocal organs), or the sounds are constant in different contexts and are restituted in a special way.

The authors would like to mention that they present preliminary results but they are willing to talk and share their knowledge with all who are interested in these problems.

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How to become twice more precise in detecting neuropsychological impairments

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Introduction

The way we typically standardize neuropsychological tests dates back to nearly 30 years ago now (Capitani, 1987). Although this was a giant leap forward at that time, the "classic approach" has three main limitations: (i) it doesn't consider possible interactions between covariates (e.g., age and education); (ii) it transforms a naturally binomial variable (accuracy) into a continuous one (percentage of correct responses), which is a deeply problematic move (e.g., Jaeger, 2008); (iii) working on by–subject percentages of correct responses, it cannot consider item covariates (e.g., frequency, length, imageability) that are known to affect performance substantially. Here we show how to overcome these limitations, and quantify their cost in terms of explained variance using the action–naming task devised by Crepaldi et al. (2006) as a test case.

Methods

Participants

290 healthy Italian speakers (148 F and 142 M) volunteered to participate in the study. They ranged 18 to 98 years in age (M=54.1) and 3 to 23 years in education (M=12.3). They were all right handed, free of neurological/psychiatric diseases, and had no history of alcohol/drug abuse. These participants constituted the norming sample.

The different types of standardization were then applied to: (i) a simulated sample of around 80,000 patients ranging in age (20–85 years), education (3–22 years), gender (M–F) and raw scores (20–50 correct responses); and (ii) an unselected sample of 69 right–handed, aphasic patients, who suffered from left–hemisphere cancer (age: 17–81, M=51.5; education: 5–23, M=12.09).

Materials

Fifty pictures of actions, either newly created or taken from Druks (2000), made up the verb retrieval test. Each item was rated for frequency (Bertinetto et al., 2005), age of acquisition, actionality, picture typicality, length in letters and number of syllables (see Crepaldi et al., 2006, for more details). Twenty items were transitive verbs, 17 were inergative verbs and 13 were inaccusative verbs.

Standardization

We first standardized the verb–naming test following Capitani et al. (1987), namely: (i) we regressed by–subject mean accuracies on gender, age and education; (ii) on the basis of (i), we computed the expected score for each participant; (iii) we subtracted these expected scores from observed scores, thus computing "corrected" scores; (iv) on the basis of the distribution of these corrected scores, we computed cut–off values for each Equivalent Score (ES).

In two further types of standardization, we followed exactly the same approach, but each time we refined the computation of expected scores by: (i) adding interactions between gender, age and education (we refer to this as *interaction norming*); (ii) moving back from mean accuracies to raw correct/incorrect scores thanks to mixed–effect models, thus being able to take under control also item variables (e.g., frequency) and any additional item– or subject–specific random variability (*mixed–effects norming*; Jaeger, 2008).

Results

We first contrasted the three approaches in terms of their amount of explained variance in the computation of expected scores, that is, their ability to "wash out" unwanted effects from expected scores. Capitani norming explained 34.7% of the total variance; interaction norming went up to 43.7%; and mixed–effect norming ensured 73% of explained variance. We thus focused on the comparison between the former and the latter approaches.
A comparison between expected scores according to Capitani and mixed–effect norming in 2,600 combinations of age (20–85) and education values (3-22) revealed an overall correlation of .81. Differences were generally bigger with young age and low education, and with old age and high education; and typically showed higher expected scores by mixed–effects than Capitani norming (see Figure 1).

We then computed ES for the simulated sample of patients according to Capitani and mixed–effects norming. They disagree 28% of the times. In the vast majority of these cases (78%), the difference is 1 point in the scale; however, the difference went up to 3 or even 4 points in a small minority of the cases (4.5%). When there is a disagreement between norming techniques, mixed–effect ES are lower than Capitani ES in 61% of the cases. Finally, among the 45070 simulated patients that would be classified as impaired at naming verbs (ES=0) according to Capitani norming, 5% would not be classified as such (ES>0) according to mixed–effect norming. The opposite figure is 12%.
The figures illustrated above are quite in line with those emerging in the actual sample of unselected patients. ES disagree 26% of the times, and in all cases they do so by one point in the scale. Mixed–effect ES are lower than Capitani ES around as frequently as the opposite happens (7 vs. 11 cases). Finally, all patients that would be impaired according to Capitani norming are also impaired according to mixed–effect norming; whereas 4 out of 16 impaired patients according to mixed models would not be so according to Capitani's approach.

Discussion

The data clearly indicate that using a better statistical model to calculate expected scores is highly beneficial in terms of amount of explained variance, that is, we can gauge the true effects of subject (e.g., age) and item variables (e.g., frequency) much more precisely, and hence enjoying higher–quality corrected scores.

Critically, this reflects substantially into how (simulated and actual) patients are classified. In this respect, it is nice that the difference between the classic approach and mixed models isn't just a matter of power/severity. That is, it is not the case that mixed models just generate more ES=0, or move down ES in general. They are either more severe or more liberal than Capitani ES with different types of patients, thus arguably indicating a gain in qualitative appraisal of the patients' performance.

This improvement in the evaluation of patients' performance in neuropsychological tests clearly impacts heavily on the quality of both clinical diagnosis and rehabilitation.

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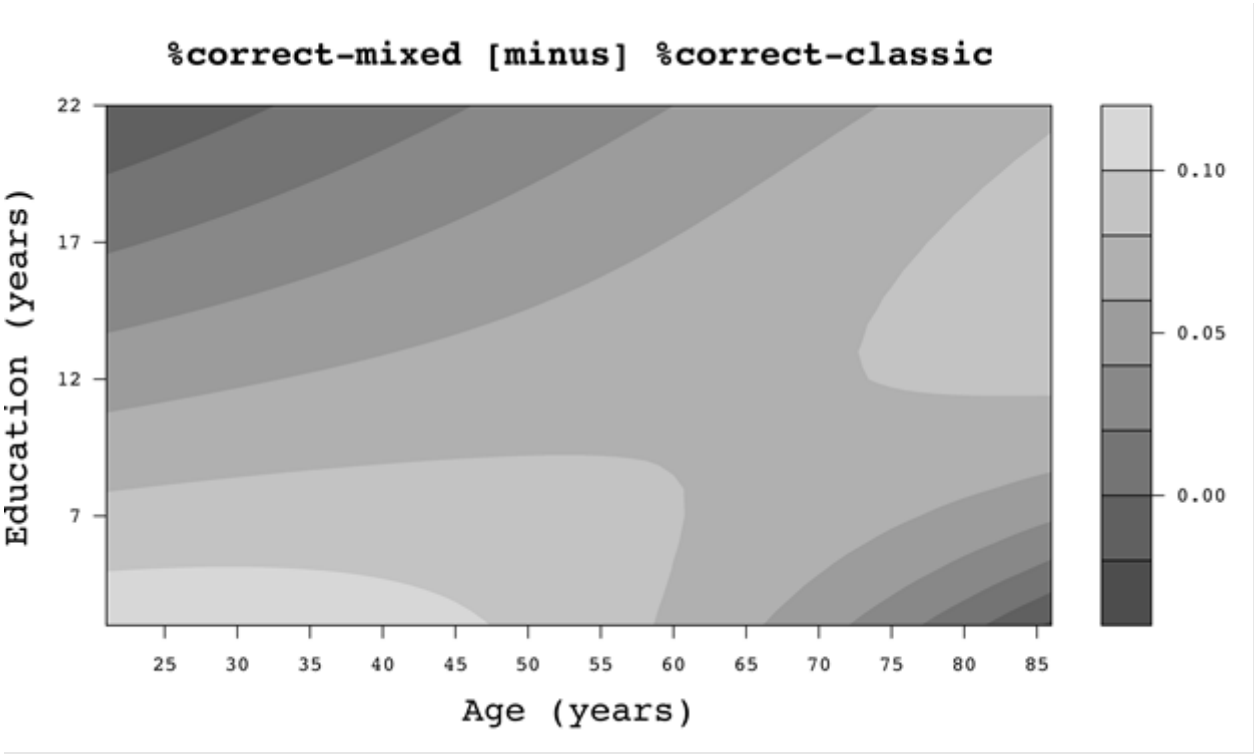
%correct-mixed [minus] %correct-classic
Education (years)
22
17
12
7
25
30
35
40
45
50
55
60
65
70
75
80
85
Age (years)
0.10
0.05
0.00

Aphasia rehabilitation from a linguistic perspective and the role of tDCS

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Introduction

The effects of aphasia rehabilitation are often moderate, and there is a need to develop strategies that promote larger and generalizable gains. Semantically-based therapy produces generalization to untrained nouns (Boyle & Coelho, 1995), but this generalization is not present in semantic verb treatments (Wambaugh et al., 2014). There are, however, reports of improved production of untrained verbs during morphological treatment (Harris et al., 2012), during simultaneous semantic and phonological cueing treatments that included sentence completion with a verb (Wambaugh et al., 2002; Rose & Sussmilch, 2008) and when verb production is trained in sentence context (Links et al., 2010).
In the current study we combine linguistically motivated therapy (Thompson & Shapiro, 2005) with transcranial direct current stimulation (tDCS). tDCS increases the effect size of aphasia therapy and has resulted on a numeric (non-significant) increase in performance for untreated nouns (Baker et al., 2010). Considering that tDCS has been shown to have task dependent effects (Antal et al., 2004), it is relevant to further investigate how specific these effects are, in particular, if they are also item specific.

Methods

Participants

In this study we included three patients with aphasia, who suffer from damage to the phonological output lexicon and phonological output buffer. Mr. SP presents with an additional impairment at the semantic level. Patients LF and SP demonstrate difficulties in grammatical processing involving thematic role assignment, as well as knowledge (for SP) and realization of predicate argument structure. All patients are right handed and have a left hemisphere lesion following stroke.

Materials and procedure

Bi-cephalic tDCS was administered during the first 20 minutes of therapy using two 35cm^2 electrodes, at 1mA. Electrode placement was individually determined after inspection of each subject's MRI scan, with the anode over left and the cathode over right hemisphere areas. We used a randomized, double blind cross-over design. Each patient was treated in 2 phases (one with sham, and the other with real tDCS), each consisting of 2 weeks of daily 1-

hour sessions. The behavioral treatment included two levels of the Italian ACTION (adapted from Bastiaanse et al., 1997; see Links et al., 2010): sentence completion (in the first week of each phase) and sentence construction (in the second week of each phase). Patients were asked to produce the verb or sentence using the most frequent past, present and future forms in Italian. Structured increasing cues were provided after lexical or morphological errors.

Measures

Patients were assessed with three verb production tasks, each administered in three sessions: sentence completion with a verb in the infinitive form (henceforth, VInfinitive), or in a finite form (henceforth, VFinite) and sentence construction (henceforth, VSentence). The overall lexical accuracy across the three days of testing was used to create a treatment and a control set, balanced for 17 linguistic variables.
Changes to communication in daily living were measured using the CADL (Carlomagno et al., 2013) and mood was monitored using Beck's depression inventory (BDI, Beck, 1988). Non-word repetition from the B.A.D.A. (Miceli et al., 1994) and object naming (Laiacona et al., 1993) were used as control tasks.

Results

Baseline behavior was stable for all patients. After sham stimulation + speech and language therapy (SLT) (phase 1), Mr. GC improved for treated verbs in the following measures: VInfinitive (GC: p=0.007), VFinite (p=0.041), VSentence (p=0.015) and in 3-day accuracy (W=0, p=0.000). After tDCS + SLT (phase 2), GC improved in the same measures as after phase 1 (respectively, p=0.002; p=0.008; p=0.043; W=0, p=0.000).
After sham + SLP (phase 1) Mr. LF improved in VFinite (p=0.007), VSentence (p=0.007) and in 3-day accuracy (W=0, p=0.000). After tDCS + SLT (phase 2), he improved in the same measures (respectively, p=0.006; p=0.04; W=0, p=0.000) and additionally, in VInfinitive (p=0.009).
Mr. SP improved after tDCS + SLT (phase 1) on treated verbs, VInfinitive (p=0.004), VFinite (p=0.023), VSentence (p=0.013) and in 3-day accuracy for treated (W=0, p=0.000) and untreated verbs (W=0, p=0.047). Following sham + SLT (phase 2), improvement was restricted to 3-day accuracy (p=0.009), for treated verbs. Figure 1 illustrates the changes observed for each patient in 3-day lexical accuracy, during the two treatment phases.
Figure 1. Effects of treatment in 3-day lexical accuracy

[insert Figure 1]

The percent of change in 3-day lexical accuracy for trained items was relatively higher after tDCS than after sham (GC: sham=40% and tDCS=53%; LF: sham=35% and tDCS=48%); SP: sham=18% and tDCS=41.6%). Generalization to untreated verbs occurred only in phase 1, for the three patients, and was characterized by an increase in 3-day lexical accuracy (GC: W=0, p=0.025; LF: W=0, p=0.008; SP: W=0, p=0.047). None of the patients showed significant changes in the control measures, BDI or CADL.

Discussion and conclusion

The Italian ACTION was successfully used to improve verb and sentence production for treated and untreated items. Improvement for untreated items occurred only in the first phase, possibly indicating that the potential to improve production of untreated items may depend on separate mechanisms. Generalization may result from task practice (familiarity with a sequence of cognitive processes) and effects on trained items may results from item practice (more accessible representations of specific lexical units) (Basso et al., 2013).
All participants showed larger improvement for treated items after tDCS than after sham. This suggests that the learning mechanisms facilitated by tDCS may be particularly beneficial to trained items. Expanding our study to a larger sample will help disentangle the effects of the order of experimental conditions (sham first vs tDCS first) from the effects of stimulation types (sham + SLT vs. tDCS + SLT). This will lead to a better understanding of the mechanisms underlying aphasia recovery, as well as of the role of tDCS as an adjuvant treatment tool.

