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Towards an Explanation for the Foreign Accent in the Foreign Accent Syndrome

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Supplement, September 2012

13th International Science of Aphasia Conference

Science of Aphasia

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Preface

Dear participants,

We are very pleased to welcome you to the 13th Science of Aphasia conference, being held, from September 7th and to September 12th 2012 in Groningen, the Netherlands.

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 neuropsychology of word production.

This year's conference is organized by the Groningen Center of Expertise for Language and Communication Disorders (GELC). This center aims to focus on the area of language and communication disorder that is present at the University of Groningen. The GELC intends to bundle this knowledge in order to optimize research in this field. The GELC is a research center offering a platform for researchers of the involved faculties: the Faculty of Arts, the Faculty of Social and Behavioral Sciences and the Medical Faculty/UMCG. In due course we would like to create a center for experimental diagnostics and treatment as well.

Founded in 1614, the University of Groningen enjoys an international reputation as one of the oldest and leading research universities in Europe. We offer degree programmes at Bachelor's, Master's and PhD levels in virtually every field, many of them completely taught in English. Located in the north of the Netherlands, Groningen is an ideal, safe student city with a flourishing student life.

As a lively university city, Groningen has the youngest average population in the Netherlands. It has a long and turbulent history, which becomes evident from the historic warehouses, courts and buildings. Groningen is also a city with nerve, with the most numerous examples of innovative architecture within its boundaries. In addition, it was once proclaimed the city with the best city centre in the Netherlands because of its charm. Experience all of this and explore Groningen!

Welcome to Groningen!

The organizing committee

Organization

The 13th International **Science of Aphasia Conference** is held in Groningen, the Netherlands, September 7 - 12, 2012

The conference is organized by:
Groningen Center of Expertise for Language and Communication Disorders

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Venue
The conference is held at the Hampshire Hotel Groningen Centre, Radesingel 50, 9711 EK Groningen, The Netherlands

Contact
E-mail: soaxiii@rug.nl
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Conference Program

Friday, September 7, 2012

17:30 - 19:00 Arrival & registration

18:00 - 19:00 Welcome reception
This reception is offered to you by the University of Groningen, the Municipality of Groningen and the Province of Groningen

Saturday, September 8, 2012

08:45 - 09:15 Registration

09:15 - 09:30 Conference Opening

Session 1: Cognitive Models of Naming
09:30 - 10:15 *Niels Schiller:* Word production theories
10:15 - 11:00 *Lyndsey Nickels:* Lexical syntactic representations - evidence from aphasia
11:00 - 11:30 Coffee Break
11:30 - 12:15 *Carlo Semenza:* Selective word production disorders
12:15 - 12:30 General Discussion

12:30 - 13:30 Lunch

13:30 - 14:30 Contributed Papers I

Sunday, September 9, 2012

Session 2: Functional Neuroanatomy of Naming
09:30 - 09:45 Introduction
09:45 - 10:30 *Jenny Crinion:* Neuroanatomy of word production
10:30 - 11:15 *Gabriele Miceli:* Neuroplasticity and treatment

11:15 - 11:45 Coffee Break

11:45 - 13:05 Contributed Papers III

13:05 - 14:00 Lunch

14:00 - 15:00 Contributed Papers IV

15:00 - 15:30 Coffee Break

15:30 - 17:00 Open Access Publishing
Esther Hoorn: Open access publishing - the author's perspective
Ben Massen: Open access publishing - the editor's perspective
Panel discussion on open access publishing

Monday, September 10. 2012

Session III: Treatment

08:50 - 09:00 Introduction

09:00 - 09:45 *David Howard:* Semantic Inhibition and its implications for aphasia

09:45 - 10:30 *Wendy Best:* Generalisation in treatment and its implications for theory

10:30 - 11:00 Coffee Break

11:00 - 12:40 Contributed Papers V

12:40 Lunch

14:30 Afternoon excursion

19:00 Conference Dinner

Tuesday, September 11, 2012

Session IV: Recovery
08:50 - 09:00 Introduction
09:00 - 09:45 *Evy Visch-Brink:* Recovery of naming, semantics and phonology in the first year post stroke
09:45 - 10:30 *Marina Laganaro:* What does recovery from anomia tell us about the underlying impairment
10:30 - 11:00 Coffee Break
11:00 - 11:45 *Mieke van de Sandt-Koenderman:* Transcranial stimulation and naming recovery

11:45 - 12:45 Contributed Papers VI

12:45 - 13:45 Lunch

13:45 - 15:15 Added value to assessment and intervention through technology I
Roelien Bastiaanse, University of Groningen, The Netherlands
Mieke van de Sandt-Koenderman, Rehabilitation Center Rijndam, Rotterdam, The Netherlands
Rintse van der Werf, Edia Education Technology, The Netherlands

15:15 - 15:45 Coffee Break

15:45 - 17:15 Added value to assessment and intervention through technology II
Elisa Gielen & Paul Jenkins, Tiny Eye, The Netherlands
Ton Mulder & Peter van der Tang, Negotica, The Netherlands
Josine van 't Klooster, UMCG, The Netherlands

Wednesday, September 12, 2012

Breakfast and Departure

THE EFFICACY OF MELODIC INTONATION THERAPY IN APHASIA REHABILITATION

Ineke van der Meulen[1,2], W. Mieke E. van de Sandt-Koenderman[1,2] &
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Rotterdam (The Netherlands)*

Introduction

Melodic Intonation Therapy (MIT; Albert et al. 1973) is a well-known aphasia therapy, using the melodic aspects of language (intonation, rhythm) to improve verbal language production in severe aphasia. In this therapy, patients sing short sentences (eg. good morning) along with the speech-language pathologist. Gradually, the support from the speech- language pathologist decreases and singing is replaced by speaking. Over the years, many studies have reported successful application of MIT (see Van der Meulen et al. 2012 for an overview). However, most studies are case studies without control condition. Hence, the level of evidence is rather poor and well-designed group studies are badly needed.

Further, most studies examined the effect of MIT in the chronic phase after stroke. Nothing is known about its effect in earlier phases post stroke. Language recovery in early phases post stroke is presumably associated with different underlying neural mechanisms than language recovery in the chronic phase. Therefore, the effect of MIT applied in the chronic phase might differ considerably from its effect in earlier phases. This issue is of particular clinical relevance, since most aphasic patients receive intensive aphasia treatment in the post acute phase. We conducted a randomized controlled clinical trial examining the efficacy of MIT in both the post-acute and the chronic phase post stroke. In this abstract, we present the preliminary results of the first explorative analyses.

Method

Design

A waiting-list control design (Fig. 1) was used in which patients were randomly designed to either the experimental condition or the control condition. This design was chosen to avoid withholding patients a potentially successful language production therapy. Patients in the experimental condition received intensive MIT treatment (5 h/wk) for 6 weeks. No other language therapy was allowed during this period. In the acute phase, patients

in the control condition received treatment with the same intensity (5 h/wk for 6 weeks). This treatment focused on language comprehension and written language. No exercises aimed at training language production were allowed. In the chronic phase, the control condition was no individual therapy. After this, the group of patients from the control condition also received intensive MIT for 6 weeks. Assessment was done before treatment (T1), after the first 6 weeks of treatment (T2) and six weeks later (T3).
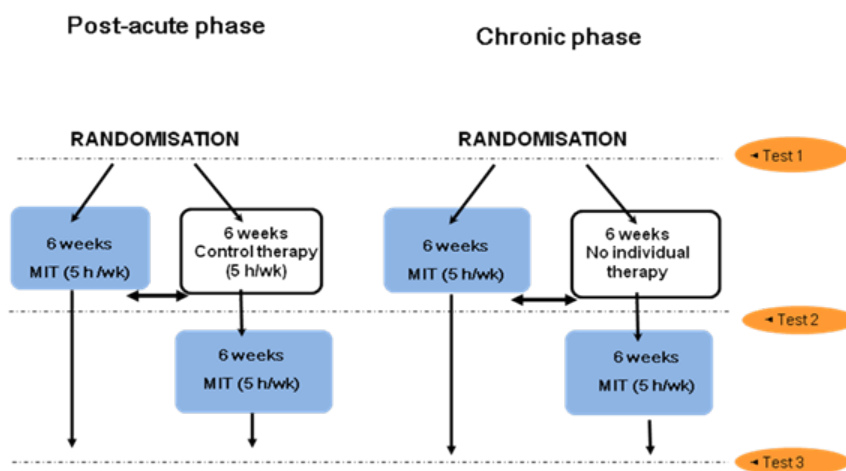
Figure 1: Design of the MIT study

Patients

Patients were recruited in 20 rehabilitation centres, nursing homes and aphasia activity centres in the Netherlands. Criteria for inclusion were: aphasia after left hemisphere stroke; time post stroke: 2-3 months (post- acute) or ≥ 1 year (chronic); native speaker of Dutch; age 18-80; premorbidly right-handed; candidate for MIT. MIT candidacy was based on the MIT literature (a.o. Sparks 2008): non-fluent aphasia, language repetition severely disordered, articulation deficits, moderate to good auditory comprehension. Exclusion criteria were: treated with intensive MIT before start of the study; severe hearing deficit; premorbid dementia.

Measures

The following tests were examined at each testing moment:

- repetition of trained and untrained items (a repetition task designed for

this study containing 11 sentences that were trained during therapy and 11 sentences that were matched with the trained items in intonation pattern, semantic content and syntactic structure)

- Aachen Aphasia Test (Graetz et al. 1991), subtests: spontaneous language, repetition and naming.

- ANELT (Blomert et al. 1995), assessing verbal communication in daily life situations

- Sabadel story retell task (Van Eeckhout 1982), assessing connected speech.

Results

The preliminary results can be summarized as follows:

- The group of patients receiving MIT in the post-acute phase (N=14) improved on the repetition tasks, the naming task and the ANELT. On the latter task, the mean improvement approached the clinically critical difference of 7 points, a considerable difference in such a short period of time. The group of post-acute patients in the control condition (N=11) only showed improvement on the repetition task.

- The group of patients receiving MIT in the chronic phase (N=10) showed improvement on the repetition task, both for trained and untrained items. For the chronic patients in the control condition (N=7), no improvement was observed.