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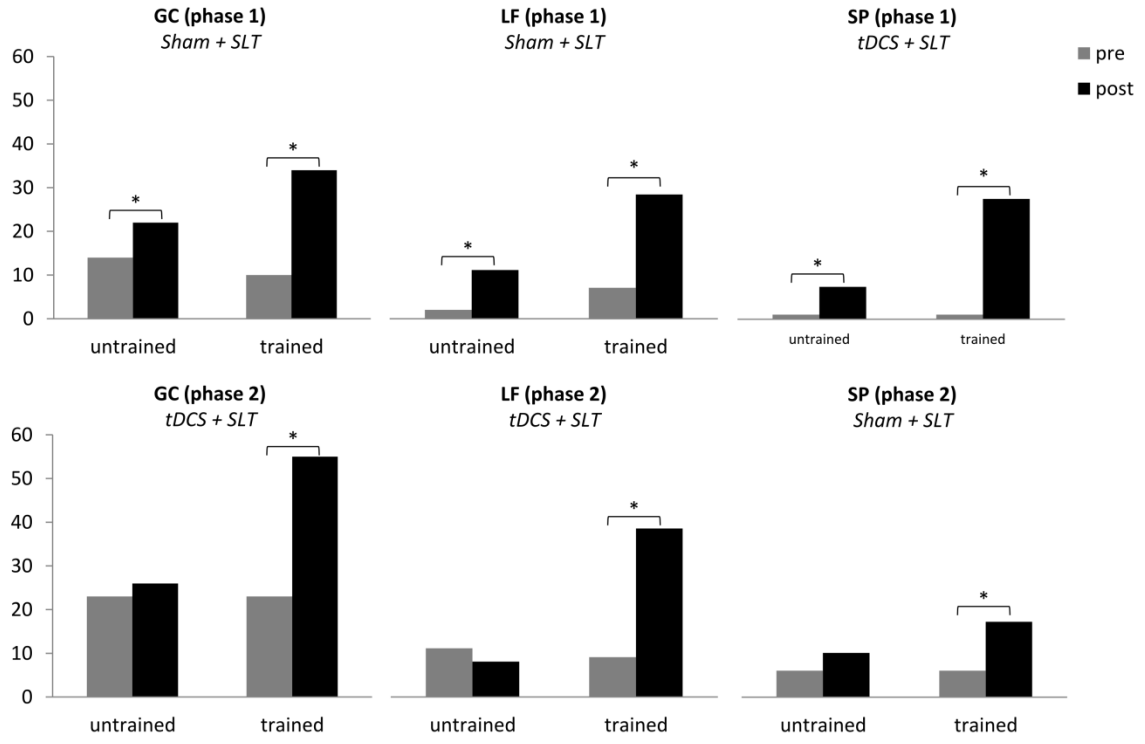
Figure 1. Effects of treatment in 3-day lexical accuracy based on three verb production tasks



An eye tracking study of time reference processing in individuals with agrammatic aphasia

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Introduction

Individuals with agrammatic aphasia (IWAs) frequently experience difficulties with interpreting tense inflections (e.g., Burchert et al., 2005). Bastiaanse et al. (2011) provided evidence for a selective deficit in reference to the past in aphasia. They claim that IWAs perform better on non-past time reference, because for its interpretation only narrow syntax is needed. In contrast, for past time reference resolution, additional access to discourse and information structure is necessary. Linking to an event in discourse is problematic because of insufficient processing resources in agrammatic aphasia (Avrutin, 2006). This is captured in the Past DIscourse LInking Hypothesis (PADILIH; Bastiaanse et al., 2011). With respect to reference to the non-discourse-linked future, data so far indicate that agrammatic individuals experience less difficulties as compared to past time reference (Bastiaanse et al., 2011), supporting the assumptions of the PADILIH. So far, most studies have looked at time reference resolution in offline tasks, such as sentence-picture matching and there is only limited data on online processing of time reference.

Aim

The current study aims to characterize processing of past and future time reference in German speaking IWAs as well as in healthy controls. Moreover, it is the first study to investigate online time reference processing in aphasia by measuring participants' eye-movements while they perform a sentence-picture matching task. This allows us to draw conclusions about what is actually happening when IWAs fail to interpret time reference correctly.

Methods

Participants

Twelve non-brain-damaged German individuals without history of neurological, psychiatric, or learning problems (NBDs; mean age 58, range 38-77) and six IWAs (mean age 58, range 42-73) participated. They all reported normal or corrected-to-normal vision, and no hearing problems. All but one of the aphasic participants were classified as agrammatic Broca's using the Aachen Aphasia Test (Huber, Poeck, Weniger, & Willmes, 1983). One IWA was initially diagnosed as Broca's, but had digressed to anomic aphasic. However, her speech output was still characterized by agrammatic symptoms.

Materials and procedure

Participants performed a sentence-picture matching task while their eye-movements were being monitored using a remote Tobii T120 eye-tracker. Sentences were presented auditorily and appeared in two conditions: future and past (n=20 each). Each sentence started with the prompt to show "the picture in which…" and was followed by the subject, object and the predicate in past or future. In addition, there were 20 filler items without specified time reference. Examples are provided in Table 1.

RoI / Condition	Show	WhichPic	Subject	Object	Stem	Inflection	Silence
(1) future	Zeigen Sie *Show*	auf welchem Bild *in which picture*	der Mann *the man*	eine Flasche *a bottle*	entkork- *uncork*	-en wird. *-Infl will*	
(2) past	Zeigen Sie *Show*	auf welchem Bild *in which picture*	der Mann *the man*	eine Flasche *a bottle*	entkork- *uncork*	-t hat. *-ed has*	
(3) filler	Zeigen Sie das Bild mit dem Stern. *Show the picture with the star*						

Table 1: Examples of target and filler sentences and auditory Regions of Interest (RoI) for the target sentences. The period of silence between sentence end and the participant's button press constituted the final RoI (termed silence).

For each trial, participants saw a picture of the subject and two object pictures: one denoting the object prior to the event ('future-picture') and another one showing it after the event ('past-picture'). There was a fixed picture preview for 4000 ms during which an introduction sentence was auditorily presented naming the depicted sentence constituents. During the "Show"-prompt, a smiley appeared for 500 ms in the middle of the screen to center participants' eye gaze before the onset of the critical sentence constituents. Participants' task was to decide which of the two pictures matches the sentence. They responded by button press. Position of the target picture (i.e., the picture matching the time reference provided in the sentence) was balanced across trials. In addition to end-of-sentence accuracy, we analyzed the proportion of fixations on the past- and future-picture during processing of the different sentence constituents (termed auditory Regions of Interest (RoI), see Table 1) and during the period of silence between sentence end and the participant's response.

Results

Data were analyzed using mixed-model regression procedures applying AIC model comparisons. NBDs' accuracy was at ceiling in both conditions (past: 95%, future: 92%). IWAs performed less accurate (past: 92%, future: 64%). There was a group x condition interaction ($\beta = 2.06$, SE = 0.87, $z = 2.36$), indicating a negative effect of future time reference on IWAs' performance.

The analyses of eye-movements revealed a significant group x RoI x condition interaction. Overall, there were more looks to the target in past than in future condition ($\beta = 0.12$, SE = 0.02, $t = 6.14$) and looks to the target picture increased during processing of the inflection ($\beta = 0.14$, SE = 0.03, $t = 4.16$) and during silence ($\beta = 0.24$, SE = 0.03, $t = 7.06$). However, for the past condition, the increase in looks to the target during the inflection was lower in IWAs than in controls ($\beta = -0.23$, SE = 0.06, $t = -4.11$), indicating a delay in IWAs' online processing. Furthermore, in the future condition, IWAs had more looks to the foil picture than controls already before processing of the inflection, indicating an overall past-picture preference. Moreover, a separate analysis for IWAs' correct and incorrect responses in the future condition revealed that, for correct responses, looks to the target during silence increased, whereas this was not the case for incorrect responses ($\beta = 0.18$, SE = 0.10, $t = 1.84$).

Discussion

In contrast to the predictions of the PADILIH, comprehension scores suggest that in the IWAs past time reference is preserved while future time reference is markedly impaired. However, the online processing patterns are in line with the PADILIH: In correct responses, processing of the past inflection was delayed in agrammatic individuals, but processing of future was similar to that of NBDs. The finding that, in future condition, agrammatic individuals exhibited a past-picture preference already before processing of the critical tense inflection suggests an explanation in terms of insufficient processing resources causing IWAs' comprehension failures. Critically, the past-picture preference needs to be overcome for correct time reference resolution in the future condition. Our results suggest that it is exactly this cognitive operation at the interface of time reference resolution and integration of non-linguistic information which leads to comprehension failures in the future condition.

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Eye movement based evaluation of a text-level reading intervention

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Introduction

Therapy approaches for acquired dyslexia primarily target improved reading at the single-word level. However, with regards to everyday life, the ability to read connected texts often is the ultimate treatment goal (e.g. Beeson & Insalaco, 1998). Despite its relevance, a literature search discloses only the "Mulitple Oral Rereading (MOR)" program (Moyer, 1979), which directly addresses text-level reading. Several studies demonstrated the effectiveness of MOR (e.g. Cherney, 2004; Moody, 1988). Transfer effects on reading accuracy (e.g. Beeson, Magloire, & Robey, 2005; Kim & Russo, 2010) and reading comprehension were shown as well (Cherney, 2004).
The present study examines the impact of an intensive text-level reading intervention following a modified MOR treatment**.** An innovative aspect of our work is not only to focus on reading accuracy and reading comprehension to evaluate the recovery process, but also to include online eye tracking methodology (Ablinger et al., 2014; Ablinger et al., 2013) to get detailed information about the process of word identification in real time.

Methods

Our sample consisted of a control group (*n* = 10; *M* = 26.7 years; range 25-29 years) and a patient group (*n* = 6; *M* = 44.3 years; range 23-66 years). Subsequent to infarction of the middle cerebral artery or traumatic brain injury the patients presented acquired dyslexia in the post-acute or chronic stage of aphasia. In addition, apraxia of speech was present in five patients. Their word reading performance before therapy was characterised by uncertainties with only mild impairments of reading accuracy. All patients received an intensive text-level reading intervention (five days/week) over a period of four weeks. In an adapted MOR procedure we used paragraphs of crime short-stories coupled with multiple choice questions. Treatment consisted of repeatedly reading aloud text passages/ paragraphs until a predetermined criterion level of reading accuracy and comprehension was reached (Willmes, 2003). Reading performance was assessed pre (T1) and post therapy (T2) for trained and untrained material. Eye movements were recorded at both testing occasions.

Results

Four patients improved their reading accuracy significantly from pre to post test in trained as well as untrained material (McNemar test, one-sided, $p < .05$). In two patients, error analysis revealed qualitative changes. While lexical, phonological and morphological errors and self-corrections decreased, the number of uncertainties increased (McNemar test, one-sided, $p < .05$). Oculomotor behaviour (total reading time, total number of fixations) improved significantly in all patients for the trained and untrained text (Wilcoxon signed-ranks test, one-sided, $p < .05$). However, aphasic readers had significantly longer total viewing times and more fixations per text than controls at both times of testing (Crawford & Howell's t-test, 1998, one-sided, $p < .05$). A group analysis revealed significant improvements of reading accuracy and oculomotor behaviour for the whole patient group for trained and untrained material (Wilcoxon signed-ranks test, one-sided, $p < .05$) with a large effect size estimate (Cohen, 1988: $d \geq 0.8$). Only two patients showed improved reading comprehension after therapy (McNemar test, one-sided, $p < .05$).

Discussion

Our results indicate that an intensive text-level reading intervention following MOR may lead to improved reading performance in patients with acquired dyslexia. Even in patients, who do not show quantitative increase of reading accuracy, therapy outcome could be judged as effective when considering the quality of errors. In these cases, severe reading errors decreased at the expense of milder reading errors, indicating better monitoring behavior.
In conclusion, the analysis of oculomotor behavior corroborates the effectiveness of our intensive text-level reading intervention following MOR and demonstrates that the applied deficit-orientated reading approach may also be successful in patients with residual symptoms of acquired dyslexia.

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Investigating the role of neighbours in treatment of acquired dysgraphia

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Introduction

Treatment of acquired spelling impairments (dysgraphia) has proven successful in improving the spelling of those words that are directly treated. In addition, sometimes words that are untreated also improve, but surprisingly little is known about this generalisation of treatment effects to untreated stimuli.
Some studies have argued that the individual's underlying impairment plays a role in generalisation, and that participants with impairments to the working memory component of spelling, the graphemic output buffer, are most likely to show generalisation (Rapp & Kane, 2002). Different theories about the mechanism of generalisation effects in treatment when there is a graphemic output buffer impairment have been proposed. One possibility is that treatment improves processes within the buffer, such as processing speed (Rapp & Kane, 2002; 'buffer account'). Alternatively, a feedback mechanism between different components of the spelling process (i.e., the orthographic lexicon and the graphemic output buffer) might strengthen the lexical representations of words, both treated and untreated (Sage & Ellis, 2006; 'feedback account').

These two accounts make different predictions about the types of words that will show generalisation. The buffer account predicts generalisation to occur for all types of words and non-words, as the buffer is thought to be involved in the spelling of every letter string (Caramazza, Miceli, Villa, & Romani, 1987). In contrast, the feedback account predicts strengthening of connections between representations in the lexicon and letter units in the buffer. Consequently, the words that are most likely to generalize are those that share orthography with items in treatment (i.e., neighbours), or words that have many neighbours in general.

The current study tested these two possible mechanisms of generalisation in two individuals with graphemic output buffer dysgraphia. Through careful design and manipulation of stimuli across two treatment phases, we aimed to answer the following research questions: 1) Does the neighbourhood size of treated items have an effect on the results of treatment? To achieve this we treated words which had no orthographic neighbours in phase one of treatment and words with several orthographic neighours in phase two.

2) Does generalisation occur to orthographic neighbours of treated items or to words with many neighbours in general? To examine this we manipulated the characteristics of untreated stimuli, such that one set included direct neighbours of phase two treated items, a second set were not neighbours of treated items but were high in neighbours in general and a third set had no orthographic neighbours (similar to the treated words of phase one).

3) Does generalisation extend to non-words? If so, is this when these non-words are neighbours of treated items? In order to answer these questions, we included non-words that were direct neighbours of the treated stimuli from phase one and two and non-words that did not have any word neighbours.

Methods

Participants

Two individuals with aphasia, GEC and JOD, participated in the study. Both individuals showed evidence for a spelling impairment that could be categorised as graphemic output buffer dysgraphia.

Procedure

We conducted two phases of treatment (four weeks each) using a copy and recall method (cf. Beeson, Hirsch, & Rewega, 2002) to improve the spelling of two sets of 20 words. Treatment was preceded by two pre-therapy baseline assessments in which all treated and control words were administered in a writing to dictation task.

Stimuli

Treated stimuli: Phase one of treatment consisted of words that have no orthographic substitution neighbours (e.g., 'window'). Phase two of treatment used words with many substitution neighbours (e.g., 'grade'). The words were morphologically simple nouns, verbs and adjectives, that were all five to six letters long. The two sets were matched on written log frequency. The words treated in phase two all had at least five orthographic substitution neighbours, or four neighbours including one of higher frequency.
Untreated stimuli: We also administered three sets of untrained words and three sets of non-words to test for generalisation. The words were 1) words with no orthographic neighbours (e.g., 'pupil'); 2) direct substitution neighbours of the treated words from phase two (e.g., 'grave' for the treated word 'grade'), and 3) words that were unrelated to any of the treated words, with many orthographic neighbours in general (e.g., 'taste').
All three control sets were matched on written frequency and length. In addition, the two control sets with neighbours (set 2 and 3) were matched to the set of treated items with many neighbours (phase two) on number of neighbours, mean and total frequency of the neighbours, and number of neighbours that are higher or lower in frequency.
The first set of non-words were orthographically unrelated to any of the words. The other two sets of non-words were substitution non-word neighbours of the treated items from both phases (e.g., 'tindow' for 'window', 'grude' for grade').

Results

Treatment is currently being completed, and analyses are underway. To date, results show that after the first phase of treatment with words with no orthographic neighbours individual GEC significantly improved on the treated items ($t(19)=1.80$, $p=0.04$ (1-tailed)), but did not show significant generalisation to any control set. When treatment finishes for both participants, we will be able to further investigate the role of neighbours on the effects of treatment.

Discussion

We hypothesized that if generalisation occurs via a mechanism of feedback between the orthographic lexicon and the buffer we would predict generalisation to occur to either neighbours of the treated words or to words with many neighbours in general, compared to words that are unrelated to treated words. If generalisation is the result of an improvement of the functioning of the graphemic buffer itself, we would expect generalisation to occur to all words and non-words equally. Preliminary results from individual GEC showed no generalisation to any control set, which does not support a 'buffer account' or a 'feedback account' of generalisation. Data collection is still ongoing. The final results will help evaluate theories of generalisation, which in turn will improve our understanding of the cognitive process of spelling, and will help make treatments more effective.

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Naming finite verbs predicts language abilities in daily living

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Introduction

People with aphasia have difficulties using language in everyday life, be it to chat with friends, to start a conversation with strangers, to do grocery shopping, etc. (Goodglass, 1976; Tesak & Code, 2008). Psychometric language tasks provide objective measures of these difficulties, particularly when they are included in comprehensive batteries.
One question that remains open is to what extent the objective measures that can be obtained from psychometric language tasks are useful to explain the language difficulties that people with aphasia experience in their everyday life. Best et al. (2008) argued for a relationship between therapy targeting word retrieval and the patients' opinion on their language disabilities. Herbert et al. (2008) found significant relationships between spontaneous speech measures and picture naming. Fucetola et al. (2006) found similar relationships between the Communicative Activities in Daily Living 2 test (CADL2, Holland et al., 1998) and comprehension tasks that require semantic processing.
From these observations emerges the need to establish which production tasks may better explain language abilities in everyday life. This is a complicated issue – naming tasks engage different levels of language organization, and use items that inevitably differ in specific variables; and, in different patients performance is differentially affected by these two factors (Nickels & Howard, 1995). We hypothesize that naming finite verbs will predict language abilities in daily living, as it uses verbs and engages lexico-semantic and morpho-syntactic processes that are affected in aphasia (e.g., Bastiaanse & Jonkers, 1998; Mätzig et al. 2009; Vigliocco et al., 2011). We expect a positive correlation that should be stronger for naming finite verbs, compared with tasks that do not use verbs, do not engage (similar) morpho-syntactic processes, or both (e.g., Bookheimer et al. 2000; Miceli et al. 1984, 1988; Tsapkini et al. 2002).

Methods

Participants

Fourteen native Italian speakers with aphasia participated in this study. Of these, 5 were male and 9 female (mean age: 66, SD = 12; mean years of education: 11, SD = 4). All participants were diagnosed with a left hemisphere stroke at least four months post onset (m=29, SD = 25). Aphasia was assessed with a language battery (BADA, Miceli et al., 2004).

Subjects with less than 5 years of education, affected by psychiatric disorders or taking drugs affecting cognitive performance were not included.

Materials

The CADL2 (Carlomagno et al., 2013, Italian version) was used to assess language abilities in everyday life; the questions of the Communicative Effectiveness Index (CETI, Lomas et al., 1989) and the Communicative Activity Log (CAL, Pulvermüller et al., 2001) were used to assess the caregivers' opinion on the same issue. One automated speech task (counting) and four picture naming tasks, each including 20 items, were administered to each participant. Stimuli for picture naming tasks consisted of black-and-white line drawings used in other tasks (Rofes et al., 2012; Snodgrass & Vanderwart, 1980). The four naming tasks required the ability to name actions by producing infinitive verbs, or by producing finite verbs, to generate verbs when seeing a picture of an object, and to name objects. Items in the picture naming tasks had more than 80% picture name agreement and were matched for frequency, imageability, age of acquisition, length in phonemes and manipulability ($p > 0.05$). Verb items were matched for manipulability, transitivity, number of internal arguments, instrumentality, number of regular/irregular verbs, name relatedness to a noun, and face/arm/leg actions. Noun items were matched for the number of biological/non-biological words.

Procedure

Task administration order was balanced following a Latin square design. The CADL2 was administered and scored following the authors' recommendations. The questions of the CETI and the CAL were scored on a five-point Likert scale. Picture naming tasks were administered on a computer laptop. Each to-be-named stimulus was preceded by a warning sound and stayed on-screen for four seconds. Quantitative and qualitative error analyses were performed.

Results

The scores of language abilities in everyday life, the caregivers' opinion, of automated speech tasks and of picture-naming tasks were normalized to 100. No significant differences were observed between the scores on the CADL2 and those on the CETI and the CAL, given by caregivers ($\chi2(2)=5.286$; $p= 0.071$). When the automated speech task and the four picture-naming tasks were considered, only the scores in naming finite verbs correlated with CADL2 (Spearman's correlation coefficient=0.604; p=0.022). See Figure 1.

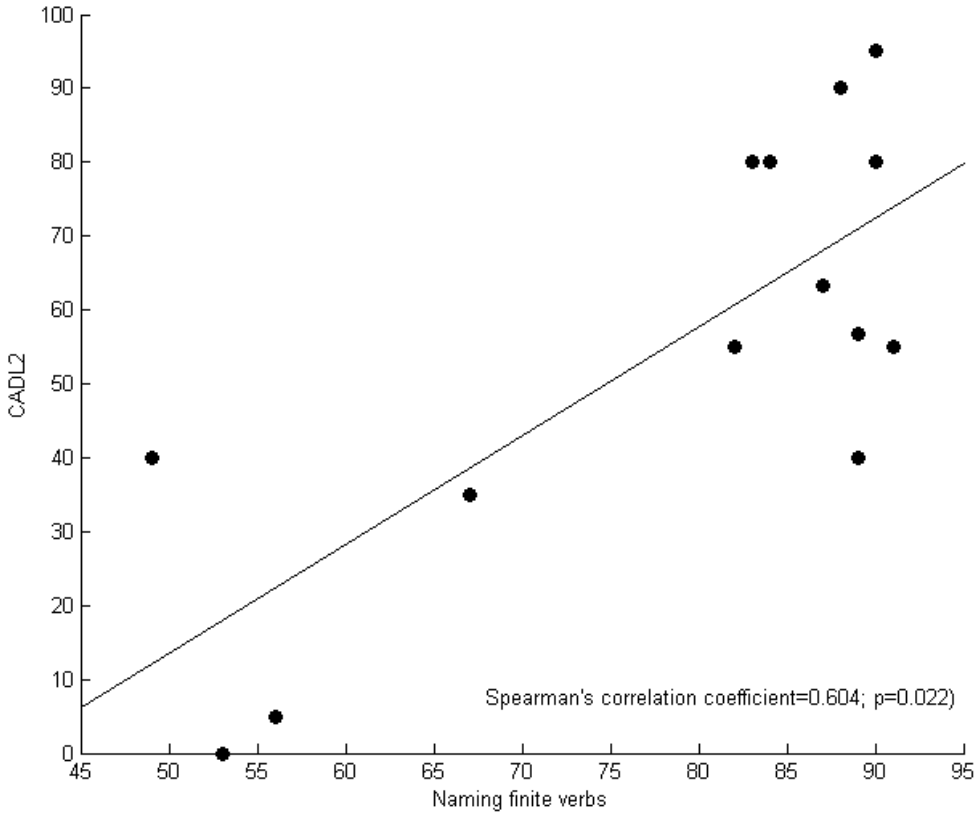

Figure 1. Correlation CADL2 and Naming Finite Verbs (scatterplot)

Discussion

Our goal was to assess how well psychometric language tasks measure language abilities in everyday life. Failure to find differences between CADL2, CETI, and CAL indicates the validity and reliability of the new version of the CADL2. The fact that naming finite verbs is the only task that correlates with the CADL2 suggests that it can be a predictor of language abilities in daily living. These results are similar to Fucetola et al. (2006). It is reasonable to assume that naming finite verbs (but, not the other tasks) correlates with CADL2 because it uses verbs – in essence, it is a sentence production task that engages morpho-syntactic processes, as it requires establishing an agreement relationship between pronoun and verb. These computational requirements are unique to this task, among those used for the present study. These processes are engaged together with lexical and semantic processes, which are also required by the other picture-naming tasks used here. Findings are relevant because the items included in our tasks were matched for a series of psycholinguistic variables. Therefore, across-task differences cannot be reduced to lexico-semantic effects. Results are preliminary, and must be replicated on a larger sample, with other neurologic populations and possibly with more ecologically valid tasks such as spontaneous speech. Including tasks that require the ability to name finite verbs can increase the sensitivity of language batteries (e.g., those used during awake brain surgery).

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Tense, Aspect and Modality in Three Populations: Typically Developing Children, Children with Specific Language Impairment (SLI) and Individuals with Broca's Aphasia

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Introduction

The production and comprehension of finite verbs that are inflected for tense and aspect can be compromised in several language-impaired populations. In Broca's aphasia, difficulty with tense and aspect is often regarded as a deficiency with past time reference (Yarbay Duman, 2009; Yarbay Duman et. al., 2011; Bastiaanse et. al., 2011).
Although time-reference is mostly expressed through tense, it also highly interacts with aspect and modality in many languages. While tense presumes the concept of a temporal axis along which events are ordered with anteriority-posteriority relations with respect to a time-point, aspectual morphology informs about semantic distinctions regarding temporal characteristics like progression or completion of events (Aksu-Koç, 2006). Completion, for example, coincides with past tense since an event regarded as completed is, in general, anterior to the moment of speech or to some other point in time. Epistemic modality (the degree of *certainty* the speaker has with respect to her proposition- or her 'modes of knowing' in general) codes grammatical morphology used for Tense and Aspect. For example, in Turkish, the speaker uses simple past tense with perfective (rather than perfect) aspect to indicate certainty that an event has happened and that this event was witnessed by the speaker. Linguistic information on Tense, Aspect and Modality in a sentence needs to be *integrated* to indicate time-reference of an event since time reference is a semantic characteristic of a verb complex as a whole.
Yarbay Duman (2009) proposed the *Integration Problem Hypothesis* (*IPH*), stating that past time reference is more difficult than non-past time reference for agrammatic speakers because interpreting the temporal information in tense and aspect is more difficult for agrammatic speakers when there is certainty of past i.e. certainty that an event has happened or completed (see also Yarbay Duman et. al., 2011). However, the IPH also predicts that integrating semantic information about aspect and morphosyntactic information about tense will be difficult for agrammatic speakers. Dragoy and Bastiaanse (2013) presented evidence from a Russian study supporting this hypothesis: in Broca's aphasia, reference to the non-past (present imperfect and future imperfect) was better preserved than reference to the past (past imperfect). This non-past time advantage, however, disappeared for future perfect when a perfective Russian verb was used to refer to a future time.

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Although studies in Broca's aphasia report that problems with tense and aspect extend beyond a pure morphosyntactic impairment, tense-related problems in SLI have primarily been characterized as a result of incomplete or optional feature specification of tense features within the functional category T/Infl (e.g., omission of finiteness markings and insensitivity to tense omissions in English) (Rice & Wexler 1996). Leonard and Deevy (2010) argued that aspect is not intact in children with SLI as these children have problems understanding completeness cues in past tense contexts compared to the present tense contexts. Our present study investigates whether tense in Turkish children with SLI is impaired as a functional category T/Infl or whether tense-related difficulties are by-products of an integration problem (such as that observed in Broca's aphasia).
In typical development, children initially use aspect to mark tense before passing through four stages to acquire the tense/aspect/modality system of Turkish (Aksu-Koç, 2006): (1) differentiating static and ongoing events; (2) using –DI and –IYOR to comment on COMPLETED versus ONGOING events within the boundaries of the *immediate present*; (3) use of modal functions (e.g., –DI marks for certainty that an event has happened) and a past non-past distinction is made (non-past includes modal future) and (4) all tense/aspect/modality inflections are used to place events in time and to add perspective.

Methods

Participants

13 children with SLI (mean age 6.9, SD 1.1) and 23 age-matched TD children (mean age 6.5, SD 0.6) were tested. All the children with SLI were receiving speech therapy for their language impairment. They had nonverbal IQ scores within the average limits (mean 90, SD 8.7). Their scores on the standardized TOLD-P:4-Turkish (Topbaş & Güven, 2013) confirmed their inclusion in this study as SLI: 12 children performed 1.5 to 2 SD and 1 child 1SD below the normal mean range on the total spoken composite index and on speaking composite respectively.

Materials

The *Test for Assessing Reference of Time (TART:* Bastiaanse, Jonkers, & Thompson, 2008; Turkish version: Yarbay Duman & Bastiaanse, 2008) was used. The test involves sentence–picture matching in three conditions (Table 1): past tense/perfective aspect, present tense/imperfect aspect and future tense/ imperfect aspect. TART is a forced-choice task (Figure 1). The present tense picture was used as a foil in the future tense and the past tense conditions.

Results

A repeated measures ANOVA with Condition (present-past-future) as the within-participants variable and Group (SLI-TD) as the between-participants variable was run. There was a significant main effect for Condition ($F(1, 34) = 33.26$, $p < .001$, $\eta^2 = .50$) and Group ($F(1, 34) = 29.59$, $p < .001$, $\eta^2 = .47$) and a significant interaction between Condition and Group ($F(1, 24) = 7.93$, $p = .001$, $\eta^2 = .19$). In the SLI group, present tense comprehension was better than the past tense ($t(12) = -6.31$, $p < .001$) and future tense was better than the past tense ($t(12) =$-

3.12, *p* =.009) but worse than the present tense (*t*(12)=3.17, *p*=.008). In the TD group, present tense comprehension was better than both the past tense (*t*(22)=-3.77, *p* = .001) and the future tense (*t*(22)=4.64, *p* <.001). There was no significant difference between comprehension in the past and the future tenses (*t*(22)=-.86, *p* = .401).

Discussion

The first main finding is that tense-related problems in SLI do not stem from a deficit in functional category T/INFL since comprehension of tense/aspect forms that refer to the past, present and future are differentially impaired. The second main finding is that tense-related problems do not stem from a deficit merely in aspect (i.e. event completion: both present and future are 'not complete', but they are differentially impaired) or solely in past time reference (i.e. non-past is also affected: future is more difficult than the present), but stem from a problem with *integrating* aspectual and tense information to indicate time-reference of a sentence. Evidence for this comes from the difference between past and present on the one hand and future and present on the other.

Children with SLI are unable to acquire adequate information on modality functions of verb inflections and cannot use aspectual distinctions efficiently to build up their tense system (stage 3), which has repercussions for the development of the past non-past distinction, including the future. Interpretations of children with SLI might thus be often reflective of COMPLETION versus ONGOING distinction with reference to *immediate present* (here-and-now) information (e.g., saying '*kağıt bitti',* paper over-past, while writing something: stage 2). This is in line with the double opposition between past & present and future & present, also confirming our assumption on modality.

The findings show a clear resemblance between SLI and Broca's aphasia. In Broca's aphasia, comprehension of past is also most difficult and future falls between past and present: worse than present (Bastiaanse et. al., 2011, for comprehension) and better than past (Yarbay Duman & Bastiaanse, 2009, for production). The findings suggest that both populations have problems with the process of building a sentence, since linguistic functions of verb inflections cannot be efficiently integrated to indicate time-reference.

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		SLI		TD	
	Example	M (SD)	Proportion	M (SD)	Proportion
PAST Tense/Perfective Aspect (Completed)	Adam süt-ü iç-*ti* The man milk-acc drink-past/3sg The man has drunk/drank milk	*12.15 (2.9)*	*0.61*	*17.56 (2.5)*	*0.89*
PRESENT Tense/Imperfect Aspect (Ongoing)	Adam süt-ü iç-*iyor* The man milk-acc drink-present/3sg The man is drinking milk	*16.46 (2.5)*	*0.82*	*19.04 (1.3)*	*0.95*
FUTURE Tense/Imperfect Aspect (Incomplete)	Adam süt-ü iç-*ecek* The man milk-acc drink-future/3sg The man is going to/will drink milk	*14.15 (3.2)*	*0.71*	*17.95 (2.0)*	*0.90*

Note. SLI= specific language impairment; TD= typically developing; M=mean; SD=standard deviation. All verb forms are regular in Turkish. Time reference morphemes are in italics.