- In both the post-acute and the chronic groups of MIT patients, improvement on trained items was larger than that on untrained items.

- There was a lot of individual variation: some patients showed spectacular improvement on all tasks. By contrast, in other patients, no improvement was observed, not even on the trained items.

Discussion

These preliminary results suggest that MIT applied in the post-acute phase after stroke differs from its effect in the chronic phase. When MIT was given in the post acute phase it not only yielded improved language repetition, but also generalized to word retrieval and verbal communication in daily life. This generalization was not found in the chronic phase, where the effect of MIT was restricted to language repetition.

The observation that trained sentences improved more than untrained ones is clinically very relevant. From the start, MIT was designed to be tailor-made

to the needs of the individual patient: clinicians were encouraged to train sentences that the patient needed in his daily life communicative situations (eg. sentences including the names of family members). The results of our study underline the importance of carefully selecting sentences to be trained.

Finally, all the patients included in this study fitted the clinical profile of MIT candidate as defined in the literature. Still, we observed a great difference in the level of MIT success in the individual results. This is in line with the experience of many clinicians. We will examine prognostic factors for MIT success, in order to establish which patients benefit from MIT and which patients don't. This will hopefully lead to more refined criteria for MIT candidacy and as such a better implementation of MIT in the clinical practice.

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Towards an Explanation for the Foreign Accent in the Foreign Accent Syndrome: the Role of Fortition

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Introduction

The *Foreign Accent Syndrome* (FAS) is a rare speech disorder occurring after brain injury leading to a perceived presence of a new accent in the speech of the patient. FAS can be described as a syndrome where segmental and prosodic deficits lead to the perception of a foreign accent. About 100 cases of FAS have been described in the literature, revealing that distinct speech characteristics of FAS are not generally applicable to all FAS patients. Different authors see FAS as a kind of compensation strategy in relation to an underlying (mild) form of AoS (Moen 2000; Miller, Lowit, & O'Sullivan 2006). According to Varley, Whiteside, Hammil and Cooper (2006) FAS and AoS are due to the same underlying deficit, but differ with respect to the possibility of a patient to compensate or control its speech problems. In FAS, however, compensation still does not lead to normal speech. According to Moen (2000) the altered phonetic settings in FAS might be due to the underlying AoS in the form of reduced motor control. As long as these alterations will lie within the normal variation of a speech community, these changes might not be noticed. If they become more deviant from the norm, they might resemble the setting of a different dialect or language

In our presentation, we will present a model that considers these stereotypic alterations and we will show why two Dutch FAS subjects were judged as speakers with a German, French, Arabic or even a Chinese accent. Starting point of the model is the fact that the accent heard in FAS patients has more to do with the listener and his or her focus on specific stereotypic aspects of the speech of the FAS speaker and on the fact that FAS might be seen as a compensatory strategy to AoS. With respect to the latter it will be proposed that fortis speech plays an important role in the compensation strategies of the speaker with AoS. In phonology, fortition refers to strengthening in the overall force of a sound. It is opposed to lenition and involves changes from, for example, a fricative to a stop or a voiced to a voiceless sound

The FOAM-model (Force of Articulation Measurement)

Fortition can be measured in different ways. One of the characteristics of the speech of one of our FAS speakers, for example, is a lengthened Voice Onset Time (VOT) in voiceless plosives. Lengthening of the VOT is caused by a more powerful realization of a sound. Difference in force of articulations between speech samples can be represented gradually, for example, by studying the VOT of plosives, but only if we investigate more aspects of fortition, we will be able to explain the variation in the perceived accents. Therefore, we have set-up the FOAM-model, measuring speech characteristics with respect to rate; pitch; intensity; duration and timbre, to be able to explain the different aspects of FAS speech. In speakers with FAS, we expected to find characteristics of hyperarticulation, such as a lower speech rate, higher pitch, and intensity, longer duration of segments and expansion of the vowel space.

Results and discussion

The aim of the FOAM-model is to chart the articulatory force of FAS speakers on the basis of its parameters in order to make it possible to compare it to normal speech. Since it was not always possible to give a norm for normal speech, some parameters were judged relatively. Furthermore, not all parameters were found to have the same influence on the force of articulation. Nevertheless, we were able to show why listeners might hear different foreign accents in FAS speech. We found out that for our Dutch FAS speakers listeners can perceive a French accent if they focus on isochrony of syllables and a lack of vowel reduction in speech, while listeners might perceive a German accent if they focus on the lack of assimilation and the longer duration of the VOT in FAS speech. This makes clear that determining the amount of fortition in speech as an explanation for FAS speech, cannot be restricted to one single parameter. The diversity in the perception of listeners can only be explained by including all aspects of fortition in the analysis. The most important characteristics of fortition in our FAS speakers were the low speech rate and the longer duration of VOT, release burst and occlusion time. Syllable isochrony also happened to be a good parameter. The difference in length between stressed and unstressed syllables was much smaller in one of our FAS patients as compared to her therapist.

With the current study we do not try to give a full explanation of the data of our FAS patients. Instead we introduce our model, were we illustrate our parameters on the basis of data of two Dutch FAS speakers. Our contribution to the discussion on the underlying deficit, or maybe to the way these speakers compensate for another speech disorder, is a model that is falsifiable on the basis of the data of former and new FAS speakers. With our model we

hypothesize, that people perceive a foreign accent in FAS speakers because of a larger amount of fortition put in the speech of the FAS speaker. This means that we expect that listeners will only hear accents in FAS speakers from languages that are characterized by a larger amount of fortition than the mother speech of the FAS speaker. This assumption predicts that people may hear e.g. a German, French or Chinese accent in a Dutch FAS speaker, but not a Dutch accent in e.g. a German or a French FAS speaker.

As been said in the introduction, different researchers assume that FAS is a (mild) form of AoS. Therefore, we aim to apply our model to speech data of AoS in general, focusing on questions such as whether speaking with more fortition might also be a compensation strategy that is used in AoS speakers to compensate for the original speech deficit.

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Effectiveness of Speech-Music Therapy for Aphasia; a Proof of Principle

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Introduction

As the name suggests, Speech-Music Therapy for Aphasia (SMTA; De Bruijn, Zielman, & Hurkmans, 2006) combines elements of speech and music therapy for the treatment of nonfluent aphasia and Apraxia of Speech (AoS). The intervention addresses three levels of speech (phonemic, word, and sentence level) by using the musical parameters of melody, rhythm, dynamics, tempo and metre. Many other programmes also include musical elements in the treatment of neurological speech and language disorders and outcomes are positive (Hurkmans et al., 2012). However, in our review we concluded that caution was required in interpreting these findings since the methodological quality of many studies was poor. In the current study we examine the effectiveness of the SMTA in a prospective study. In a multiple baseline across behaviours design (Fucetola et al., 2005) we evaluated the effects of a standard treatment protocol in five speakers with aphasia and AoS.

Methods

Participants

Five patients suffering from nonfluent aphasia and AoS caused by a stroke participated in the study. At the time of the experiment, patients were 3 months post onset. Four men and one woman participated in the current study with a mean age of 58.4.

Outcome measures

A series of speech and language tests was administered to all patients pre and post therapy and 3 months later (follow up) including subtests of the Dutch version of the AAT (Graetz et al., 1992); a test for the diagnosis of apraxia of speech (DIAS; Feiken and Jonkers, in press.) and a test for functional verbal communication (ANELT; Blomert et al., 1995). A baseline was established using a Modified Diadochokinesis Test (MDT, Hurkmans et al., in press.). This instrument assesses programming and planning of speech with the outcome measures (1) consistency; (2) accuracy; and (3) fluency. During baseline and

therapy the patients were tested with the MDT and with an unrelated control task (PALPA 12; Bastiaanse et al., 1995, repeating number series).

Treatment

All 5 patients received 24 sessions with SMTA treatment (twice a week; 30 minutes per session) following a standard protocol. SMTA was provided by an experienced SLT and a music therapist. Apart from the therapy sessions, the patients practiced three times a week at home.

Statistical analysis

A comparison per patient was made between the scores on the MDT. The scores on the MDT on the first and last baseline test were compared, as well as the scores of the MDT before and after treatment, using paired t-tests. The change on the control test was analyzed using a Mc Nemar-test. For the AAT, ANELT and DIAS the critical scores from the tests were used to measure improvement.

Results

MDT and control test

After therapy, all patients had improved significantly at all MDT outcome measures, except for the accuracy measure for one patient. No improvement was found on the control test for 4/5 patients.

Improvement on the subtests of the AAT

Four of the five patients improved significantly on the Token Test which means that the severity of the language impairment decreased. Repetition of phonemes and words significantly improved in two of the patients; repetition of sentences significantly improved in four patients. The same holds for confrontation naming: naming words significantly improved in two patients where four patients significantly improved in sentence construction. Improvement remained stable after treatment ended. No improvement was found on the subtest that is not related to speech production, that is, language comprehension, except for one patient.

Improvement on the ANELT

The understandability of the ANELT significantly improved in four patients according to the norms of the test. The intelligibility measure significantly improved in three patients. There was no decline in the score at follow up testing.

Improvement on the DIAS

Articulation of phonemes and words and scores on the diadochokinesis test were considered. The articulation of phonemes and the diadochokinesis test

of the DIAS significantly improved in four patients. Significant improvement of articulation of words was revealed in two patients. At follow up testing there was no decline.

Discussion

In this proof of principle study, we examined the effectiveness of the SMTA. The evaluation measures and the performance of several language and articulation tests showed significant improvement. Repetition of pseudo syllables was more consistent, accurate and fluent after 24 SMTA sessions. However, evaluating speech therapy by evaluating para-speech tasks is insufficient and inaccurate for showing general improvement. Therefore, we used subtests of the AAT, the DIAS and the ANELT to supplement the MDT. We showed that improvement on the MDT was associated with improvement in articulation. This improvement is not the result of spontaneous recovery since the patients were 3 months post onset and no improvement was found on unrelated control tests, except for one patient. We conclude that SMTA is an effective rate and rhythm therapy for AoS and nonfluent aphasia, that can help to improve verbal communication.