Table 1. The mean number (SD) and proportion of correctly identified sentences in each condition.

Figure 1. An example of TART-comprehension. The target sentence is: 'the man is drinking milk'

Strategies in non-fluent aphasia: Object clitic substitutions and redundant structures

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Introduction

It is generally agreed that object clitics are susceptible of impairment in non-fluent aphasias, especially in cases of agrammatism (Stavrakaki & Kouvava, 2003; Baauw & Cuetos, 2003; Rossi, 2007; Gavarró, 2008; Nerantzini, 2008; Martínez-Ferreiro, 2010; Sanchez-Alonso, Martinez-Ferreiro & Bastiaanse, 2011; Reyes and Bastiaanse, 2013). Direct object clitics crucially depend on discourse linking, which according to Avrutin (2006) causes a high processing load that individuals with aphasia may fail to overcome. In the event of difficulties implementing discourse linking operations, production results indicate a preference for clitic omission or their substitution by full DPs. However, no further analyses of the strategies underlying other documented errors, such as substitutions or agreement mismatches (Nerantzini, 2008; Martínez-Ferreiro, 2010), are generally provided. This study targets the performance pattern underlying these non-target responses in Catalan and Castilian Spanish. To do so, we focus on the use of transitive sentences in which a clitic element coexists with the full DP it agrees with (1a vs. 1b).

(1) a. La hace la cama. [Clitic + Full DP] (Spanish)

it make$_{\text{PRES.3RD.SG}}$ the bed

(She) makes it the bed.

b. La hace. [Clitic substitutes for full DP]

it make$_{\text{PRES.3RD.SG}}$

(She) makes it.

The status of these constructions as instances of clitic doubling, a phenomenon that is banned in both languages in accusative contexts (but allowed, among others, in Rioplatense Spanish), and/or as instances of right dislocations, and their implications for theoretical accounts of the performance of individuals with aphasia are addressed in these lines.

Methods

Data sample

The error pattern of 15 native speakers of Spanish and Catalan was revisited in order to detect the presence of doubled structures in substitution for direct object (accusative) clitics. The first data set (Reyes & Bastiaanse, 2013) included the results of 5 Castilian Spanish speakers with agrammatic aphasia (mean age: 55.4, range: 34-68) tested through a sentences completion task (based on Bastiaanse, Edwards & Rispens, 2002) that included a set of 64 reversible transitive sentences in four conditions (declaratives with full DPs, declaratives with object clitics, topicalized object DPs, and imperatives). The second data set (Martínez-Ferreiro & Bastiaanse, 2013) included results from 7 Catalan and 3 Castilian Spanish speakers (mean age: 58.5, range: 24-76) diagnosed as Broca's, mixed transcortical, or global aphasic individuals.

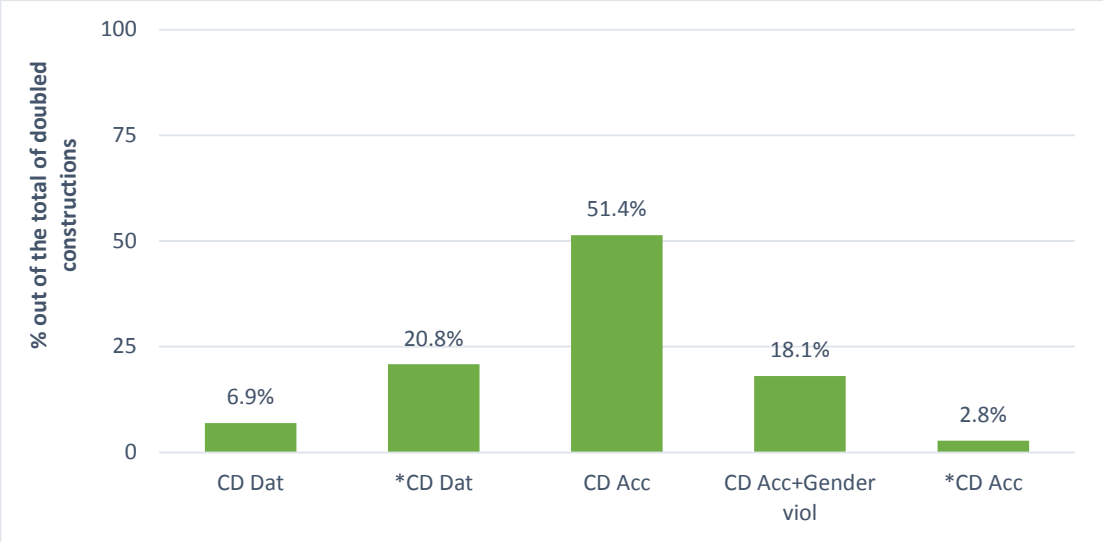
Scoring

From the total pool of non-target responses recorded in these studies, we first selected all those including any instance of clitic doubling and/or right dislocation, either grammatical or not. Then, these responses were further classified according to the nature of the clitic element into accusative and dative doubling constructions.

Results

The results from Reyes & Bastiaanse (2013) reveal that, out of the 5 subjects included in the study (providing a total number of 558 responses), 4 use the combination of clitic + full DP. A total of number of 43 non-target doubled structures were found (9 in conditions eliciting full DPs, and 34 in conditions eliciting clitics in pre-verbal and postverbal position). However, only two subjects frequently reverted to this strategy (S01, S02: n = 1; S04: n = 32; S05: n = 10), and these constructions tended to entail further syntactic violations.

In Martínez-Ferreiro & Bastiaanse (2013), even if clitic elements were not required to complete the task, four out of the ten individuals in the aphasia group were found to produce instances of doubled structures to a varying degree (6.9% of non-target responses; 30/426); and for three of them, this strategy is repeatedly used (C03: n=8; C05: n=6; C06: n=16; C07: n = 1). No instances of clitic doubling were found in the Spanish sample. Regarding the nature of the constructions, 26/29 responses were instances of direct object clitic doubling in otherwise grammatical structures. Three instances of agreement violation between the clitic and the full DP were also attested. In all cases, singular masculine DPs coexisted with feminine singular object clitics.
The results across studies are summarized in graph 1.



CD: Clitic doubling; CD Dat: CD with dative clitics; *CD Dat: CD with Dat clitics substituting for accusative clitics; CD Acc: CD with accusative clitics; CD Acc + Gender viol: CD with Acc clitics including a gender mismatch between the clitic and the DP; *CD Acc: CD with Acc clitics substituting for dative.

Graph 1: Distribution of doubled constructions across studies.

Discussion

The high rates of otherwise grammatical doubled constructions may be taken as indicators that these are actually instances of right dislocations. Microvariation emerges as for the productivity of this structure across languages. According to Villalba (2011), right dislocations are very frequent in Catalan, while Spanish makes very marginal use of it. This is mirrored in the results from Martínez-Ferreiro and Bastiaanse (2013). None of the Spanish-speaking subjects produced instances of this construction, and those in Reyes and Bastiaanse (2013) contain multiple grammatical mistakes.

Lack of intonational break and presence of the preposition *a* 'to' are taken as arguments to set clitic doubling and right dislocations apart (Anagnostopoulou, 2006). The broken pattern of rhythm characteristic of non-fluent aphasias may be held responsible for the absence of an identifiable break between the verb and the DP. However, examples such as (1), produced in Spanish without any pause and in the absence of preposition, make it difficult to set apart both constructions with the scarce amount of data available up to date.
With independence of their nature, the use of these constructions, that we take to derive from a failure in discourse linking (in line with Avrutin, 2006), can be taken as an indication of preserved sensitivity to contexts requiring the use of clitics. However, failure to delete the full DP suggests that the clitic fails to satisfy its requirements, being reduced to a mere filler what makes it susceptible of displaying gender, number, and case mismatches. The full DP is still necessary to host the relevant inflectional markers.

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Memory and language interactions during discourse of patients with MCI due to AD

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Introduction

Discourse represents our main way of communication. For patients, discourse impairment has consequences on communication and therefore on daily independency. For researchers, discourse allows cognition assessment through an ecological way. More and more studies focus on discourse production in Alzheimer's disease (AD). Some of these studies have been carried out using autobiographical discourses (Hoffman et al., 2010; Gayraud et al., 2011) and revealed more extensive lexical-semantic impairments than the one observed in standardized tasks. They also showed that patients use more pauses and more pauses inside a phrase, attributed to lexical retrieval difficulties. However, pauses can reflect others cognitive processing, in particular discourse planning (Goldman-Eisler, 1968; Corley and Stewart, 2008). Beyond pauses, discourse production also implies other cognitive abilities: memory (Ullman et al., 2004) or executive functions (Cannizzaro et al., 2012). Here, we aim at better understanding the neurocognitive aspects of memory and language processes interactions through discourse production analysis.

Methods

Participants and assessment

Patients (N=15) with a diagnosis of mild cognitive impairment (MCI) due to AD (McKhann 2011) were recruited in the outpatient memory clinic (Neurology department, University Hospital, Toulouse, France). Matched cognitively normal subjects (N=15) were recruited among patients' relatives or using recruitment posting. They all underwent an ecological autobiographical episodic memory task, made of 8 incidental mini-events in the hospital precincts mimicking real-life events. After a twenty minutes delay, they were asked to recall them as precisely as possible. Participants also underwent a full comprehensive neuropsychological evaluation.

Discourse analysis

Participants' and experimenters' discourses were manually and orthographically transcribed with the CHILDES system (Child Language Data Exchange System, CHILDES, MacWhinney, 2011) using the imbedded Clan software program (Computerized Language ANalysis) and its CHAT transcriptions norms (Child Language Data Exchange System, *CHILDES*, MacWhinney, 2011). Disfluencies were annotated: false starts, repetitions, rephrasing, incomplete sentences, pauses. Pauses length was manually tagged with Audacity software (http://audacity.sourceforge.net/), using a 250 ms threshold (Goldman Eisler, 1968).

We first investigated overall autobiographical discourses structures through elements that may be modulated by episodic memory: use of historical present (Park et al., 2011), spatial and temporal adverbs/phrases. Then, we focused on disfluencies and speech organization (disfluencies rates, length of pauses, speech rate, articulation rate, standardized pauses rate, mean length of utterance). Finally, we paid attention on the localization of pauses in discourse, following Goldman-Eisler's typology of grammatical vs non-grammatical pauses. To be more specific, we added a further distinction within the grammatical pausing, by identifying grammatical-planning pauses (i.e. grammatical pauses that occur at the beginning of an utterance). We called them "planning pauses" since this grammatical juncture is supposed to request the higher cognitive demand (Goldman-Eisler, 1968; Corley & Stewart, 2008). We measured the percentage of grammatical, grammatical-planning and non-grammatical pauses; lexical frequency and grammatical classes of words following non-grammatical pausing. Analyses are summarized figure 1.

After discourse analyses, we correlated the results observed with participants' performance at neuropsychological tasks involving lexical-semantic processing and episodic memory.

Statistical analysis

All statistical analyses were performed using the Satistica software package, version 8 (Statsoft, 2007). For inter-group comparisons we used a non-parametric Mann-Whitney test. Correlations with cognitive abilities were realized with Spearman's rank correlation on episodic memory (Epitoul cued recall) and lexical-semantic processing (picture naming task, semantic and phonological fluency tasks). Correlations were performed in each group independently.

Results

Patients' discourse overall structure was slightly impaired: they produced less historical present but not less spatial or temporal elements than controls. Regarding disfluencies, patients produced more false starts but were not significantly different than controls on others measures, including the number of pauses. Though, their speech organization was impaired: they were less effective than controls because of longer pauses. Concerning the localization of pauses, patients did not differed from controls on grammatical or non-

grammatical pauses production but used more grammatical-planning pauses. However, they produced more non-grammatical pauses before verbs used to recall the mini-events. Words following non-grammatical pauses had also a higher lexical frequency than in the control group.

Correlations analyses showed that discourse impairment was not linked to any lexical-semantic task in the MCI group while, among controls, many measures were negatively correlated with semantic fluency, phonological fluency and naming task performance (i.e. historical present, repetitions…). As regards pausing specifically, it was not correlated to lexical-semantic processing in any of the two groups **but appeared positively correlated to memory recall in the patients group** (percentage of grammatical-planning pauses; percentage of non-grammatical pauses; percentage of verbs following non-grammatical pausing). Complementary neuroimaging analysis (Pistono et al., in prep) showed that, in the patients' discourses, planning-pauses were correlated to grey matter density in the frontopolar area. This region is known to be important to switch attention from the external world to personal thoughts (Burgess et al., 2007).

Discussion

Autobiographical discourse structure in MCI patients appeared partly impaired and pausing weakened their speech organisation. Their pauses use differed on grammatical-planning pausing because of higher need of planning the recall of the mini-events. Correlations with neuropsychological tests showed that their discourse impairment was not associated to lexical-semantic deficit. It pointed out relations between memory and language. Whereas it is usually assumed that speech disfluencies in AD patients reveal difficulties in access to the lexicon, we conversely propose that, at an early stage of AD, these could reflect a compensatory mechanism. Without denying the presence of such impairment in this disease, we put forward the hypothesis that patients' discourse is influenced by memory and that pauses help patients to remember the episode they lived. In others words, discourse production represents a relevant way to assess cognition of patients suffering of neurological disorders. A better understanding of discourse at early stages of neurodegenerative diseases may become a helpful diagnostic tool and a way to prevent communication impairment and autonomy loss in daily leaving.

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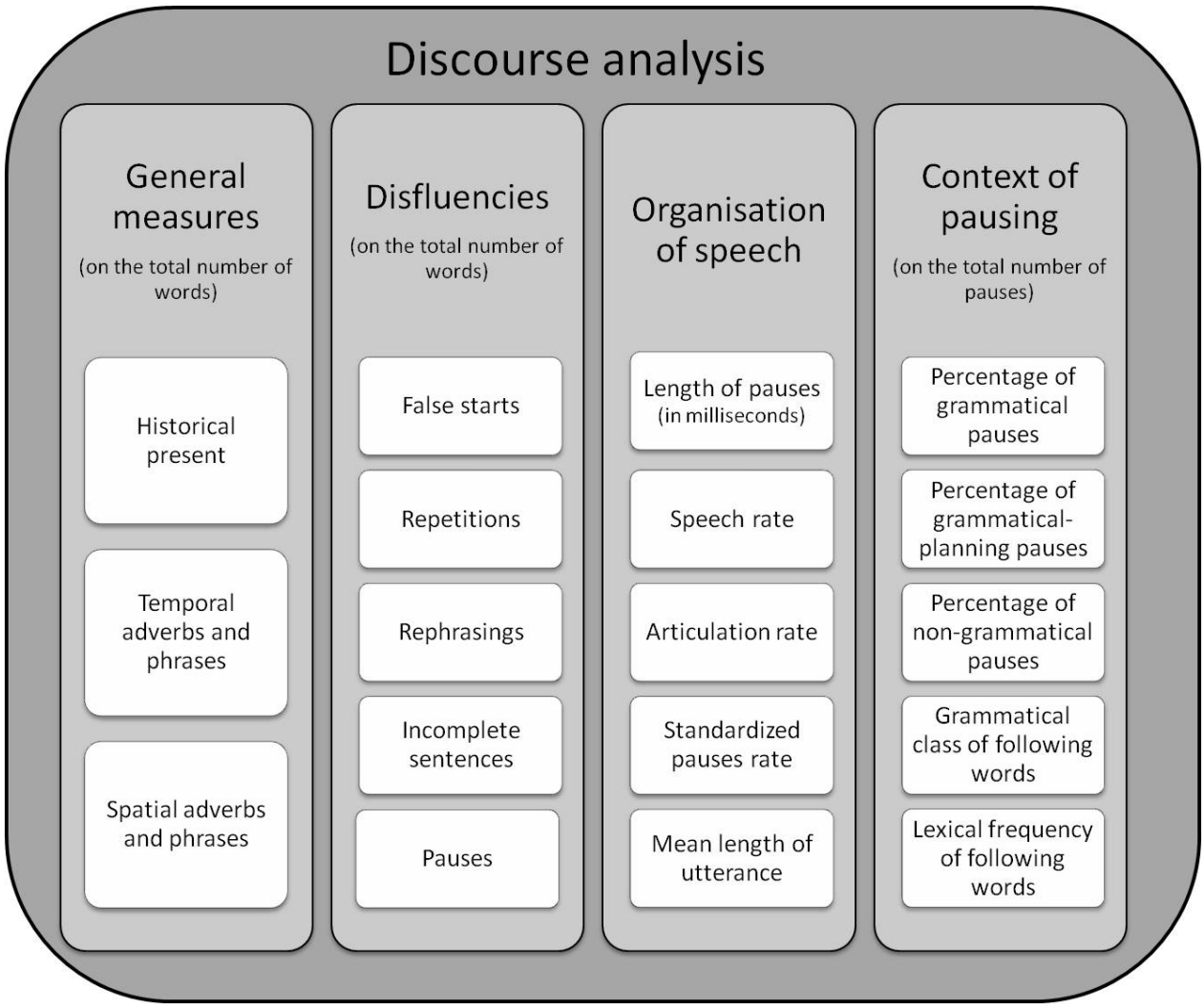

Figure 1 : Summary of the variables under examination for discourse analysis.

Speech Mapping of the Broca Region using repetitive Transcranial Magnetic Stimulation

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Introduction

Neurosurgical intervention of language-eloquent tumours requires individual identification of indispensable structures for language functions. The gold standard so far is the invasive technique of intraoperative electrical cortical and subcortical mapping during awake craniotomy. The use of the non-invasive electrophysiological method of repetitive transcranial magnetic stimulation (rTMS) –the so called "virtual lesion technique"– in preoperative speech mapping is a promising innovative approach in neurosurgery (Espadaler & Conesa, 2011). The technique allows to induce an acute and exhaustive reversible focal dysfunction without structural damage (for a review, see Pascual-Leone et al., 2000). Previous TMS research proved for example a functional specialization of the inferior frontal cortex according to semantic and phonological processing of words (Gough, Nobre & Devlin, 2005; for a comprehensive overview on assessment of language functions using TMS, see Devlin & Watkins, 2007). The aim of our study is to develop a standardized procedure for speech mapping using rTMS including a detailed neurolinguistic analysis. At this stage the individual functional parcellation of the Broca Region in a physiological language network was explored with healthy participants. It is planned to continue with tumour patients.

Methods

Participants

Until now ten healthy volunteers (mean age of 28,6 years; range 22-46 years; 3 male, 7 female) were included in the study. All participants were native German speakers.

Language Tasks

During the rTMS procedure, participants were asked to name 30 common black and white line drawings of German nouns with 3 syllables at low-frequency in spoken language (CELEX database: Baayen et al. 1996). Pictures were presented by a computer placed in front of the participants using Presentation software. The experimenter initiated each picture in order to position the coil exactly over the following target. Before rTMS session pictures were presented in a paper version to ascertain the participants object familiarity.

Procedure

The rTMS speech mapping procedure was assigned as follows:

1. **Neuro-navigation**: An anatomical volume MRI data set was used to register the participants brain with an optical tracking system of the software LOCALITE, Biomedical Visualization Systems. This allowed to position and monitor the stimulation coil exactly on the predefined target areas during rTMS delivered by a transcranial magnetic stimulator (MagVenture MagPro X100).
2. **Definition of stimulation intensity:** Strength of applied magnetic field was defined individually by both the resting motor and speech threshold. The speech threshold was determined by the stimulation intensity which inhibits language processing significantly. Stimulation intensity (individual speech threshold) was 140%-170 % of the individual resting motor threshold. The proceeding was determined in line with the safety parameters by Epstein et al. (1996) and Wassermann (1998).
3. **Speech and language mapping**: During picture naming, rTMS with a stimulation length of 1000 ms (5 Pulses – 5Hz) was applied simultaneously to the onset of picture presentation. Stimulation sites for neuro-navigated rTMS were defined by a 5 x 6 points grid (with a distance of 6 mm between points) superimposed manually on the left-hemispheric inferior frontal gyrus (Figure 1 A). Stimulation followed a fix sequence through the grid and was repeated fife times including a sham stimulation for baseline measurement.
4. **Language evaluation**: Speech and language phenomena were qualitatively assessed online and later analyzed in full detail offline by two independent speech and language therapists using the video-taped session. Further, speech latencies were determined. Error types included: no-response errors, delay, speech disruptions, semantic paraphasias, phonematic paraphasias and performance errors. Performance errors included phonetic distorsions, dysprosody and dysfluency, following Corina et al. (2010), due to the fact that distinction of dysarthric speech production and apraxia of speech symptoms is as difficult in rTMS as in the context of intraoperative mapping.

Results

The rTMS-induced errors were analyzed by number, location and type. Results of the first ten cases showed a disturbance of speech and language on 42% of the naming tasks (in total 120 tasks in verum stimulation). Main focus of the disturbances appeared at stimulation sites close to the inferior frontal junction which is represented by the highest columns in Figure 1 B. Most frequently observed errors were performance errors (72%), followed by delay (14%). Speech disruptions (5%), phonematic paraphasias (4%), no-response errors (3%), and semantic paraphasias (2%) were less frequently. The comparison of latencies of sham and verum stimulation varied individually.

Discussion

Performance errors appeared by far most frequently and on all stimulation sites. There was an emphasis on the pars opercularis which is involved in motor programming and execution. However, these errors are difficult to explain on anterior stimulation sites. This may point on problems in segregation of non-specific effects, which still constitutes a challenge in the interpretation of rTMS-induced errors. Errors could be discussed for example in context of peripheral nervous interference or discomfort during stimulation. Interestingly, language symptoms were observed infrequently which wasn't expected in this extent. After achieving a standardized work-flow we plan to continue with tumour patients. Additionally, we are still

evaluating the obtained imaging data by comparing connectivity patterns of speech-positive and speech negative areas. Consequently, a convergence of rTMS and functional and structural imaging data could enhance relevance for planning neurosurgical interventions.

Acknowledgements

We want to thank Stefan Heim for his helpful suggestions.

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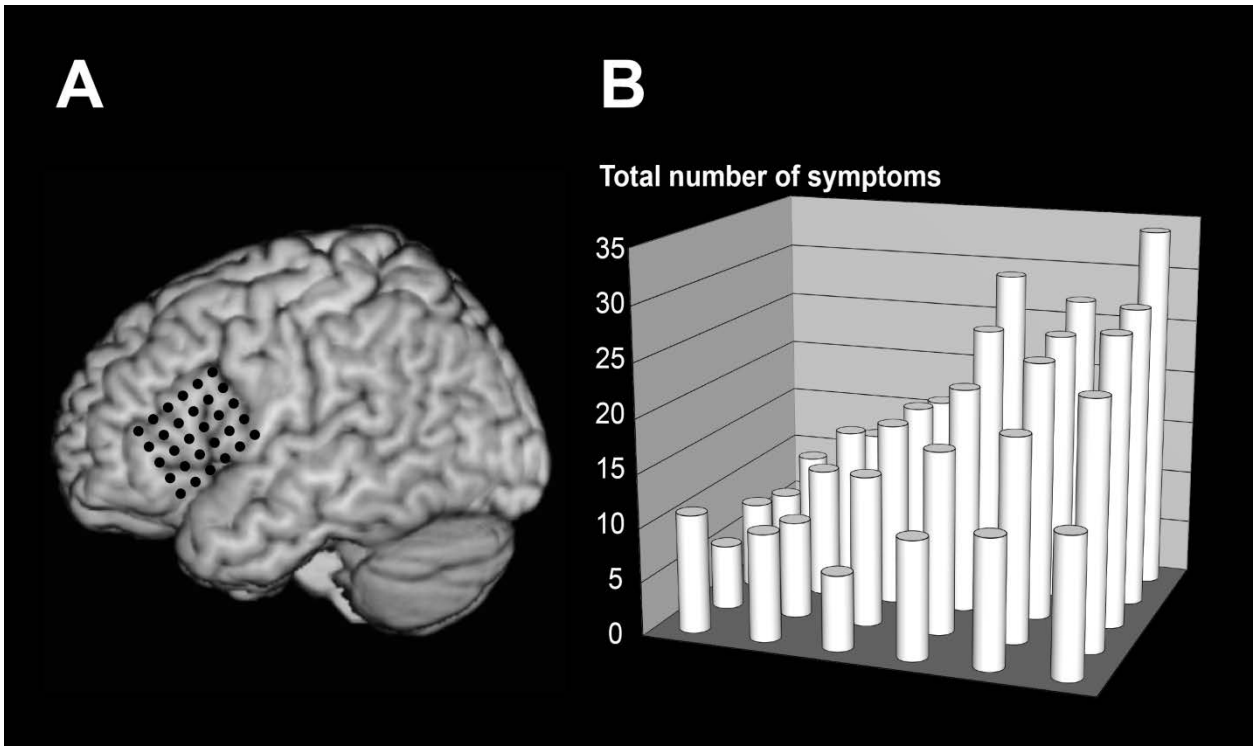

Figure 1: (A): Position of the stimulation grid superimposed on the Montreal Neurological Institute (MNI) brain. (B): Consolidation of all symptoms of the participants on each point of the grid.

Abstract: Neural Correlates of Motor and Language Recovery after Stroke: Four Single Case Studies

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Introduction

In patients with both initial aphasia and hemiplegia after stroke, motor and language recovery may take different courses. It is possible that motor skills improve and language impairments persist, or vice versa. Other developments of rehabilitation may include that severe initial impairments in motor and language abilities persist or both abilities recover well. Up to now, scientific research has primarily concentrated on the examination of the course of recovery with focus on motor *or* language abilities. To our knowledge, there is only one multiple single case study which combines the exploration of motor as well as language recovery. Harnish et al. (2011) examined language abilities, motor function of the upper limbs, and functional motor reorganization in five stroke patients. The patients underwent six weeks of therapy only in the motor domain. Those three subjects showing significant language improvements also manifested the largest motor improvements. Harnish et al. concluded that language changes seem to co-occur with motor changes after motor therapy. The present single case study explored if there are neural correlates of predictors for concurrent motor and language recovery after stroke. In particular, lesion areas that provide beneficial conditions for recovery were investigated. It was examined if lesion location differentiates patients with optimal motor and language recovery from patients with recovery in one domain, and if the preservation of the corticospinal tracts and the left arcuate fasciculus are predictive for a good motor or language recovery. Furthermore, the presence of an additive interaction between the motor and language domain during recovery was investigated.

Methods

Patients

To explore the aims of the study, four patients with different base levels of motor and language skills at the beginning of the study were chosen. Clinical records documented that at the acute stage of the stroke, all patients had a comparable severity of initial motor and language symptoms. The different base levels resulted from the patients' individual recovery

processes prior to the participation in the study.
Patient GB showed a mild disorder of fine motor skills as well as an amnestic aphasia, while patient SN had a right-sided severe hemiplegia, a severe global aphasia and an apraxia of speech. Patient FH showed mild residual symptoms of hemiparesis, global aphasia and an apraxia of speech. Patient PG had a severe hemiparesis and a residual aphasia. General inclusion criteria were: first ischemic stroke in the left hemisphere, right handed according to the Edinburgh Inventory of Handedness (Laterality coefficient ≥ 80; Oldfield, 1971), postacute or chronic stage of stroke, general MRI compatibility, normal or corrected-to-normal vision, no hearing loss, no history of dementia or other CNS or psychiatric diseases.

Research Design and Clinical Examinations

A pre-posttest-design was applied. The pre-test took place during the first week of the patients' stay at the aphasia rehabilitation ward of the Uniklinik RWTH Aachen. Functional language scales (Aachener Aphasie Test, Huber et al., 1983; subtests of Lexikon Modellorientiert, Bleser, de et al., 2010; subtests of Aachener Materialien zur Diagnostik neurogener Sprechstörungen, Schnitker et al., 2011) were used to identify the clinical status of the patients. In order to evaluate the patients' motor abilities, a physiotherapist applied functional motor tests (Wolf Motor Function Test, Wolf et al., 2001; Dynamic Gait Index, Shumway-Cook & Woollacott, 2001). Alongside functional scales, structural MRI scans were conducted in the first week of the patients' stay at the hospital. The post-test took place during the 7^{th} (i.e. last) week of the stay at the aphasia rehabilitation ward. Again, the functional language and motor scales were used to evaluate patients' development during the intensive treatment. MRI measurements were not repeated. Between pre- and post-test, the patients participated in language- and physiotherapy at the aphasia rehabilitation ward.

Data Analysis

The analysis of imaging data was characterized by lesion mapping and its evaluation via FSL and included atlases (Mori et al., 2005; Mazziotta et al., 1995). The coherence between lesion data and patients' base level abilities at pre-test as well as the coherence between lesion data and rehabilitative improvements at the post-test were analyzed on an individual subject basis (Huber, 1973).

Results and Discussion

Patients who showed a good base level of language function at the pre-test had smaller lesions in the frontal lobe compared to patients who manifested a poor level of language function at the pre-test. The results obtained suggest that the extent of damage of the frontal lobe may be a correlate for a sufficient language recovery. This assumption can also be transferred to the subcortical frontal structures insula and putamen.
Regarding the corticospinal tract, patients with less lesions in this tract had better motor skills at the pre-test and were able to show the best motor recovery at the post-test. In line with previous studies (e.g. Zhu et al., 2010), it can be confirmed that the preservation of the corticospinal tract is a neural correlate of motor recovery, not only in patients with motor

impairments but also in patients exhibiting both motor and language dysfunctions after stroke.
The amount of lesioned voxels in the arcuate fasciculus and superior longitudinal fasciculus increased in the patients according to the sequence from highest to lowest base level of language abilities. Therefore, the preservation of these fibers seems to be meaningful for developing sufficient language skills and recovery after stroke.
First indicators were found that there is an additive interaction between motor and respectively motor speech rehabilitation after stroke. Patients with a good base level of motor function at the pre-test were able to improve in the subtest articulation, while patients with a good base level of language abilities exhibited greater gains in the functional motor scales. This result is in accordance with the study of Harnish and colleagues (2011), who found that the degree of motor as well as language improvement co-occured.