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Effects of Brain-Damage on Sentence Comprehension: Evidence from Swahili-English Bilinguals with Agrammatic Broca's Aphasia

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Introduction

There is substantial empirical evidence in the neurolinguistic literature that supports the view that certain linguistically complex sentence types are difficult to comprehend for monolingual agrammatic speakers (cf. Caramazza & Zurif 1976; Grodzinsky 2000). Particularly vulnerable are the semantically reversible sentences whose constituents have moved out of their canonical positions, such as: object relatives, passives, and wh sentences.

As result, several theories have been formulated to account for the sentence comprehension deficit. The Derived Order Problem Hypothesis (Bastiaanse & Van Zonneveld, 2005) postulates that every language has a base order (e.g. Subject-Verb- Object, 'the boy is kissing the girl' for English) and that every other word order is derived (e.g. Yes/no question in English, 'is the boy kissing the girl?'). The DOP hypothesis attributes the difficulty with derived order sentences to their structural complexity. However, the focus of previous research on sentence comprehension has been almost exclusively on monolingual studies. The way Swahili-English bilingual agrammatic speakers understand movement-derived sentences has not been investigated before. Swahili is an interesting language with respect to this theory because of its rich morphology and double complexity: at the levels of the verb and at the sentence. Its base order in the verb complex remains the same in derived order sentences (see the example below).

Base order:	Mwanamme	a - na - m- piga		mwanamke
	Man	s/he-Present-he/her-hit		woman
	"The man <u>hits</u> the woman"			
Derived order:	Mwanamke	a-na-pig-wa	na	mwanamme
	Woman	s/he-Present-hit-Passive	by	man
	"The woman <u>is hit</u> by the man"			

NB: The verb complex can function as complete sentence on its own with base order (SVO)

– a- na- m- piga "s/he hits her/him"

– a- na- pig-wa "s/he is hit"

The base order in the verb complex remains the same in derived order sentences; it is only the final inflection that changes (piga → pigwa).

The aim of the current study

The aim of the current study is twofold: 1) to determine whether the morphological differences in the verbal system of the two languages play a role in comprehension of sentences in derived order condition; 2) to assess the empirical validity of the DOP-h in Swahili-English bilingual agrammatic speakers. We predict: 1) worse performance in Swahili language due to verb complexity. When speaking Swahili one has to deal with double complexity: at verb level and at the sentence level in derived order sentences; 2) parallel impairment of derived order sentences in both languages since the DOP-h is language independent.

Methods & Procedures

There were 22 participants in this study: 11 Swahili-English bilingual agrammatic speakers, and 11 age-, education- and native language- matched non-brain-damaged speakers (NBDs) as controls. All were aged between 20 and 49 years, with over 12 years of education. The agrammatic speakers were equally proficient in English and Swahili pre-morbidly, and none had any history of neurological, hearing or vision problems. A sub-test of BAT (Paradis & Mwansau, 1990) on sentence comprehension in Swahili and English was administered first to determine the level of comprehension in each of the two languages.

An adaptation of the sub-test of the VAST (Bastiaanse et al., 2002) for sentence comprehension to Swahili and English was used to test whether word order and verb complexity influence comprehension differently in the two languages of bilingual agrammatic speakers. The task in each language included 200 semantically reversible sentences distributed equally into five sentence types: 40 passive sentences; 40 active sentences; 40 object relative sentences; 40 subject relative sentences; and 40 scrambled (topicalized) sentences. The passives, object relatives and the scrambled sentences were in derived order condition, whereas both the active and subject relative sentences were in base order condition, similarly for both languages. All the sentences had a transitive action verb with NPs in singular form. There were 40 sets of pictures, with each page consisting of a set of four different pictures.

All the tasks involved sentence-picture matching. The participant was shown a set of four pictures on the same page and asked to look at them all. The examiner read a sentence aloud and asked the participant to point to the

picture matching the sentence. Only one picture matched the sentence. The three other pictures were distractors to help determine error types: reversed role distractor, lexical distractor, and reversed role/ lexical distractor.

Results

The NBDs made no errors on either test. The results of the agrammatic speakers are shown in Figure 1.
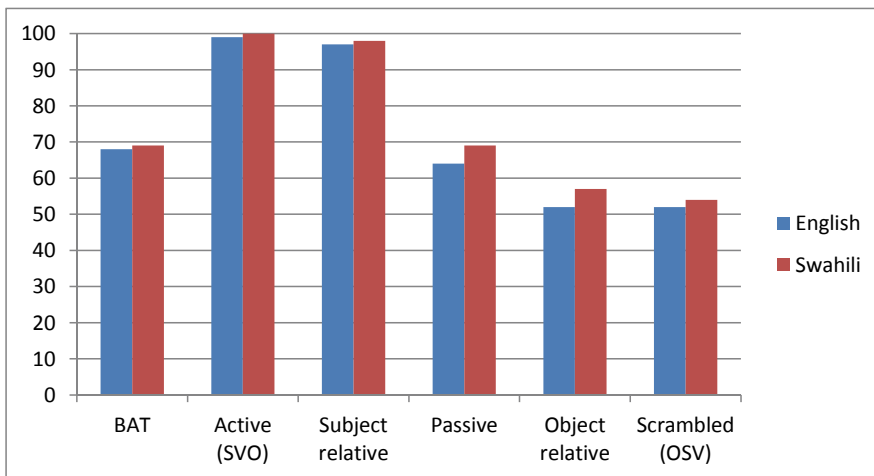
Figure 1: The agrammatic speakers' percentage accuracy in sentence comprehension on the sub-test of the BAT and on the five sentence types of the sub-test of the VAST.

The BAT results show comparable levels of comprehension in both languages (t (10) = 0.48, p = .64): Swahili (Mean = 68.5%) and English (Mean = 67.5%). On the sub-test of the VAST, there were no significant differences in agrammatic speakers' level of performance between Swahili and English on both the derived order condition (t (10) = 1.66, p = .128) and the base order condition (t (10) = 1.39, p = .195). However, in both languages, the agrammatic speakers showed greater difficulty comprehending sentences in derived order than those in base order conditions: in English (t (10) = 14.26, p < .0001) and in Swahili (t (10) = 17.86, p < .0001). On the English test, they performed poorly on comprehension of passives (64.1%), object relatives (51.6%), and scrambled sentences (51.5%) in comparison to active (99.4%) and subject relative sentences (97.4%). A similar pattern was observed on the Swahili test: worse performance on comprehension of passives (69.4%), object relatives (56.5%) and scrambled sentences (54.4%) than on comprehension of active (99.8%) and subject relative sentences (98.3%).

Discussions & Conclusion

In this study, we sought to determine whether the striking morphological differences in the verbal system of the two languages play a role in comprehension of derived order sentences, predicting worse performance in Swahili due to its complex morphology. Furthermore, we assessed the empirical validity of the DOP-h in Swahili-English agrammatic speakers, predicting difficulty with derived order sentences. As per our first prediction, the structural differences between the two languages do not seem to play a significant role in the comprehension of derived order sentences. The double complexity at the verb level and at the sentence level in Swahili derived order sentences appears neither facilitative nor inhibitive to sentence comprehension: the agrammatic speakers are impaired similarly in both languages. As per our second prediction, the results show a parallel impairment of derived order sentences in both languages. The agrammatic speakers show worse performance on comprehension of sentences in derived order than those in base order in both languages. The comprehension of both the active and subject relative sentences is relatively better preserved than the comprehension of passive, objective relative and scrambled sentences similarly in both languages. These findings are compatible with the DOP-h. On language representation in a bilingual brain, considering the agrammatic speakers' early age of acquisition and pre-morbid high proficiency level in both languages, the data (showing parallel impairment) suggest shared neural substrates for the derived order constructions in the two languages.

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Semantic and Phonological Naming Therapy: New Criteria of Therapy Effects Assessment

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Introduction

Studies that compare the effects of semantic and phonological naming therapies often demonstrate positive response to both treatment techniques, irrespective of underlying locus of naming deficit (Lorenz & Ziegler, 2009; Wambaugh et al., 2001). This can be explained by the fact that both tasks include semantic (a picture) as well as phonological (word repetition) information. The therapy effect may, therefore, be just a result of their co-activation, the therapy method itself being irrelevant (Lorenz & Ziegler, 2009). However, a typical measure of therapy efficiency assessment is accuracy (Freyaldenhoven & McCullough, 2006; Lorenz & Ziegler, 2009; Wambaugh et al., 2001; Spencer et al., 2000). We proposed that the difference between therapies may be, nevertheless, revealed by using some additional assessment parameters: activation rate, activation latency and correct response latency.

Methods

Participants

The comparison of the therapy effects required participants with the same underlying naming disorder. To identify aphasic individuals with the deficient access to the phonological output lexicon (POL), a series of diagnostic tests in Russian was elaborated, with orientation on the distinguishing features of this deficit described in Howard & Gatehose (2006). It included the elimination of the conceptual and semantic impairment, and evaluation of the frequency and imageability effects.

Two patients who demonstrated the deficit of the access to the POL were chosen for the participation in the treatment study: IS, 47 y.o. woman, two years and three months post-onset, and SK, 57 y.o. man, one year and seven months post-onset; both had been diagnosed at the Center of Speech Pathology and Neurorehabilitation (Moscow, Russia) as having dynamic and mixed motor (efferent and afferent) aphasia according to Luria's classification.

Treatment: materials and procedures

Stimuli. All stimuli sets were composed using the psycholinguistic database of 400 Russian verbs and black-and-white pictures of the correspondent actions (Dragoy et al., unpublished), with the information on the parameters that are ascertained to influence naming performance, such as frequency, imageability, length, number of arguments, instrumentality and reflexivity.

Design. 6 individual sets of 22 pictures for each patient were composed. They included one control set and one treated set for each kind of therapy (picked from the items that had been named incorrectly in the naming deficit assessment) and two sets of fillers (named correctly in the assessment). The control sets were supposed to demonstrate a possible generalization to the untreated items. All the treated and control sets for both therapies were matched on the number of arguments, reflexivity, instrumentality, lemma frequency and length. Each patient participated in both semantic and phonological therapies, but in different order.

Baselines. Before and after each therapy a baseline was taken using E-Prime (Psychology Software Tools, Inc.): the patient had to name the pictures (that is, to describe in one single verb in the 3SG/3PL form, what an actor was doing in the picture) without cues of any kind. Audio responses were automatically recorded. The baselines included control and treated sets. The changes in the baseline performance after therapy were analyzed as therapy effects.

Therapy procedure. During the therapies the patient had to perform cued naming task. If the picture was not named correctly, the cues appeared in hierarchical order. The fillers were cued as well the treated items. If after all the cues the patient was not able to produce the target verb, the experimenter asked the patient to repeat it after her. The repetition stage was present both in the phonological and the semantic therapy. The phonological therapy included following cues: a rhyming verb, the first phoneme of the target verb, the first syllable, the first two syllables etc. The cues in the semantic therapy were presented as follows: a typical setting of an action, an instrument or an attribute, a direct object, a hyperonyme and a *cohyponyme* of a verb.

Analysis. The results were assessed using several parameters. Accuracy was the rate reflecting the number of correctly named items, irrespective of preceding paraphasic attempts. The activation rate was the number of items with any kind of verb namings, both correct and paraphasic. The correct response latency was the time before the correct response. The activation latency was the time before any nomination was made.

Results

Accuracy improved in all treated sets in both patients. Besides that, after the phonological therapy SK demonstrated a decrease of the activation latency in the treated set, and IS - a higher number of activated items in the control set

and an increased correct response latency in the treated set. After the semantic therapy no effects besides accuracy improvement were found.

Discussion

Although the accuracy increases in the treated sets both after semantic and phonological therapy, some other effects are seen only after the phonological therapy. We hypothesize that the phonological therapy specifically influenced the patients' naming strategy while the semantic therapy resulted in memorizing picture-verb pairs. This is also confirmed by the patients that estimated the phonological cues as more helpful. Since the patients with the deficient access to the POL are supposed to have an intact semantic system (see Howard & Gatehose, 2006), the activation rate and latency may pertain to the semantic system-to-POL mapping which can change during the elaboration of a naming strategy in consequence of therapy procedures.

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PREDICTORS OF TIMED PICTURE NAMING IN PERSIAN

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Introduction

Normalized words and pictures presented as visual stimuli are widely used in experimental studies investigating linguistic and cognitive processing of normal and impaired speakers in a wide variety of languages around the world. Many studies have used word and picture naming tasks to investigate the underlying lexical processing of normal speakers across different languages (Bates, et al., 2003; Juhasz, 2005). Our primary hypothesis is that the variables that influence timed picture naming in majority of Indo-European languages will also predict naming in Persian. Then, we want to see whether the AoA and word frequency would have an independent effect on picture naming.

Methods

The stimuli for the present study are 200 colorized pictures of the Snodgrass and Vanderwart (1980) produced by Rossion and Pourtois (2004). Pictures were standardized based on objective values and subjective ratings of several variables including the concept familiarity, age of acquisition (AoA), word length (in syllables), visual complexity, image agreement, and name agreement between 100 native Persian-speaking adults. The selected pictures were used in a reaction time experiment to investigate the relation of each variable with naming latency among 100 native Persian- speaking undergraduate students.

Results

Multiple regression analysis indicated the percentage of name agreement, image agreement, AoA, and word frequency (R square= 0.64, $p < .0001$), as the most predictive variables of naming latency in Persian. Adding other variables could not explain any significant changes in variance. Besides, the interaction of AoA and word frequency was not statistically significant.

Discussion

In consensus with almost all studies in different languages our results confirm the cross-linguistic impact of name agreement and AoA on picture naming

latency. Our results also showed that AoA has a unique and independent effect on naming latency in addition to the effect of word frequency. Such findings suggest that AoA is not simply a proxy measure of word of frequency (Zevin & Seidenberg, 2002) and emphasize the important effect of AoA in lexical processing across languages.

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How Likely are Stem Errors when Accessing Plurals?

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Introduction

How plural forms are represented has been hotly debated for decades. Is it the case that regular plurals are stored as a full word form representation separate to their singulars (e.g., cat vs cats), or are plurals stored as a stem with a separate plural marker <s> (e.g., cat vs cat-<s>)? The majority of findings support models that integrate both types of representations (e.g., Baayen, Levelt, Schreuder, Ernestus, 2008; Schreuder and Baayen, 1995; Burani & Caramazza, 1987; Caramazza, Laudanna, & Romani, 1988). These models are referred to as *dual-route* theories as they postulate a combination of full-form and decompositional representation for regularly inflected plurals. Current versions propose that words with *low surface frequency* but with *high cumulative stem frequency* are decompositionally stored (Burani & Laudanna, 1992; Laudanna & Burani, 1995; Diependaele, Sandra, & Grainger, 2009; & Hay, 2001), whereas words with a *high surface frequency* are fully listed. With respect to plural morphology a similar analogy holds: some plurals are low in surface frequency and their singulars are higher in frequency, resulting in high stem frequency counts. These 'singular-dominant' plurals are generally thought to be represented decomposed. Other plurals are relatively high in surface frequency compared to their singulars. There is more debate regarding these 'plural-dominant' plurals, with some suggesting that they might be represented as full forms (e.g., Baayen, Dijkstra, & Schreuder, 1997; Baayen, Burani, & Schreuder, 1997). We will use evidence from errors in aphasic word form retrieval to explore if plurals are stored *decomposed*. When a word form is unable to be retrieved, the next most active entry in the lexicon will be substituted. This will result in a response which does *not* share the target stem (errors will be semantically or phonologically related words, e.g. 'eyes' for 'ear'((s)). In contrast, if plurals are stored as separate entries from their singulars, and the plural is unavailable, the singular form may still be accessible (e.g., 'eyes' for 'eye'). Hence, a *non- decomposed full form* representation predicts fewer 'stem' errors than decomposed storage, when word form retrieval is impaired. It follows then, that in theories which propose that plural-dominant plurals are stored as full forms, and singular-dominant plurals are decomposed, that fewer stem errors on plural-dominant

singulars and plurals will be observed (as errors will tend to consist of the selection of alternative singular or plural forms). While our previous research has focused on plural errors when the stem was maintained (Biedermann, Lorenz, Beyersmann, & Nickels, 2012), this current study tries to explore the likelihood of stem errors in the presence of plural dominance.

In order to explore this hypothesis, we examined all erroneous responses when the stem was not produced correctly in a spoken picture naming task presented to speakers with aphasia.

Methods

Participants

The effect of plural dominance in spoken picture naming was explored in four speakers with aphasia (DEH, SJS, DRS, and FME). DEH suffered from a pure word form level deficit, SJS showed a functional lesion in the mapping from semantics to lemma and word form level, DRS was impaired in the mapping from the lemma to the word form level; and FME had a functional lesion within the semantic system.

Materials

32 pairs of pictures representing both single and multiple exemplars of the same object were selected, divided into two subsets, one including 16 plural-dominant picture pairs (e.g. 'eye-eyes') and one including 16 singular-dominant picture pairs (e.g. 'nose-noses'). All items were named with at least 80% accuracy by 33 healthy controls. In the plural- dominant group, the plural items were significantly more frequent than the singular items. In the singular-dominant group, singular items were significantly more frequent than the plural items. Spoken and written frequency values were taken from CELEX (Baayen, Piepenbrock, & van Rijn, 1993). All subsets were matched on logarithmic surface frequency of the plurals, and other lexical variables. All subsets were presented twice to the participants in a quasi-randomised order, ensuring that the singular and the plural of a pair were not presented within one session.

Results

The only participant, who showed a significant difference across conditions for stem error production was SJS: stem error rate between plurals and singulars for the plural-dominant condition differed significantly (Wilcoxon, matched pairs, 2-tailed: p=0.01), whereby stem errors occurred more often for the plural (18 out of 32) compared to the singular (10 out of 32). The only other significant difference was observed for plural and singular production overall: SJS produced significantly more stem errors for the plural compared to the

singular (Wilcoxon matched pairs, 2-tailed: p= 0.05), with 30 plural stem errors versus 20 singular stem errors. As the singular-dominant condition did not show any difference between singulars and plurals, the main effect for the overall difference seems to be driven by the plural-dominant condition. DEH, DRS and FME showed no significant differences for any condition.

Further analyses comparing plurals of the singular-dominant condition to the plural-dominant condition, and the overall plural-dominant condition to the singular-dominant condition (including singular and plural) did not show any significant differences for any participant.

Discussion

As SJS showed the reverse pattern to our prediction and the remaining three participants did not show any differences for any condition, our findings do not support the full-form assumption for plural-dominant plurals, when accessing the stem. Our previous research (Biedermann et al 2012) found clear plural dominance effects in number error production (when stem was maintained): singular-dominant plurals and singulars differed significantly in error rate, whereas the plural-dominant singulars and plurals did not. The debate about dominance might therefore depend on the point in time of processing: while stem errors occur early in the production process, number errors (reflecting dominance) might occur only late.

Results will be further discussed within the dual-route accounts.

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The Production of French "Non-Schwa Variants" as a Window into Phonological Planning in Aphasic Patients?

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Introduction

In the psycholinguistic word production literature, a recurring question concerns the nature of phonological planning units, i.e., the number of words processed simultaneously at the phonological encoding level. The existence of between word phoneme exchange errors (e.g., Garrett, 1975) suggests that more than one word can be activated in parallel. Connected speech processes in error-prone speech (e.g., French liaison) also provide evidence in favour of the activation of multiple phonological forms.

By contrast, few studies have investigated the scope of phonological planning in aphasic speakers. It has nevertheless been observed that phonological exchange errors rarely occur between words in patients with conduction aphasia (Kohn & Smith, 1990). On this basis, it can be hypothesized that the phonological encoding unit in these patients is limited to a single word even in connected speech. The aim of the present research is to examine this hypothesis further.