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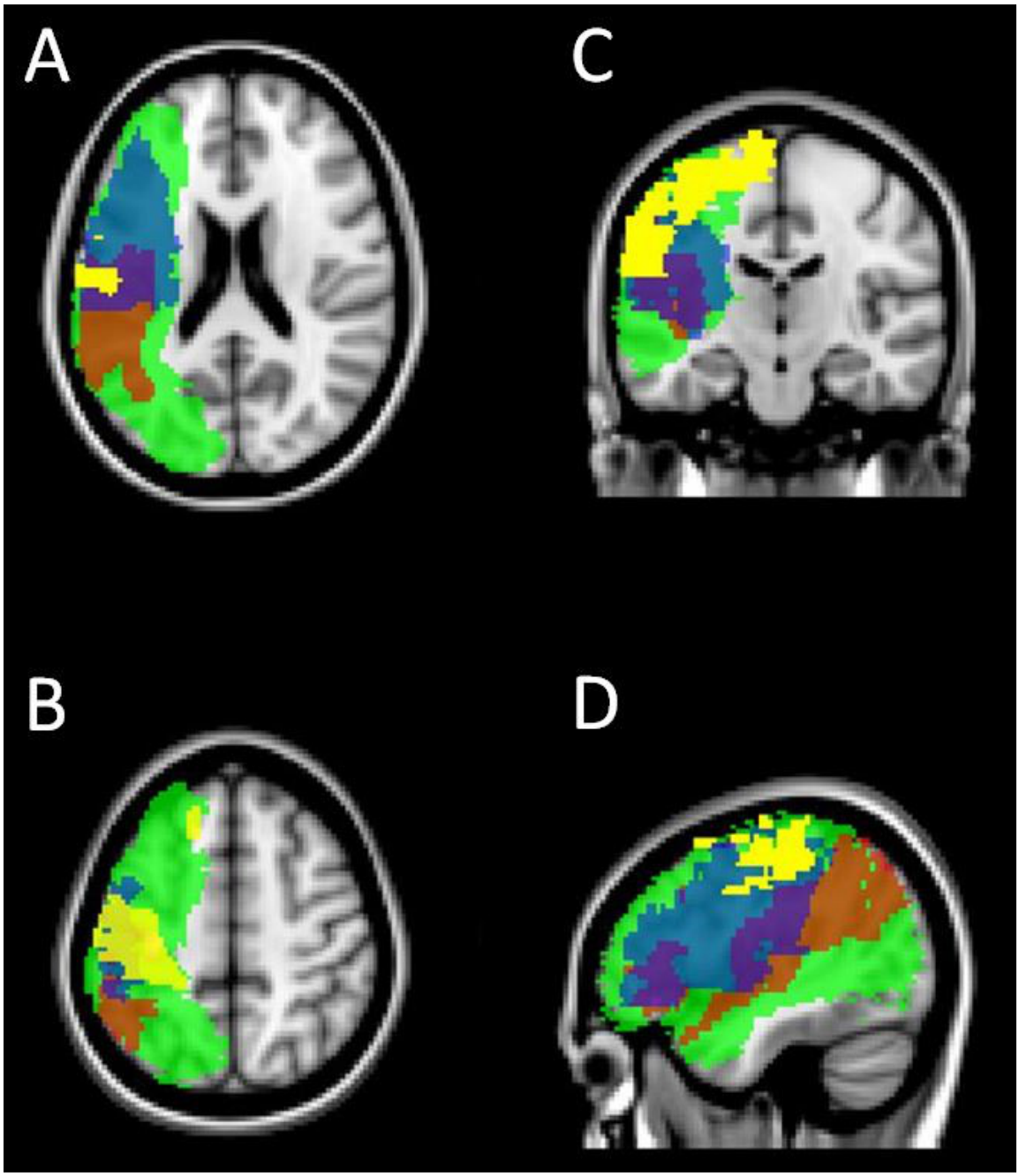

Figure 1. Structural MRI (FLAIR sequence). Overlay of normalized lesion maps of the patients in the standard brain.

Blue, FH; red, GB; green, SN; yellow, PG. (A) axial, subcortical view (B) axial, cortical view (C) coronal view (D) sagittal view (left hemisphere).

Improving communication in aphasia: A comparison of naming- and discourse based treatment, both facilitated by transcranial direct current stimulation (tDCS)

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Introduction

The impairment-based approach to aphasia therapy seeks to improve the language production of individuals with aphasia (IwA) by focusing on the underlying linguistic deficit (Basso, Forbes, & Boller, 2013). Typically, treatment interventions concentrate on the sublexical, lexical or syntactic level aiming at the recovery of a specific language skill. Especially therapy methods for naming disorders in IwA have been well established in clinical settings today (e.g., Nickels, 2002). Although a direct effect of these treatment methods, namely, an improvement in the subjects' performance on trained items and tasks, is indisputable, there have been controversies regarding the extent of generalization of these methods to untrained items, tasks and, more importantly, real-life communication settings (Kempler & Goral, 2011). Thus, a number of investigators have developed promising treatment methods that aim at improving a certain linguistic structure through discourse production (Boyle, 2011). However, it still remains open which therapy, a naming treatment or a treatment that integrates linguistic units in a broader discourse context, results in improved language production and communication in daily life (Boyle, 2011).

Recently, numerous studies investigated the effect of language training in IwA with adjuvant non-invasive brain stimulation. There is converging evidence for an improvement of naming recovery after transcranial direct current stimulation (tDCS; see Holland & Crinion, 2012; Elsner et al., 2013 and Monti et al., 2013 for reviews) compared to sham-stimulation. One study used a discourse productivity treatment coupled with tDCS (Marangolo et al., 2013). Although Marangolo and colleagues (2013) reported an improvement in informative speech for all participants that also generalized to untreated items, the exact treatment applied remains elusive. Furthermore, no transfer effects on other language tasks than the description of video clips was assessed.
The present study attempts to fill the described gaps by comparing the effect of an intensive naming treatment to an intensive discourse treatment, both boosted by tDCS. The following research questions are addressed: (1) Which kind of treatment – naming training or discourse training – will lead to better communicative skills in chronic, non-fluent aphasia? (2) Do improvements generalize to untreated items and tasks? (3) Does the impact of tDCS on both treatments differ in its effectiveness?

Methods

Participants

We are currently recruiting individuals with chronic, non-fluent aphasia (post-onset ≥ 6 months) who are eligible to participate. Diagnosis of aphasia is made through assessment of the Aachener Aphasie Test (AAT; Huber et al., 1983). All participants are right-handed and suffered from a single left hemisphere CVA. They do not have other cognitive deficits or severe motor speech disorders.

Materials and procedures

In order to compare the efficacy of both treatments on a within-subject level, a two-period crossover design is applied. Participants are randomly assigned to either begin with the naming or the discourse treatment. Both treatment periods last for two weeks (8 training sessions) separated by a washout period of 2 weeks. Before, between and after both treatments, participants are administered the Amsterdam-Nijmegen Everyday Language Test (ANELT; Blomert et al., 1997) and a naming test of 344 pictures. During both treatments, all participants receive 1mA of anodal tDCS over the left primary motor cortex for 20 min. The reference electrode is placed contralateral supraorbital. As previously mentioned, there is considerable evidence for a positive effect of tDCS on naming treatment (e.g., Monti et al., 2013); hence, a sham control group is not included in the present study.

Naming treatment

Materials for the naming treatment are taken from an ongoing study. From overall 344 pictures of objects, for each participant 60 unknown pictures are chosen to be trained. Pictures are matched on length and frequency. During a training session, participants receive phonological and orthographical cues along with the pictures which diminish in length over four levels. In the last level, participants are asked to name the pictures by themselves and scoring is recorded. During one treatment session, two runs of the training are carried out.

Discourse treatment

Eight short video clips (Mean length = 124 s) taken from the movie ‘Modern Times’ by Charlie Chaplin are used for the discourse treatment. Each training session aims at a free description of one video scene by the participant. A systematical therapy scheme with different levels of increasing task difficulty was developed to induce targeted structures. Tasks include a non-verbal comprehension test of the video content via the arrangement of pictures on a storyline, the naming of items from the target video, the naming of object-verb-collocations, the development of individual propositions for complex pictures and for the target video. The examiner is allowed to provide help to the participant if required, first unspecific in the form of general feedback and in a second step more specific in the form of semantic and phonological cues. Each session starts and ends with a description of the target video which is recorded and scored. During one treatment session, two runs of the training are carried out. Prior to treatment, all video clips are described by 20 healthy, age

matched, native speakers of German who have no history of neurological or psychiatric illness.

Results

A preliminary analysis of the naming treatment coupled with tDCS showed a significant improvement in correctness scores compared to a sham group from an ongoing study. These results confirm the increase of improvement induced by tDCS. First results on the effect of the discourse treatment coupled with tDCS show significant improvements on trained and untrained items and tasks. Full data on the comparison of the naming and the discourse treatment will be available by September and reported at the conference.

Discussion

The present study will contribute to the ongoing discussion about the effectiveness of different types of therapy: Should future treatment interventions continue with a training of a specific linguistic skill or should therapy move towards a more integrated approach aiming at real-life communicative settings? Further outcomes will be discussed in full detail at the conference.

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Cerebellum and Apraxia

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Introduction

Classical tenits posit that the role of the cerebellum is limited to pure sensorimotor control. However, evidence from clinical and imaging studies shows that the cerebellum is crucially involved in nonmotor cognitive and affective functions. Schmahmann and Sherman (1998) [1] introduced the cerebellar cognitive affective syndrome (CCAS), characterised by executive, visuo-spatial, affective and linguistic impairments caused by cerebellar pathology.
Apraxia, as a planning, organisation and execution disorder of a skilled motor action (not caused by motor, sensory or intellectual impairment) [2], may be regarded to form part of the executive cluster of CCAS. Indeed, several anatomoclinical studies have confirmed involvement of the cerebellum in at least some types of apraxia, which adds to the nonmotor role of the cerebellum.
According to Hugo Liepmann [3], apraxia is thought to evolve from a disruption of the creation, activation or retrieval of movement formulae. These formulae represent the idea of a movement as a visual or acoustic image and are stored in the left parietal lobe. The left prefrontal area subsequently associates these formulae with an inherently stored innervatory pattern to transfer the information to the left primary motor areas. The corpus callosum transfers this information to the right motor cortex if the movement is to be executed by the left limb [3]. Based on some recent clinical evidence we hypothesize that the cerebellum forms an intrinsic part of this connectionist model of Liepmann.

Methods

To delineate the possible role of the cerebellum in the planning and organisation of skilled motor actions, a number of recent case studies are reported of apraxia following cerebellar pathology. Different kinds of apraxia were described following cerebellar disease including Apraxia of Speech (AoS), Apraxic Agraphia (AA), a cluster of apraxias (e.g. constructional, ideomotor and drawing apraxia) characterising Developmental Coordination Disorder (DCD). All of these cases provided evidence for involvement of the cerebrocerebellar network in the pathophysiology subserving apraxic disorders.

Results

Apraxia of Speech (AoS)

In AoS motor speech planning and programming are selectively impaired. The patient is no longer capable of converting phonological information into the correct verbal-motor commands [4]. AoS is frequently associated with Foreign Accent Syndrome (FAS), a motor speech disorder in which a change of accent is perceived by listeners of the same language community as distinctly foreign [5].

AoS is primarily associated with damage of the language dominant motor speech region (anterior insula, inferior premotor and motor cortex, BA 44 of Broca's area). However, based on some overt semiological similarities with ataxic dysarthria, it has been hypothesized that AoS and ataxic dysarthria may share similar pathophysiological mechanisms [4].
Cerebellar involvement in AoS was confirmed by Mariën et al. (2006) [4] and Mariën and Verhoeven (2007) [6]. They described two right-handed patients with FAS after a left hemispheric stroke. In addition to a significant hypoperfusion in the language dominant hemisphere, Tc-99m-ECD SPECT perfusion scans revealed a secondary hypoperfusion in the contralateral right cerebellum. This phenomenon of crossed cerebrocerebellar diaschisis resolved after the remission of FAS, suggesting a crucial role for the cerebellum in motor speech planning [4].

Apraxic Agraphia (AA)

AA is a peripheral writing disorder characterized by poor letter formation, sometimes even illegible scrawls due to a disruption of the (access to) the graphic motor programs. AA is typically associated with damage of the superior parietal region and the dorsolateral and medial premotor cortex (Exner's area) of the language dominant hemisphere [7] but recent evidence indicates that cerebellar lesions may also induce AA.
Mariën et al. (2007) [8] reported a right-handed patient who developed AA after a right cerebellar hemorrhage. In addition to a hypoperfusion in the lesion site (right cerebellar hemisphere), a Tc-99m-ECD SPECT perfusion scan showed a hypoperfusion in the clinically suspected but structurally intact supratentorial region in the prefrontal region of the language dominant hemisphere (Exner's area). Three additional cases of AA after focal damage of the cerebellum were documented by De Smet et al. (2011) [7]. Mariën et al. (2013) [9] also reported a 15-year-old left-handed patient with AA probably due to an incomplete maturation of the cerebrocerebellar network confirming the involvement of the cerebellum in AA [9].

Developmental Coordination Disorder (DCD)

DCD is a neurodevelopmental disorder characterized by difficulties in acquiring motor skills, sensorimotor coordination disturbances, deficient postural control, strategic planning problems, disrupted visuo-spatial information processing, executive dysfunction, and usually a much lower PIQ than VIQ [10]. The condition closely resembles CCAS due to the frequent association with affective, behavioural and social disturbances [11][1].
DCD is typically accompanied by constructional and drawing apraxia, as is the case with a 19-year-old left-handed patient described by Marën et al. (2010) [10]. Structural MRI showed a rostral vermisdysplasia, a slight anterior/superior asymmetry of the vermal fissures. A Tc-99m-ECD SPECT perfusion scan revealed overall decreased perfusion of the cerebellum and a distant functional suppression of the supratentorial regions involved in the execution of planned actions, visuo-spatial processing and affective regulation. This case study provides additional evidence for the association between DCD and CCAS and suggests that the cerebellum and the cerebrocerebellar network might be a part of the pathophysiological mechanism underlying DCD [10].

Discussion

The involvement of the cerebrocerebellar network in different forms of apraxic disorders suggests that the cerebellum is implicated in the neural network responsible for the control,

planning and execution of skilled movements. It might be hypothesized that the cerebellum is indeed part of Liepmann's network for skilled movements. The left parietal lobe is responsible for the storage of movement formulae, the left prefrontal lobe for the execution of the formulae and the corpus callosum for the transfer of this information to the right motor cortex. Within this model the cerebellum may be considered to be responsible for the cognitive planning, timing and coordination of the execution of the movement formulae [3].

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Positive effects of computerized executive function training in aphasia. A pilot study

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Introduction

An increasing number of findings suggests that executive functions (EFs) affect language abilities in aphasia. Two components of EFs, updating working memory representations and conflict resolution, are supposed to play a role in various language processes, including syntactic and semantic processing in aphasia (e.g., Novick et al, 2013; Thothathiri et al., 2012). Research in experimental psychology implies that EF skills can be enhanced with intensive practise and that these improvements can transfer to untrained tasks sharing the same processing components (e.g., Dahlin et al., 2008; Jaeggi et al., 2011). In line with these results, Novick and colleagues (2013) showed that training of EFs can lead to improved accuracy in syntactic processing in healthy young adults.