We compared the ability of patients with mild phonological impairment and of patients with mild phonetic impairment to produce *French schwa words*. We took advantage of the fact that these words are typically produced with the schwa ("schwa variant") in isolation (Fouché, 1986, e.g., *reviens!* 'come back') and often produced without the schwa ("non-schwa variant") in particular contexts of connected speech (e.g., when preceded by a vowel, e.g., *tu r'viens quand*? 'when are you coming back?'). Recent studies have shown that both variants are lexically stored in the lexicon of non-brain damaged speakers (e.g., Bürki, Alario, & Frauenfelder, 2011). Here, we asked our participants to repeat these words in two conditions. In the *schwa condition*, the prompt consisted in a schwa variant, in the *non-schwa condition*; it consisted in a non-schwa variant. In both conditions, the word had to be preceded by the determiner *mon/ma*.

We hypothesized that both groups would produce schwa variants in the non-schwa condition but that the source of these "errors" would differ. In line with the hypothesis that patients with phonological impairment tend to encode multiple word sequences word by word, the production of schwa variants for these patients should occur whenever the unit of phonological planning is a single word, a context known to trigger the activation of the "schwa variant" representation. Accordingly, these patients should only select the "non-schwa

variant" when able to plan the determiner+noun sequence as a single unit. By contrast, it is well known that patients with apraxia of speech (AoS), produce schwa epentheses in consonant clusters and that these insertions are phonetic in nature (Ziegler, 2008; McNeil et al., 2008). Consequently, we expect that AoS patients will insert a phonetic schwa when prompted to repeat a non-schwa variant, and that these "errors" are independent of the scope of phonological planning. Accordingly, we predicted that (1) patients with a phonological impairment would tend to produce "schwa variants" in the presence of a pause between the determiner and the noun, while AoS patients' non-schwa productions would be independent of such pauses and (2) that the acoustic properties of the produced schwa in the "non-schwa-variant" and "schwa variant" conditions would differ for patients with AoS but be similar in patients with phonological impairment.

Methods

Participants

Four participants diagnosed with apraxia of speech (AoS) and three aphasic participants diagnosed with phonological impairment took part in the study.

Materials

The stimulus set involved 20 French words with a schwa in their initial syllable and a simple onset (*fenetre* 'window') and 20 non-schwa words (fillers).

Task and procedure

Participants were familiarized with the 40 nouns of the experiment and their corresponding pictures. In the test phase, they heard each spoken word in isolation which they had to repeat preceded by the determiner *mon* or *ma*. The list was presented twice, once with the schwa variant (*schwa condition*), once with the non-schwa variant (*non-schwa condition*).

Results

Only schwa words produced in the *non-schwa condition* were considered. Among the 137 correct productions, 65 were realized with the schwa and 72 without. Pauses between determiner and noun were more frequent in patients with phonological impairment (38% of occurrences) than in patients with AoS (14%). Results analysed with a generalized linear mixed effects model revealed no main effect of diagnostic category (p>0.1), or presence of pause (p>0.3) but an interaction between these two variables, revealing that the probability of producing a schwa variant was influenced by the presence of a pause for phonological patients only ($F(1, 133) = 6.75$, $\beta = 9.29$, $p<0.05$). Crucially, at least one patient in each group produced only schwa variants,
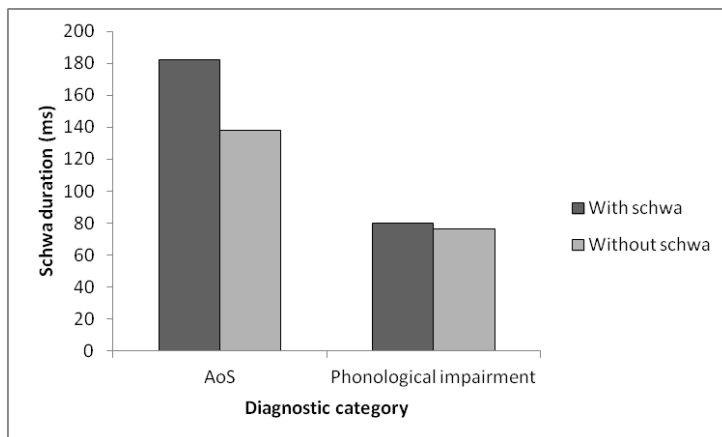
Figure 1: Schwa duration (ms) as a function of condition for each patient

which allowed us to carry out specific acoustic analyses on the schwa produced by these two patients in the two conditions .

Results are presented in Figure 1. They showed that the schwa is longer in the *schwa variant condition* than in the *non-schwa variant condition* only for the patient with AoS (mean difference: 35 ms) but does not differ between conditions for the aphasic patient with phonological impairment (mean difference: 3.5 ms). This created a significant interaction between condition and patient $F(1, 69) = 8.03$, $\beta = -28.4$, p<0.05).

Discussion

The aim of this research was to examine whether aphasic patients with phonological impairment showed evidence for a reduced scope of phonological planning. We examined whether the inability to repeat "non-schwa variants" of French words in a noun-phrase context was determined by the existence of a pause between the determiner and the noun and whether the productions were similar between "schwa" and "non-schwa" conditions. We found that this was indeed the case. By contrast, the frequent productions of "schwa variants" of patients with AoS are due to a phonetic insertion, as confirmed by the acoustic difference between the schwas produced in these two conditions. This study also further confirms that a similar phenomenon can have two clearly distinct origins in terms of the levels of representations and processes involved, as described by Buchwald and Miozzo (2011) for consonant deletion in consonant clusters.

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Gesturing in Aphasia, Compensatory with or without Speech?

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Introduction

Gestures can convey meaning in co-occurrence with speech; gesticulation. As well as in absence of speech; pantomimes (McNeill, 2000). For people with severe aphasia, gesturing therefore could potentially be a good strategy to compensate for their speech loss. The different gesture modes proposed here however, probably result from different processes (e.g. Lausberg et al., 2000). Our study aims to find out what happens to gesticulation and to pantomime when speech breaks down, as is the case in aphasia.

Because the production of gesticulation is thought to be linked to speech (McNeill, 2005), one might expect people with aphasia to show impaired gesticulation. De Ruiter (2006), on the contrary, proposes that gesticulation by people with aphasia could potentially add to the content of their impaired speech. Pantomimes are believed to result from a process, which is not linked to speech production (e.g Goldin-Meadow et al., 2008). Therefore, one might hypothesize that the use of pantomimes will not be influenced by aphasia.

This study reports on the gesture abilities of a person with Wernicke's aphasia. We analyze the gesture techniques used in gesticulation and pantomime. With this case study we illustrate the apparent dissociation between these two gesture modes.

Participants

Case

QH is 68 years old, right handed and has functional use of both hands. He is diagnosed with Wernicke's aphasia and ideomotor apraxia (based on a test for pantomime of tool use and imitation of hand and finger postures; Goldenberg, 1996; Goldenberg et al., 2007). His speech is fluent, but neologistic, and contains some stereotype like utterances. Whereas his verbal communication is severely affected, his comprehension of speech is relatively good.

Controls

We compared QH's results to the performance of 6 right handed healthy control participants (age 41 -58 years).

Methods

We conducted two experiments in which participants were asked to name the first 20 pictures from the Boston Naming Task (Kaplan et al., 1983). In one experiment, they were asked to do this verbally (in which gesticulation spontaneously occurred). In the other experiment, the use of speech was explicitly forbidden. Instead, they were requested to use pantomimes.
Based on Müller's approach (Müller, 1998), we analyze the different gesture techniques used (e.g. pretending to hold a toothbrush = a 'handling' technique) in both pantomime and gesticulation.

Results

In the pantomime condition, QH almost exclusively uses gesture techniques that illustrate the shape of an object. These pantomimes show a detailed image of the presented picture, which QH seems to be 'copying'. In the gesticulation condition on the other hand, he mostly uses pointing and handling techniques (which each account for 48 % of the gestures used). Furthermore, it is noticed that whereas the pantomimes were created well in sight, gesticulation was often performed near the presented picture, which could not be seen by the experimenter (because of a cardboard screen).
Secondly, we compare the pantomimes used by QH to the pantomimes used by healthy controls. Compared to healthy controls, QH uses a much more limited range of techniques. In an analysis per item, we see that across control participants, there is consistency in the techniques used for a certain object. That is, for 14 out of 20 items, a specific technique is used by all participants (e.g. all participants used a handling technique for pantomiming the item 'wheelchair'). The pantomimes used by QH however, do not match this pattern.
Lastly, we draw a comparison between QH and healthy controls for their gesticulation. Unlike healthy controls, who hardly gestured in this condition, QH shows gesticulation for every item tested. His gesturing was accompanied by fluent speech, which was perceived as neologistic and incomprehensible (score correct = 0/60 for 20 items).

Discussion

With this case-study, we have shown a dissociation between the gestures used by QH in gesticulation and pantomime. Our finding that QH uses more gestures in his gesticulation than healthy controls do, supports the

hypothesis of De Ruiter (2000) that gesture can compensate for speech loss in people with aphasia. However, the gesticulation used by QH, does not seem to be intended as compensatory for speech, as most of his gesticulation was performed out of sight from the tester (in contrast to his pantomimes). Neither does it seem to be intended as facilitating speech production. Firstly, his gesticulation never resulted in a correct naming of an object. Secondly, based on previous studies (e.g. Cocks et al., 2010), one would expect 'shape' gestures rather than 'handling' or 'pointing' gestures when trying to resolve word finding difficulties. We plan to further address this observation, by analyzing gesticulation produced by healthy controls when facing word finding difficulties. Furthermore, we wish to test the hypothesis that gesticulation can be compensatory for speech production, by performing a perception task in which we compare gestures and speech for their comprehensibility.

For the pantomime condition, our study has shown a remarkable difference in pantomimes used by QH and healthy controls. QH is less creative and uses fewer and different gesture techniques. We did not expect pantomiming to be influenced by aphasia. Yet, it might better be explained by his ideomotor apraxia. Goodale et al. (1994) report that in pantomiming, people use mental representations of a concept, which they hypothesize people with apraxia would not be able to do. QH repeatedly looked at a picture, while copying it very detailed in his pantomimes. Following Goodale et al. (1994), we hypothesize that he uses this strategy, because he could not rely on a mental representation of the concept. We plan to further analyze the gestures illustrating a 'shape' in this study. We expect that healthy controls, unlike QH, do not show such detailed copying of pictures. Rather, we expect them to use salient elements which represent a certain concept (e.g. two bumps for a 'camel'), a strategy which people with apraxia are reported to show difficulties with (Hogrefe et al., 2011).

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Prepositions Inside Words and the Morphosyntax of Compounds – A View from Agrammatism

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Introduction

In this paper, we investigate the performance of an Italian Agrammatic speaker with compound words, with major emphasis on the processing of (complex and simple) prepositions *inside* words, thus aiming at especially evaluating the performance with prepositional compounds of the [Head Noun-Prep-Dependent Noun; N-P-N] type, such as *coda di cavallo* (horse-tail) and exocentric compounds of the [Prep-Noun; P-N] type, such as *sopracciglio* (eyebrow). As shown by Bisetto & Scalise (1999: 35), it is quite realistic to consider N-P-N items as fully productive compound words in Italian.

Methods

Participant

Our patient (SM) is a 56-year-old right-handed male with 10 years of education, who suffered of a hemorrhagic stroke. He was diagnosed with Broca's Aphasia on the basis of standard tests.

Stimuli

The stimuli consisted of a set of 391 words, which included 80 P-N compounds, 144 N-P-N compounds (with 104 simple and 40 articulated prepositions) and 110 balanced Italian compounds of the following types: V-N$^{[exocentric]}$(e.g. *coprifuoco*, curfew), V-V$^{[exocentric]}$ (e.g. *bagnasciuga*, foreshore), N-A$^{[exocentric]}$(e.g. *pellerossa*, redskin), A-N$^{[exocentric]}$(e.g. *purosangue*, thoroughbred), N-N$^{[left-headed]}$ (e.g. *capobanda*, gang leader), N-N$^{[right-headed]}$ (e.g. *fotoromanzo*, photostory). Furthermore, 57 non-compound (*distracters*) nouns with a word embedded in the left or right edge of another word were included (e.g. *cremagliera*, rack, where *crema* stands for cream; *scarafaggio*, beetle; where *faggio* means beech). The embedded word was not related in meaning to the whole unit (cf. El Yagoubi et al. 2008). The variables considered in the experiment were length, frequency and neighbourhood size. Frequencies of the stimuli were collected from COLFIS (Bertinetto et al. 2005). The tasks were *Reading aloud* and *Repetition*. Two *Completion* tasks were also

performed, following Mondini et al. (2005). In a first condition [Completion (a)], 50 items in which the linking preposition had been omitted were said aloud to SM by a speech therapist. SM was asked to say which preposition had to be inserted between the head and the modifying noun. In a second condition [Completion (b)] a set of 30 N-Prep-N compounds were intermixed with 20 N-N compound fillers (50 items in total). First, SM had to say whether or not a prepositional link was required (e.g. *calzamaglia*, tights [*lit*. stocking-knit] does not require a preposition, while *mulino a vento*, windmill, requires it) and, when required, which preposition had to be inserted. A further *Repetition* task was created, consisting of a set of 111 N-P-N (un-lexicalized) phrases (e.g. *i biscotti alle noci*, nut-cookies).

Results

The experiments show that N-P-N compounds are significantly more impaired than P-N compounds in our Agrammatic subject. In the repetition task, SM made only 1/80 errors with P-N compounds while the errors with N-P-N compounds were 50/144. The different ratio of performance is statistically very significant (1/80 *vs*. 50/144, [^{2}(1)=22.8; p<.0001]). In the reading task, in which SM, performed in general slightly worse, we found 19/80 [23.75%] errors with P-N compounds and 68/144 (47.22%) errors with N-P-N compounds. Again, our results are significant from a statistical viewpoint (19/80 *vs.* 68/144, [^{2}(1)=5.6; p=.0184]). N-P-N errors consist almost exclusively of omission and substitution of the required prepositional linking element, with an overwhelming prevalence of omissions. N-N compounds, both right headed and left headed, were virtually unimpaired in repetition, and only very slightly impaired in reading. Others compounds were virtually unimpaired in repetition, and only slightly impaired in reading. The Completion task confirmed the marked deficit of SM with linking prepositions in N-P-N compounds. In Completion (a) SM made 28/50 errors (exclusively consisting of insertion of the wrong preposition). The result for Completion (b) was 33/50 right answers, with 0/20 errors with items that do no require a linking element and 17/30 errors with N-P-N compounds (a significant fact: ^{2}(1)= 9.7; p=.0018). Interestingly, 15/17 errors consisted of omission of the linking preposition (SM answer was:'*no preposition required* ') and only 2/15 errors consisted of the insertion of the wrong item. Finally, SM performance with phrases' repetition was quite poor, with only 34/111 [30.63%] correct answers. Crucially, the most prevalent errors [63.41%] were the omission of the preposition.

Discussion

Our results demonstrate that SM is selectively impaired in retrieving the prepositions linking the modifying nouns to their head, and confirm previous investigations (Mondini et al. 2005). SM's deficit is consistent with the

well-known difficulties with functional items shown by agrammatic subjects (see e.g. Miceli et al. 1989). Moreover, our data can trigger interesting interpretations, from a theoretical viewpoint: (a) the complex preposition (e.g. *fuori*, outside) which are produced with no significant problems by SM, are likely to be *relational nouns* and not functional *axial parts* (in the sense of e.g. Svenonius 2006) when involved in the formation of Italian P-N compounds (a specific Agrammatic deficit for *axial parts* has been detected in Zampieri et al. 2011); (b) the significant dissociation in SM performance with N-P-N words and with V-N ones [e.g. in repetition, 50/144 *vs.* 0/19 errors, [2] (1)=6.4; p=.0114] undermines Ralli's (2008) hypothesis of a structural affinity of the two forms. Interestingly, our results for V-N compounds are quite different from the ones collected in Semenza, Luzzatti & Carabelli (1997), where a group of six Broca's aphasics showed a significant proportion of omissions of the verb component; (c) SM's same behaviour with all type of exocentric compounds enhances the hypothesis that all of them can have the same underlying configuration. Our proposal is that all of them originate as reduced relative clauses, modifying a *light* silent head noun (see Kayne 2003; Cinque 2011); (d) finally, a crucial question is raised: are N-Prep-N *real* compounds, since they behave very differently from N-N compounds in SM performance? Possibly, the same underlying architecture holds both when these items are processed as phrases and as "lexicalized syntax" (cf. Starke 2009). Given the high number of substitutions (see also Matzig et al. 2010) emerging from the Completion (a) task and due to the very similar poor performance of SM with both N-P-N compound-like-items and analogous phrases, a unified analysis of this kind is strongly suggested by our study.

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Investigating Potential Sentence Length Effects in Agrammatic Performance: Evidence from Morphosyntax

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Introduction

Several studies on aphasia have reported asymmetries between subject-verb Agreement, Tense, and Aspect. Nevertheless, not all of these studies had all three conditions matched for sentence length. For instance, in the sentence completion tasks reported in Varlokosta et al. (2006) and Fyndanis, Varlokosta, and Tsapkini (to appear), the agreement sentences were shorter than the tense sentences, and the latter were shorter than the aspect sentences. Interestingly, the pattern of the agrammatic performance reported by Fyndanis et al. reveals an inversely "proportional" relationship between sentence length and accuracy scores. This raises the question whether the differences among the three categories were genuine, or reflected just length effects. In fact, Cheimariou et al. (2010) reported equal degrees of impairment in Tense, Agreement, and Aspect in Greek-speaking individuals with aphasia tested with materials matched for length. This study aims at teasing apart the contributions of the above-mentioned functional categories and sentence length to agrammatic performance.

Methods

Two sentence completion tasks were administered to two Greek-speaking agrammatic individuals (PG and PK), with a five-day interval in between. The first task included the shortest possible sentences for each condition (Agreement<Tense<Aspect), while the second task had all three conditions matched for length (Agreement=Tense=Aspect). The second task used the sentences included in the first task, except that the agreement and tense sentences were longer, as some additional adverbials had been added in these conditions. In both tasks, the adverbials used to elicit the target values immediately preceded the target verb forms. Between-task differences for Agreement or Tense would point to a differential effect of these categories and sentence length.

Results

As shown in Table 1, in both tasks, PG was significantly more impaired in Aspect than in Tense and Agreement. No dissociation was observed between Tense and Agreement, in any of the two tasks. Moreover, no significant dissociation was observed between the tasks for either Tense or Agreement. PG performed worse (albeit not significantly so) on all three categories of the second task, compared to the first one.

PK's pattern of performance on the first task was similar to PG's, since he performed significantly worse on Aspect, compared to Agreement and Tense. Although Agreement elicited a higher accuracy rate compared to Tense, these two categories did not differ significantly. While the same pattern emerged in the second task (Agreement>Tense>Aspect), no significant dissociations were observed across categories. Surprisingly, PK's performance on Aspect improved significantly in the second task. Tense and Agreement elicited higher accuracy rates in the second task, but the between-task differences were not significant for any of the two functional categories.

Discussion

Sentence length does not have a significant effect for PG, although it seems that it places an extra burden on her processing system, since her performance drops when the sentence length increases.

Interestingly, her performance on Aspect is lower in the second task, compared to the first one, although the length of the aspect sentences was kept constant across the two tasks. It appears, thus, that the extra burden placed on PG's processing system by the increased length of the tense and agreement sentences affects the categories under investigation across-the-board. However, the overall results and the lack of a significant dissociation between the two tasks, for any of the functional categories, reveal that, for PG, there is a genuine dissociation between Aspect, on the one hand, and Tense and Agreement, on the other hand. It appears that inherent properties of Aspect (e.g., subjectivity) render its testing or processing "difficult" (see Fyndanis et al., to appear).