The current study extends this line of research to aphasia with three major research questions: 1) Can EFs be enhanced through training in aphasia? 2) To what extent is the effect of training transferred to other EF processes, and 3) of most interest, does training of EFs lead to transfer to language? In order to approach these questions, we modified a computer-based adaptive training task (Novick et al., 2013) to be appropriate for patients with aphasia and tested pre-post performance differences on tasks related to EFs and language.

Methods

Participants performed an EF training targeting two EF components: Updating working memory representations and conflict resolution. We designed an adaptive training task in which task demands were continuously adjusted according to participants' performance. Participants practised the training task four times a week for a month, in twenty-minute sessions each day. Before and after the training, participants were assessed by tests related to EFs and language (see below).

Participants

Three patients (K.K., B.L., and B.B) with chronic Broca's aphasia (post onsets: 12, 8, 12 months, respectively) participated in the study. All participants had a left hemisphere lesion, were right-handed and spoke Hungarian as their primary language. They were classified

using the Western Aphasia Battery (Kertész, 1982; Hungarian adaptation: Osmánné-Sági, 1991).

Training task

We programmed a modified n-back task with lures. Based on the classical n-back paradigm, focusing on updating working memory, participants were exposed to a stream of letters and were asked to press a button when the letter presented was the same as the one appearing *n* trials before. In addition, lures were incorporated into the task; letters that occurred either immediately before or after the *n*th-back item, requiring participants to resolve the conflict between the representation of the target and that of a highly familiar lure. Participants had to perform at three lure levels before n increased (no lures, n+1 lures only, and both n+1 and n-1 lures). If they performed accurately at a given level, then the level of difficulty increased, if they did not, then it decreased following four unsuccessful attempts.

Assessment tasks

We designed a letter n-back task to measure the performance on a task with the same structure and stimuli as the training task, but with different timing, and an auditory n-back task to assess the performance on a task with the same structure as the training task but with different stimuli. We used the standardized Test for the Reception of Grammar-Hungarian (TROG-H, Bishop, 1983, Hungarian adaptation: Lukács et al., 2009) to assess comprehension of grammatical structures and sentences, and the Boston Naming Test (Kaplan et al., 1983) to assess naming ability.

Results

Group level and individual performances on the training and the pre-post tasks are shown in Figure 1. Group level analyses (Fig 1.A) using Friedman's ANOVA showed that participants improved on the training task ($\chi^2(12) = 21.25$, $p < .05$). To analyse performance at the individual level (Fig 1.B), correlation between number of training session and mean level at a session was calculated using the Pearson correlation coefficient. According to this, K.K. showed a significant increase in performance ($r = .701$, $p < .01$), B.L. showed a tendency for increase ($r = .501$, $p = .08$), and B.B. did not show statistically significant improvement ($r = .220$, ns.).

Pre-post differences on the assessment tasks were tested using McNemar's test for each participant separately (Fig 1.C). Concerning the EF tasks, B.B. improved significantly on both the auditory and the letter 1-back tasks ($p = .016$, $p = .008$, respectively), K.K. improved on both conditions of the letter n-back task ($p = .063$ for 1-back, and $p = .031$ for 2-back). B.L. did not show significant improvement on any of the EF tasks. Concerning the language tests, as shown by the TROG, K.K. and B.L. improved significantly on sentence comprehension ($p = .016$, $p < .001$, respectively). Results on the BNT showed that only B.B. improved significantly on naming ($p = .031$).

Discussion

In sum, the training task proved to be adequate to evoke a training effect, however individual differences clearly seem to affect development on the training task. This is in agreement with earlier studies showing that individuals greatly vary in their responses to EF training. Importantly, we observed pre-post improvements in both EFs and language assessment in some individuals with aphasia. Although this suggests that transfer effects occurred, data collection with control participants is in progress to exclude retest effects as an alternative explanation. Together, our results suggest that cognitive functions can be enhanced through training in aphasia, and this might lead to improvement on language abilities.

Acknowledgments

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Figure Captions

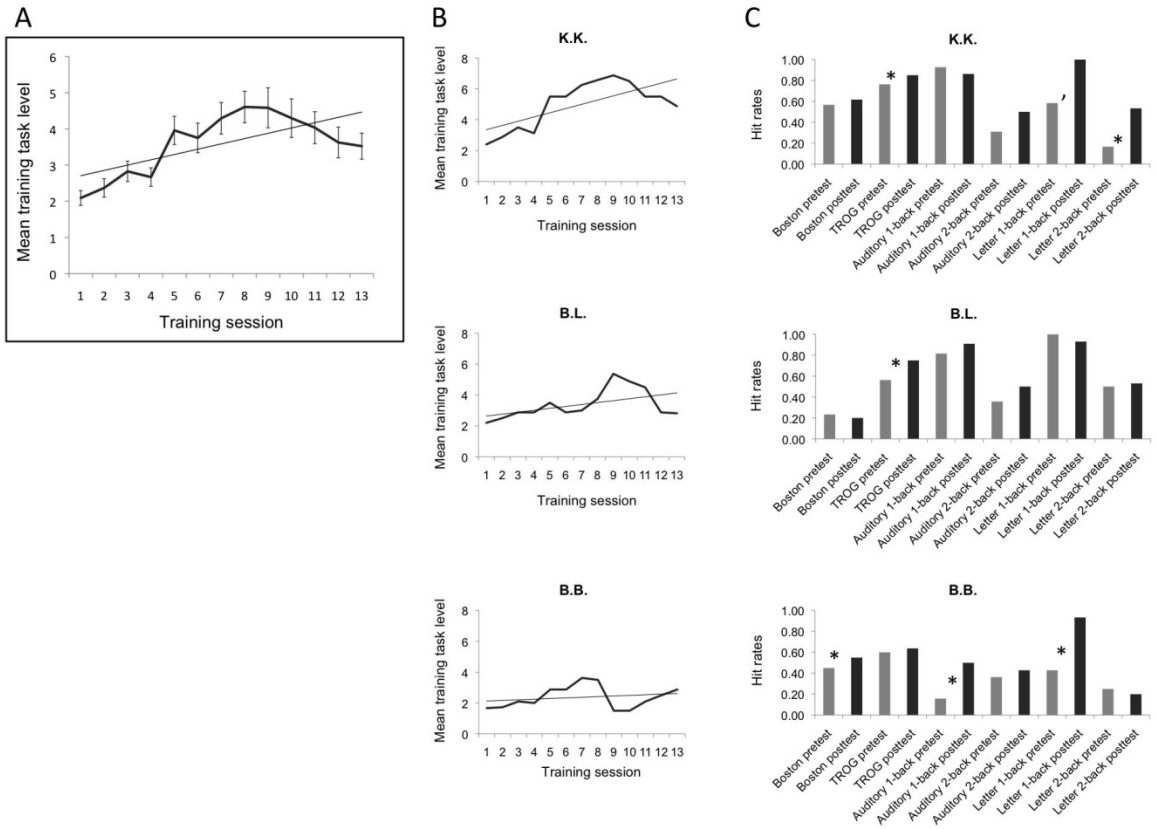

Fig. 1. Training performance and pre-post performances on assessment tasks. A. Performance on the training task during the thirteen sessions of training at the group level. B. The same shown separately for each participant. C. Performance on the assessment tasks before (pretest) and after (posttest) the training shown separately for each participant. Asterisks indicate significant pre-post differences (*$p < .05$). Primes indicate tendencies for pre-post differences (’$p < .1$).

Sentence production training in severe expressive aphasia and apraxia of speech: a case study

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Introduction

Aphasia therapy has traditionally focused on single words (Nickels, 2002). However, is it possible for someone with severe expressive difficulties, who cannot reliably produce single words, to achieve success at the sentence level? Certain theoretical and clinical approaches would indicate the answer is "yes". For example, proposals that more complex forms should be targeted as they will generalize to simpler forms (Bose et al, 2001; Maas et al, 2002; Thompson et al, 2003) and 'Script Training' which has shown success in training individuals on a set of linked phrases (Nobis-Bosch et al, 2011; Youmans et al, 2011). Thus far, these studies have selected individuals with mild to moderate aphasia and AOS, or those with minimal or no AOS. However, in both approaches the implication is that targets for rehabilitation can be set at a level well beyond what a patient is able to achieve during assessment. For example, an individual who cannot reliably produce single words in connected speech can be trained on the production of sentences. If sentences can be acquired as complete 'chunks' (as indicated by Script Training approaches) this should be possible. The data presented here is a case-study of an individual (AB) with chronic, severe expressive aphasia and moderate/severe AOS. Treatment targeted the production of a set of 25 sentences, of varying length and complexity, chosen for their functional relevance.

Methods

Case history

AB has chronic, severe Broca's aphasia (WAB Aphasia Quotient: 36; Kertesz, 1988) following a stroke in 2008. He presented with phonological output difficulties and AOS according to criteria from Miller & Wambaugh (2012). Example data from the Apraxia Battery for Adults-2 (Dabul, 2000): Increasing word length 2A & 2B = 8 & 14, severe. Spontaneous speech contained limited content words, for example producing few relevant words during picture description (Comprehensive Aphasia Test, CAT, Picture Description score = 5; Porter & Howard, 2004) and tended towards repeated VCV and CVC strings e.g. /ənəsə/, /kɑwəkəməs/. AB benefitted from phonological cues in confrontation naming (CAT Picture Naming = 2/24, with phonological cue = 18/24).

Treatment

A set of 25 functional phrases were generated with AB, of varying length and complexity (e.g. "Would you like a drink?", "How's your business in Cologne?", "Stop messing about"). Items were selected for their functional relevance. Treatment consisted of 1:1 sessions 3 times a week, for 8 weeks. Sessions lasted 45 minutes, and comprised two practice types. In two of the three sessions, phrases were practiced in the context of a barrier game focusing on verbal production (Pulvermüller et al, 2001). The target was an intelligible production of the whole phrase (auditory target rather than articulatory accuracy). The cueing hierarchy

was (1) spontaneous output from a cue card (written phrase, with a single written word later in therapy) (2) writing and then reading aloud the phrase (3) phonological cues for phrase and word onset (4) full repetition. In one of the three sessions, phrases were practiced using a traditional repetition hierarchy (Rosenbeck et al, 1973). In all sessions, copying, generating and reading the written form was encouraged to cue verbal production. Additional practice was provided using a PowerPoint file that presented each phrase in its written form and with an associated audio file for repetition practice. AB reported practicing with this file every day.

Results

AB showed successful acquisition and maintenance of the sentences (see Figure 1). This was in the face of a stable presentation of AOS (Apraxia Battery for Adults-2 Increasing word length 2A & 2B: Pre = 9 & 6, Post = 7 & 4). There were indications that expressive language had improved (CAT Picture Naming: Pre = 2/24, Post = 10/24). Data for his connected speech output is currently being analysed. AB reported an impact on his day-to-day function, being able to use the sentences during his work and leisure activities. He kept a small booklet with the written phrases as a functional cue for verbal production. Additional phrases were added after this block of therapy, which consequently allowed him to order a taxi for the first time since the stroke.

Discussion

This case study presents data showing that an individual with severe expressive difficulties can be trained on the production of sentences. Sentences were acquired as complete 'chunks' of speech that became more automatic to produce over the course of therapy. Intervention utilized particular strengths, specifically the benefit from phonological and written cues to support speech. Generalization to word retrieval was indicated by other outcome assessments. Generalization to every-day situations was more immediate as sentences targeted situations directly. The data supports the view that severe aphasia and the inability to produce single words reliably on assessment is not a barrier to training whole sentences during therapy. In addition, it supports the idea that sentences can be trained and acquired as whole units. Sentences may also be more functional for individuals, as they allow the inclusion of questions and frequently used statements that arise in conversation.

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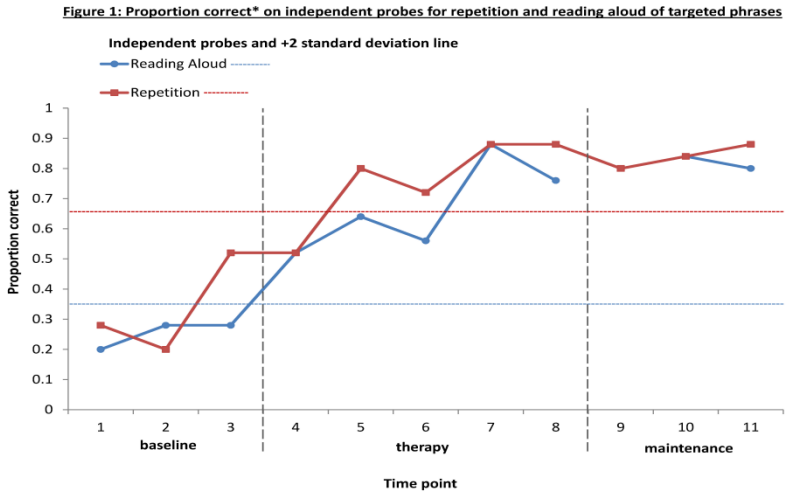
Figure 1



*As judged by an independent rater blind to the time point of the probes; based on complete, intelligible productions of the sentences with no support from the therapist.

Concretism, pragmatics, and the interplay of language and cognition in schizophrenia

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Introduction

Language and communication dysfunctions have been widely reported in schizophrenia (Kuperberg 2010). "Concretism" is an old terms to describe these dysfunctions, defined as inability of abstract thinking, often interpreted in terms of alteration of the semantic system, i.e., meaning processes (Kircher et al. 2007). However, this aspect is controversial. In a previous study we showed that patients affected by schizophrenia are indeed able to judge semantic relations, performing as controls in judging semantic anomalies, and there is converging evidence in the literature for other semantic tasks (Moro et al. in preparation). More recent research describes language disruption in schizophrenia in terms of impairment at the pragmatic level, i.e., matching meaning and context. Schizophrenic patients seem unable to infer the meaning that the speaker intends to convey, to grasp figurative uses of language (Schettino et al. 2010), to catch irony and humor (Polimeni et al. 2010), which results in inappropriate behavior in communicative exchange. Importantly, pragmatics is seen as resulting from the interplay of a number of cognitive abilities, spanning from Theory of Mind to memory and executive functions (Bambini & Bara 2012). This constellation of abilities has been shown to be compromised in schizophrenia, with a special emphasis on the social component (Bechi et al. 2013). Yet social and general cognition on the one side and pragmatic abilities on the other side have not been systematically investigated in relation to one another in the case of schizophrenia. In this scenario, a comprehensive exploration of the patient's communicative abilities becomes of primary importance, in order to assess the relationship between the pragmatic competence and the major aspects of psychopathology, neurocognition and social cognition. The present study aims at specifically assessing pragmatic skills with a newly developed protocol, and to analyze relationships between communication-related skills and psychopathological and neuropsychological measures, especially focusing on aspects of social cognition.

Methods

Participants

39 patients affected by schizophrenia (DSM-IV TR, all subtypes; mean age = 40.87, SD=10.3; mean education = 11.89, SD = 2.68) and 32 healthy controls were assessed (mean age = 42.03, SD= 10,63; mean education = 13.25, SD = 13.25, SD = 3.79).