Given his similar patterns of performance across tasks, PK appears to be more impaired in Aspect than in Tense and Agreement, with Tense being slightly more impaired than Agreement. Interestingly, unlike PG, PK performed better on the second task, in all three categories, despite the longer sentences used for Agreement and Tense. Therefore, *prima facie* increased sentence length does not cause greater difficulties for PK. Most importantly, his performance on Aspect improved significantly in the second task. PK's overall better performance on the second task possibly reflects increased familiarity with it, which was achieved due to his previous experience with the first task. His significantly better performance on Aspect in the second task, in the face of non-significant

improvements for Agreement and Tense, could be accounted for by assuming that increased sentence length does cause extra difficulties for PK, but these difficulties are wiped out and overridden by the facilitatory effects of his increased familiarization with the task. Crucially, while in the tense and agreement conditions in the second task there is a counterbalance between these two variables (*increased sentence length* and *increased familiarization with the task*), this is not the case with Aspect, since the length of the aspect sentences was kept constant across the two tasks. Thus, in the case of Aspect (in the second task), only increased task familiarization was at play, which resulted in PK's significantly better performance.

In contrast to PK, PG's performance on the second task does not appear to reflect increased familiarity with it. Nevertheless, we could not rule out the possibility that, for PG, both facilitatory effects of increased task familiarity and inhibitory effects of increased sentence length were at play, with the former, however, being wiped out and overridden by the latter.

To conclude, it appears that, although sentence length seems to play a role in linguistic performance in agrammatic aphasia, the dissociations between functional categories are genuine, at least for PG. It is difficult to determine the exact "magnitude" of the sentence length effect in the context of the proposed experimental paradigm, since it is likely that increased sentence length and task familiarization act in opposite directions, which results in different patterns of performance depending on which of the two variables has a stronger effect for a given agrammatic speaker. To obtain a clearer picture regarding the role of sentence length, perhaps the two tasks should be administered at least 15 days apart, so that the task familiarity effects are minimized.

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The Interaction between Lexical Retrieval and Oral Reading: Evidence from Acquired and Developmental Anomia and Surface Dyslexia

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Introduction

Lexical retrieval is a multi-level process that starts with a conceptual stage where non-verbal conceptual information is retrieved and conceived. This stage is followed by lexical stages: the semantic lexicon (and possibly also a syntactic lexicon), followed by the phonological output lexicon. The information retrieved from the phonological output lexicon is then sent to the phonological output buffer. Naming difficulties in aphasia can result from a deficit in each of these stages.

One of the clinical challenges is to detect the locus of the impairment in the lexical retrieval model for each patient with anomia. This is done on the basis of analysis of naming error types, the assessment of various effects on naming, and the performance on additional tasks and abilities such as conceptual categorization, word-based reading comprehension, auditory comprehension, word and pseudo-word repetition and more.

Oral reading also relies on a multi-level process, which starts with the orthographic visual analyzer, proceeds, in the lexical route, to the orthographic input lexicon, the phonological output lexicon, and the phonological output buffer. Information also flows from the orthographic input lexicon to the semantic lexicon and the conceptual system for reading comprehension. On the other route, the sub-lexical route, information flows from the orthographic-visual analyzer to grapheme-to-phoneme conversion, whose results are held in the phonological output buffer.

One of the common reading deficits is surface dyslexia (hence: SD), a reading deficit at one of the points in the lexical route, which forces reading aloud via the sub-lexical route. Friedmann and Lukov (2008) have shown three subtypes of surface dyslexia: SD that results from a deficit in the orthographic input lexicon, SD that results from a deficit in the output of the orthographic input lexicon to the phonological output lexicon and to the semantic system, and interlexical SD, a disconnection between the orthographic input lexicon and the phonological output lexicon. Individuals with SD of all these types show impaired oral reading of irregular words and potentiophones (*listen*
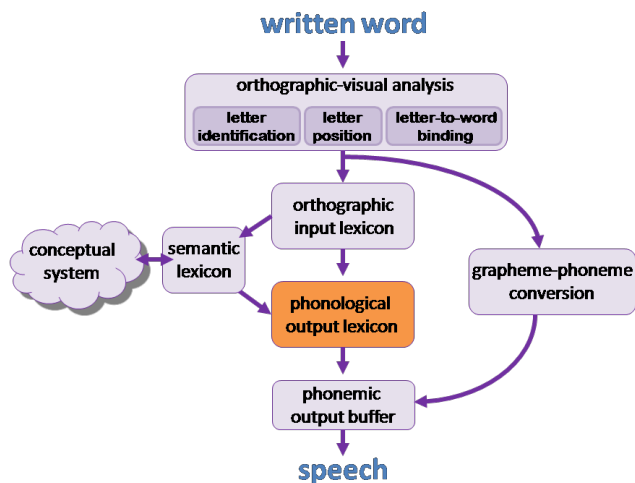
Figure 1: The phonological output lexicon is involved in naming as well as in reading aloud via the lexical route

read with a pronounced t, *none* read as "known"). The three subtypes differ with respect to lexical decision and comprehension of homophones. Individuals with SD in the orthographic input lexicon show impaired lexical decision of pseudohomophones (Is 'kar' a word?) and impaired homophone and potentiophone comprehension (Is 'bear' related to drinking or to animals?). The two other subtypes (in which the input orthographic lexicon is spared) show good lexical decision of pseudohomophones. Output SD causes impaired homophone comprehension, whereas in interlexical SD, in which participants can reach semantics from the orthographic input lexicon, homophone comprehension is spared. Friedmann and Lukov suggested another locus in the naming process that may lead to SD: a deficit in the phonological output lexicon, but have not reported individuals with SD with this kind of impairment.

Given that both naming and oral reading share the phonological output lexicon, in the current study we explore the pattern of reading of individuals with anomia who are impaired in the phonological output lexicon. We present seven patients who have SD following a phonological output lexicon impairment. This theoretical consideration and finding suggests that reading aloud of irregular words and potentiophones can serve a new mean to detect a phonological output lexicon deficit in naming. We present evidence from the reading patterns of 7 participants with anomia. All participants, 3 with acquired anomia and 4 with developmental anomia, have anomia due to a

selective deficit in the phonological output lexicon. Importantly, all manifest the classic reading aloud pattern that is typical to SD, but show spared pseudo-homophone lexical decision and good homophone comprehension.

Participants

Seven individuals with anomia participated in this study. Three were participants with acquired anomia, aged 48-75, who showed significant naming disorders (22%-71% correct naming) in the *SHEMESH* picture naming test (Biran & Friedmann, 2004). Four other participants were siblings aged 10-16 years, two brothers and two sisters, who had developmental anomia, performing significantly poorer than their age, with 65-85% percent correct naming in the *SHEMESH* naming test. The performance in the naming test for all participants was analyzed in terms of error types and effects. Further tests (nonword repetition, picture association, word association, word-picture matching) were administered to determine the locus of impairment of each participant. The 7 participants were included in the study because this battery of tests indicated that their naming deficits results from a selective deficit at the phonological output lexicon. These participants had phonological (and semantic) errors in naming, hesitations and long naming latency resembling tip of the tongue states, and were affected by word frequency. At the same time they repeated nonwords well, and comprehended words and pictures well, indicating that their deficit was indeed in the phonological output lexicon.

Reading assessment

After establishing that each of these participants had a naming deficit that resulted from a deficit in the phonological output lexicon, we administered a battery of reading tests to each of them, which assessed their reading in general but focused on whether or not they read via the lexical route. The reading tests included oral reading of word lists that contained words sensitive to SD: irregular words and potentiophones. To evaluate the status of their orthographic input lexicon and its connection to the semantic lexicon, we administered pseudo-homophone lexical decision tasks, and homophone and potentiophone comprehension tasks (word association tasks and word-picture matching tasks).

Results

The oral reading of all participants revealed the typical surface dyslexic errors, such as regularization errors and potentiophone substitutions. Importantly, all the participants performed flawlessly on the pseudo-homophone lexical decision task and on the homophone-potentiophone reading comprehension task, implying spared orthographic lexicon and spared access to lexical semantics through the orthographic input lexicon.

Discussion

We predicted, based on the fact that the phonological output lexicon is involved both in naming and in oral word reading, that a deficit to this stage would cause both naming deficits and surface dyslexia, and that this surface dyslexia would only affect oral reading. Indeed, the seven participants with acquired and developmental anomia in this study showed exactly this pattern. This points to a new cause for surface dyslexia, and suggests that oral reading of irregular words and potentiophones may serve as a complementary task when a phonological output deficit is suspected.

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The Grammatical Deficit in Regular Past Tense Formation: A Study of Persian Speaking Population with Parkinson Disease

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Introduction

Parkinson's disease impairs motor and cognitive functions from the initial stages of the Disease (Owen et al., 1992). These patients have problems in executive functions and language. With respect to the language component, syntax, morphology and phonology aspects display more deficits than semantic aspects. This may be the result of cortical - subcortical language networks dysfunctions which support these three language levels. PD patients have more problems in regular morphology, which is processed implicitly in comparison to irregular morphology, which is more explicitly represented. Neurolinguistic studies of past tense formation in patients with subcortical dysfunction result in the declarative/procedural model of language processing which in regular behavior (regular morphology) is subserved by implicit memory that recruits corticosubcortical networks whereas the temoroparietal cortex is involved in irregular behavior processing (semantic knowledge and irregular morphology) (Ullman, 2004).

Several neurolinguistic studies have investigated the DP model for regular and irregular verbs in PD patients. Ullman et al. (1997) studied the past regular and irregular verbs production in PD. They found out that regular verbs were impaired in PD but irregular verbs exhibited less deficits.

The DP model has been studied in several different populations with PD (English, French and Greek). Investigations in French and English showed greater impairment in regular verbs as compared with irregular verbs (Terzi, Papapetropoulos, & Kouvelas, 2005). In contrast Greek patients with PD did not have significant differences between regular and irregular verbs.

One of the limitations in DP model studies is that they have not been done in many languages. Another drawback is that there are no studies that have assessed cognitive impairments and their effects on patient's syntactic behaviors.

The aim of the present study was to investigate past tense formation in a new population of patients with Parkinson's disease, namely speakers of Farsi. Furthermore the effects of the participants' cognitive status on regular and

irregular production will be assessed.

Farsi is an Indo-European language, belonging to the Iranian branch of the Indo-Iranian group. Typologically, it is a SOV language with a rather rich morphology. There is no gender agreement in Farsi but there is subject-verb agreement with respect to person and number. Each verb has a past stem and a present stem. The past regular verbs are made by adding /id/ and /d/ to present stem before person agreement. Past irregular verbs are not rule-governed and the stem of verbs in present tense is not preserved in the stem of the past tense verb (Nilipour & Raghibdoust, 2001).