Materials and tests

Pragmatic abilities were tested through the APACS test (Assessment of Pragmatic Abilities and Cognitive Substrates), a newly developed instrument addressing two main pragmatic domains, important for successful communication in daily living: discourse management (through interviews and story comprehension tasks) and derivation of communicated meaning (through figurative language and humor comprehension tasks). Innovatively, APACS aims at reproducing conversational contexts as much as possible, basing on topics and photographs directly related to the daily living communicative experience, and being structured in three compact parts that do not require to shift from task to task with increasing effort overload.
Patients were also assessed with Positive and Negative Syndrome Scale, measuring symptoms severity (PANNS); Theory of Mind Picture Sequencing Task, measuring Theory of Mind (ToM); and Brief Assessment of Cognition in Schizophrenia (BACS), a brief evaluation of the main cognitive functions usually impaired in schizophrenia.

Results

Results showed a wide impairment of pragmatics and communication abilities in patients, performing significantly worse than controls in all subtests, excluding scene description ($ps < 0.001$). The worst performance were obtained in the subtests assessing comprehension, especially story comprehension, humor and figurative language. The PANNS scale did not correlate significantly with any subtest. On the contrary, several social and cognitive domains correlated significantly with the pragmatic tasks. In particular, ToM correlated with figurative language and humor comprehension, whereas verbal memory correlated with narrative comprehension, humor and the most complex part of figurative language comprehension ($ps < 0.001$, Bonferroni correction). We built exploratory regression trees investigating the relation between several predictors and the performance in the pragmatic tasks. ToM was the best predictor for figurative language comprehension, while verbal memory was the best predictor for story comprehension, humour and complex figurative language comprehension.

Discussion

Our data show that communication deficits in schizophrenia affect especially comprehension and include specific pragmatic domains that capture what in old times fell under the label of concretism. As suggested by regressions analysis, ToM seems to be crucial for figurative language comprehension, while, for more complex pragmatic tasks such as humour, an intact verbal memory seems to be required. This is consistent with neurofunctional finding (Bosia et al. 2012) and neuroanatomical evidence (Catani et al. 2011) of selective vulnerability of specific circuitries in the schizophrenic brain which are related to social and cognitive functioning. In the perspective of unraveling the neural basis of pragmatics, mind reading, memory and learning processes may thus represent important substrates of pragmatic abilities, and schizophrenia provides a suitable test-ground for neuropragmatic models.

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Relationship between Subacute Brain Activity and Aphasia Recovery

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Introduction

Recovery from post-stroke aphasia is highly variable and there is currently no effective method of predicting individual recovery to guide rehabilitation. This project addresses the lack of knowledge regarding brain mechanisms responsible for aphasia recovery to provide much needed specificity in determining the best predictors of recovery for language symptoms commonly targeted in rehabilitation.

Methods

Nine individuals with post stroke aphasia and 18 healthy controls performed an event-related functional MRI language task (auditory speeded lexical decision with legal nonwords and high and low imageability words) and behavioural naming and comprehension tests at 2-4 weeks and 6 months post-stroke.

Results

Imaging analyses conducted on the relationship between subacute brain activity for the word>nonword contrast and behavioural performance at 6 months revealed a strong negative correlation between increased right temporal lobe activity and word comprehension. There was also a strong positive correlation between increased left inferior frontal activity and improved naming at 6 months.

Discussion

These findings demonstrate the potential of this paradigm to elicit language-related neural activity in subacute stroke patients that may help predict recovery in specific language functions at 6 months. These data also indicate how distinct patterns of brain activity may relate to improvement in different language functions.

Semantic interpretability speeds up the processing of morphological features. A psycholinguistic experiment on Gender Agreement.

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Theoretical Background

A set of Italian nouns, all denoting Italian referents, occur as couples like *cavallo-cavalla* (horse-mare) that show a systematic opposition between their grammatical feature of Gender and the semantic feature of the sex of their referents. In such cases, many theories (Thornton 2005) consider *cavallo* and *cavalla* as two different lexemes, each one with its proper Gender. In a previous aphasia case study (Franzon et al 2013) it was taken into account the possibility that the opposition in nouns like *cavallo-cavalla* could reflect an operation of inflection on the same lexical root, depending on the referential context.
The present survey aims to explore the Agreement processes in the nominal domain with reference to this kind of contextually inflected nouns, by contrasting them with nouns whose gender presents the more common inherent inflection for Gender.

Materials and methods

Task: Noun phrases made of a noun and an adjective appear on the screen one at a time. One of the two words lacks the ending morpheme. (e.g. COLP_ GROSSO) The participants are asked to complete the word by pressing a key to insert –a or another to press –o. Response times are taken for each answer.
Participants: 24 neurologically unimpaired subjects, aged 22 to 34, with 13 to 18 years of education.
Materials:

1. 24 nouns, 12 masculine + 12 matched feminine, like CAVALLO – CAVALLA ('horse'-'mare' in which Gender is contextually assigned; in these the semantic feature of the sex of the referent corresponds to the gender opposition, overtly marked on the morpheme (o=masculine / a=feminine).
2. 24 nouns, 12 masculine + 12 matched feminine, like COLPO-COLPA ('hit' - 'guilt') in which the same morphophonological opposition does not correspond to a semantic opposition.

3. 96 filler nouns (48 masculine, 24 of which animate; 48 feminine, 24 of which animate). In 64 of these, the ending does not show the correspondence o=masculine / a=feminine.

Conditions: the two *kinds* of nouns described above appear in four different conditions. The variables are:

1) *Position*: noun – adjective vs adjective – noun
2) *Class*: completion takes place on the noun vs on the adjective

Results

RTs

ANOVAs by subject reveal significant effects of *Class* ($F(1,23) = 39.92$, $p < 0.001$): nouns (1001.44)are completed slower than adjectives (951.02) and of *Kind* ($F(1,23) = 17.98$, $p < 0.001$) nouns with a contextual gender are completed faster (949.29) than nouns with an inherent gender (1003.17)

Interactions: *Position x Kind* ($F(1,23) = 16.29$, $p < 0.001$) Nouns with contextual Gender are completed faster when the noun follows the adjective (927.23) with respect to when noun precedes the adjective (971.36). Nouns with inherent gender are completed faster when the noun precedes the adjective (994.01) with respect to when the noun follows the adjective(1012.33) .

Position x Class ($F(1,23) = 15.34$, $p < 0.001$) If the noun precedes the adjective, the adjective (938.73) is completed faster than the noun (1026.64). If the noun follows the adjective, the difference is not significant.

Accuracy

ANOVAs by subject and reveal significant main effects of *Class* ($F(1,23) = 35.98$, $p < 0.001$): adjectives are completed more accurately (0,98) than nouns (0,94), and of *Kind* ($F(1,23) = 20.61$, $p < 0.001$): completion on nouns with a contextual gender is more accurate (0,97) than in nouns with inherent gender (0,94).

Interactions: *Kind x Class* ($F(1,23) = 32.66$, $p < 0.001$): if the completion is required on the noun, the accuracy on nouns with the contextual gender is higher (0,97) than on nouns with an inherent gender (0,91). If the completion is required on the adjective, the accuracy is higher on nouns whose gender is inherent (0,99) than in those with a contextual gender (0,98).

Discussion.

The main effect of *Class*, i.e. the fact that the adjective is completed more accurately and quickly than the noun, may depend on the fact that such an operation consists in copying into the higher DP positions the morphosyntactic values of Gender (and Number) that have already processed in the noun; conversely, when the noun has to be completed, the features cannot be simply copied and pasted to the noun, but the noun has to undergo the whole processing *da capo* before rising to the DP to check the agreement in a proper position.

The difference of RTs between the two *Kinds* of nouns seem to match with theories that propose that there could be two types of gender (Atkinson 2012; Di Domenico 1997; Franzon et al. 2013): a non-interpretable one, set by the lexicon and thus inherent on the nouns, and a variable one assigned in syntax on the basis of the referential context. This latter would be interpretable at a semantic level. The condition in which Gender is variable and interpretable, and assigned in syntax (like in *cavallo-cavalla*) seems to require less processing costs, even if it is less common and linked to some restrictions, like the Animacy of the referent. The opposite condition, in which Gender is inherent and non-interpretable, like in (*colpo – colpa*), would require more processing costs, even if it is the most frequent in the lexicon.

It may be the case that when an inflectional morpheme bears context-related semantic content about the referent, its processing requires less costs with respect to the cases in which the morpheme is only a formal exponent and its value lacks semantic interpretability.

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Past, Present and Future of Basque aphasiology and Cross-linguistic studies of aphasia.

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Introduction

The Basque language is non Indo-European, but lives surrounded by two Indo-European romance languages: French and Spanish. It is said to be one of the oldest languages of Europe and yet only a few studies have focused on aphasia manifestations in Basque (Erriondo & Laka, 2001; Munarriz & Ezeizabarrena, 2011; Pourquié, 2013). This reflects today's situation of aphasia research: In aphasia literature, non-Indo-European languages are strongly under-represented, and an extreme bias is found towards English and western European languages (Beveridge & Bak, 2011).
In aphasiology, two main approaches compare the manifestations of aphasia in different languages:
- The study of language recovery in multilinguals with aphasia in order to determine which factors influence recovery or attrition (Paradis, 2004; Adrover et al., 2011)
- The identification of variants and invariants of a given syndrome observed in different languages in order to determine the underlying nature of language deficits and to distinguish spurious from valid generalizations (Menn & Obler, 1990; Nespoulous, 1999).
I will consider the need to compare languages to assess the Argument Structure Complexity Hypothesis (Thompson, 2003) as an explanation for verb deficits in agrammatic aphasia. Argument structure is closely related to verbs and mediates between lexical semantics and syntactic representation (Grimshaw, 1990). Since languages differ in their way of conveying thematic structure information, there are good reasons to assess argument structure effects on verb deficits in agrammatic aphasia from a cross linguistic perspective. In particular, I will show that Basque, French and Spanish contrastive grammatical features (e.g. Ergative-Absolutive/Nominative-Accusative systems; pro-drop/ non-pro-drop languages; triargumental/monoargumental verb agreement; agglutinating/isolating morphology) are relevant to create crosslinguistic tasks that examine the Argument Structure Complexity Hypothesis at different levels of language processing.

Methods

I will present a new protocol that aims to assess verb processing from a cross-language perspective in Basque, French and Spanish, by controlling verb argument structure complexity, using intransitive, transitive and ditransitive verbs. It assesses uninflected and inflected verbs, at word and sentence levels, in both production and comprehension. It aims to identify the level of language processing at which argument structure complexity increases difficulties for agrammatic speakers.

Results

A Basque-French speaking 68 year-old male, diagnosed with non-fluent Broca's aphasia subsequent to a perisylvian left-hemisphere CVA, was assessed 9 years post-onset, in Basque

(Lower-Navarrese dialect). The case showed caracteristic symptoms of agrammatism: verb inflection deficits, omission of grammatical morphemes, lack of complex sentence structures. Verb processing was assessed on a serie of tasks including verbs with different argument structure (intransitive, transitive and ditransitive) in word and sentence contexts: action naming, sentence production, sentence comprehension and narration. A dissociation was observed between lexical and morphosyntactic verb processing. Whereas the patient had preserved lexical access to all verb types (intransitive = transitive = ditransitive), more morphosyntactic errors (verb auxiliary omission) were found in richest verb structures (intransitive > transitive > ditransitive).

Discussion

Increasing difficulties depending on argument structure complexity have been reported from different fields and in different populations (Ebbels et al., 2007; Pizzioli & Schelstraete, 2008; Cruice et al. 2014). Agrammatic studies report either lexical deficits or morphosyntactic processing difficulties that increase with argument structure complexity (Thompson, 2003; Thompson et al., 2010). Thompson and al. (2010) speculate that distinct brain regions subserve the semantic integration of arguments and phrase structure building operations. Although correlating specific linguistic processes to brain areas based on aphasiological studies is tedious (Démonet & Thierry, 2001), dissociations can emerge from behavioral studies of aphasia, at different levels of language processing, by using a cross-linguistic approach. I will argue that the future of aphasiology does not have to be limited to neurotechnological advances but should also consider language diversity as a rich source of insight. I will also argue that this type of approach can be successfully used to evaluate language acquisition difficulties in children, thus extending its usefulness to other populations.

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Mapping the dorsal and ventral language streams using electrical stimulation and diffusion tensor imaging.

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Introduction

Current models assume a dual system to connect temporal and frontal cortices for auditory language processing in humans (1–5). According to this dual pathway model, speech processing is divided in two major pathways: dorsal and ventral. The dorsal, audio-motor pathway maps acoustic speech signals into articulatory representations (phonological processing) and the ventral stream (pathway) is involved in access to the meaning of the words (comprehension). In order to test this model, we developed a new approach combining the electrical stimulation mapping, diffusion tensor imaging and extensive neuropsychological assessment focusing on the white matter organization for language processing.

Method

Participants

The study group included 10 patients (4 female) undergoing electrical stimulation mapping during the awake-asleep-awake brain surgery. Subjects ranged in age from 18 to 64 years and suffered from brain lesions (intrinsic tumors and vascular malformations) located in the perisilvian language areas. A specific neuropsychological assessment was carried in this group in three temporal moments: before, during and after surgery. 65% of accuracy in the language naming tasks performed during the pre-surgical evaluation was established as a threshold for the inclusion in this study.

Neuropsychological assessment

A fine-graded neuropsychological assessment protocol was developed adapting the language tasks for each of the language streams separately. The specific tasks for the

phonological processing involved repetition of words and non-words, whereas in order to explore the semantic processing intraoperatively we employed the semantic judgment tasks: Spanish adaptation of “96 trial Synonym Judgment Task” (6), “Pyramids and Palm Trees Test” (7) and it’s more complex derivative - "Camel and Cactus Test" (8).

Neuroimaging

A high-resolution T1-weighted images were acquired before and after surgery allowing precise localization of lesions and post-surgical cavities. Moreover, we performed the diffusion tensor imaging (DTI) before surgery in order to virtually dissect the major subcortical language-related pathways: arcuate, inferior fronto-occipital, inferior longitudinal, and uncinate fasciculi. We further compared the condition of these tracts with the intraoperative and behavioral data.

Results

The subcortical intraoperative stimulation applied at the level of the left dorsal pathways for language (arcuate fasciculus) resulted in phonological paraphasias and/or repetition impairment while at the level of the ventral pathways (inferior fronto-occipital, inferior longitudinal and/or uncinate fasciculi) was associated with the semantic errors in naming and/or disturbed capacity of semantic judgment. The neuropsychological follow-up converged with these intraoperative observations, indicating that depending on the lesion’s localization patients differed in their profile of speech disturbances. The virtual *in vivo* dissections depicting the white matter organization of patients revealed that damage at the level of the dorsal pathways for language was associated with the phonological processing disturbances during both neuropsychological assessment and tumor removal. The damage at the level of the ventral pathways was related to semantic errors in naming and semantic judgment impairment.

Discussion

The between technique comparison, that we employed, converged supporting the dual pathway model for language subcortical organization. However, we observed also that the spontaneous recovery, lesion type (vascular malformations versus tumors) and the tumor grade (slow versus fast-growing) are associated with the post-surgical neuropsychological language testing performance. For this reason we add a qualitative interpretation of our results.

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Stem-, Spraak- en Taalpathologie

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