Method

20 right-handed patients with PD and 20 healthy subjects participated in the present study. The control group was matched for age, education and MMSE Scores. Besides the MMSE test, PD patients also received some neuropsychological tests to assess executive functions and visuo-spatial problem-solving skills (Wisconsin Card Sorting Test - WCST (Kongs, Thompson, Iverson, & Heaton, 2000), and Coloured Raven Progressive Matrices (Raven, 1965), respectively).

The past tense formation task used was a sentence completion production task. Subjects were given 20 sentences. After each sentence was read to them it was repeated in the context of past eventbut except the verb's place in the sentence was left empty. Subjects were asked to fill in the slot with the verb in the past tense. 20 of the verbs used have a regular past tense and 20 have an irregular past tense.

Results

PD patients showed greater impairment in regular verbs with respect to irregular verbs, $t(19)=2.4$, $p=0.023$. By contrast healthy controls performed equally between irregular and regular verbs $t(29)=0.8$, $P=0.4$.

We analyzed the scores of Parkinson's patients and healthy controls on each type of verb. Patients with Parkinson's disease scored significantly lower than healthy controls for regular verbs $t(48)=3.2$, $P=0.002$, while no difference was found on irregular verbs between groups $t(48)=0.54$, $P=0.59$

No correlations were found between the performances of patients with Parkinson's disease on past tense formation tasks and neuropsychological tests either in regular or irregular verbs. The same holds true for healthy controls when their performance on past tense formation tasks was compared with their scores on the MMSE.

Discussion

We studied past tense formation in Farsi speaking with Parkinson Diseases. Our result showed that PD patients had more impairment in the regular verb

production whereas the irregular verbs were relatively intact. The output of the present study supports the DP model for regular Past tense formation. However, we could not find any relationship between past tense formation and cognitive status. This finding supports the claim of a linguistic deficits in PD, which cannot be attributed to the cognitive status.

According to the Corollary of Murphy's Law: only that which can go wrong will go wrong. In other words, the structure of the language determines what types of errors may occur (Paradis, 2001). For example there are no irregular verbs in Azari but they are frequent in Farsi (Johari et al.). Crosslinguistically, in some languages such as English there are clear-cut disassociation between regular and irregular verbs, however, there are no clear-cut disassociation between regular and irregular verbs in some languages such as Greek (Terzi et al., 2005).

However there are several factors that are related to PD patients' language impairments, which need to be considered in the discussion. The role of cognitive functioning is one of them. Studying PD patients with different stages of cognitive impairments may disclose the relationship between cognitive deficits and syntactic problems. In the present study we assessed PD patients with some neuropsychological tests and found that there was no statistically significant relationship between verb production and cognitive status. Investigation of effects of cognitive deficits on past tense formation with wide neuropsychology tests is recommended for future research in this field of study.

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Conversation Therapy for People with Agrammatic Aphasia and Their Conversation Partners: Evaluation Outcomes

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Introduction

Interventions for aphasia frequently focus on the language skills of an individual with the aim of influencing everyday communication. Recently there has been a growing interest in direct exploration and remediation of conversation. This paper investigates the outcomes for a case series of eight people with agrammatic aphasia and their conversation partners who took part in an 8 week conversation training programme that aimed to develop strategy use in both speakers (Beeke et al., 2011; Beckley et al, submitted).

Methods

Design
The study employed a case series experimental design using mixed methods to evaluate change. It is the first, to our knowledge, to measure conversation on multiple occasions prior to and following intervention. Assessors were blinded as to the point at which the conversation data were collected.

Intervention
Therapy involved both members of the interactional dyad - the person with aphasia (PWA) and the conversation partner (CP) - using a modified version of the SPPARC conversation training programme (Lock, Wilkinson and Bryan, 2001), with a focus on developing PWA strategy use alongside CP facilitatory communication style. A specific set of facilitator and barrier behaviours to conversation, selected by the therapist and each dyad together, were targeted in intervention (termed Dyad Specific Behaviors, DSBs).

Measuring change in conversation
An Aphasia Conversation Measure (ACM) was developed to permit quantitative investigation of conversation change resulting from therapy. These data were supplemented by a qualitative analysis, using Conversation

Analysis (CA). Three hypotheses were formulated to investigate the nature of any change:

1) The intervention will result in a measurable change in general features of conversation, e.g. PWA initiation, CP understanding checks.

2) Specific behaviours targeted in therapy (DSBs) will alter in a predicted direction: barriers will decrease, e.g. CP 'test' questions - the answers to which are already known; facilitators will increase, e.g. PWA use of gesture, drawing, writing.

3) Participants will report long term changes in their conversations, during disability focused questionnaires and an independent interview.

Results

After therapy, 10 of 16 participants who completed the programme (five of eight PWAs, six of eight CPs) showed statistically significant positive conversation changes, measured using the ACM. Only one dyad showed no positive changes in either participant (Dyad 7). As predicted, there was no concurrent change in PWA language skills post therapy, demonstrated by stability in test performances across multiple pre and post therapy baselines. This confirms that change to PWA conversation is due to effective communication training, rather than a reduction in agrammatism (sentence construction was not targeted in therapy). In a questionnaire-based assessment of conversation (CAPPA, Whitworth, Perkins and Lesser, 1997) participants reported using a significantly increased range of their pre-stroke conversational styles after therapy.

Quantitative results, presented in Table 1, show positive changes in specific aspects of conversation (e.g. PWA initiation) for five of eight PWAs, and the use of strategies chosen and practised during therapy increased for one of the five ('Barry', Dyad 6), with a trend towards significance for another ('Simon', Dyad 2) [all names are pseudonyms]. This result suggests that certain PWAs can learn to implement new strategies after conversation training, as we already know CPs can (Simmons Mackie et al, 2011, Wilkinson and Wielaert, 2012). For the other three PWAs ('Kate', Dyad 1; 'Jill', Dyad 5; 'Stuart', Dyad 8), although there were positive changes in general features of conversation, these did not include an increase in the use of facilitative strategies targeted in therapy. For 'Giles' (Dyad 3), no quantitative changes were seen, however a qualitative analysis revealed that he was better able to deploy his chosen strategies of writing and drawing after therapy, but only when prompted by his wife.

Positive changes in conversation were detectable for six of eight CPs, with a significant reduction in the conversation barrier of test questions (asked despite CP already knowing the answer, usually associated with teacher-student behaviour) seen in four of the six CPs ('Linda', Dyad 3; 'Alex', Dyad 4; 'David', Dyad 5; 'Pamela', Dyad 8). The remaining CPs ('Cath', Dyad 2;

'Louise', Dyad 6) used significantly fewer understanding checks (requests for clarification) after therapy, most likely due to the positive impact of therapy on their husbands' conversations (Simon and Barry respectively).

Table 1: Quantitative conversation changes for Dyads 1 to 8

Preliminary data	Poisson Trend for Frequencies		Trend test for rankable counts	
	z	p	z	p(2-tailed)
DYAD 1				
No of PWA turns	-1.72	n.s.		
No of PWA turns initiations	-3.06	0.0022	2.43	0.0149
Cp responds without need for repair				
Behaviours targeted in therapy				
Facilitators	-1.16	n.s.		
Barriers	-0.58	n.s.		
DYAD 2				
No of PWA turns	2.68	0.0073 2-tailed		
No of PWA turns initiations	2.08	0.0378 2-tailed		
CP responds without need for repair	2	0.0455 2-tailed		
Behaviours targeted in therapy				
No of PWA turns c gesture, writing, drawing	1.57	n.s. trend		
DYAD 3				
No of PWA turns	-0.81	n.s.		
No of PWA turns initiations	-1.85	n.s.		
CP responds without need for repair	-1.91	n.s. trend		
Behaviours targeted in therapy				
No of PWA turns c, writing, drawing	no instances			
CP asks test question	-4.81	0.000 1-tailed	-1.23	n.s.
DYAD 4				
No of PWA turns	-0.22	n.s.		
No of PWA turns initiations	2.65	0.0041 2-tailed		
CP responds without need for repair				
Behaviours targeted in therapy				
No of PWA turns c gesture, writing, drawing	0.00	n.s.		
CP asks test question	-3.46	0.000 1-tailed		

Preliminary data	Poisson Trend for Frequencies		Trend test for rankable counts	
	z	p	z	p(2-tailed)
DYAD 5				
No of PWA turns	-1.15	n.s.		
No of PWA turns initiations	2.45	0.0143 2-tailed	-2.77	0.0057
Cp responds without need for repair				
Behaviours targeted in therapy				
No of PWA turns c gesture, writing, drawing	1.29	n.s.		
CP asks test question	-3.52	0.000 1-tailed		
DYAD 6				
No of PWA turns	1.68	n.s.		
No of PWA turns initiations				
CP responds without need for repair	2.897	0.0038 2-tailed	0.765	n.s.
Behaviours targeted in therapy				
No of PWA turns c gesture, writing, drawing	2.4	0.0082		
CP asks test question	1	n.s.		
DYAD 7				
No of PWA turns	-0.54	n.s.		
No of PWA turns initiations	-0.74	n.s.		
CP responds without need for repair				
Behaviours targeted in therapy				
No of PWA turns c gesture, writing, drawing	-2.47	0.0136 2-tailed [1]	1.13	n.s.
CP asks test question	no instances			
DYAD 8				
No of PWA turns	-1.45	n.s. 2-tailed		
No of PWA turns initiations	-1.41	n.s.		
CP responds without need for repair				
Behaviours targeted in therapy				
No of PWA turns c gesture, writing, drawing	-0.43	n.s.		
CP asks test question	-4.15	0.000 1-tailed	-1.74	0.0406

Discussion

The results demonstrate changes in conversation that are associated with the focus of intervention for one or both speakers (PWA/CP) for seven of eight dyads, with clear implications for the treatment of agrammatism. One factor

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[1]Reduction in strategy use

that may offer an explanation of the differential gains made by PWAs is cognitive ability, particularly problem solving and the ability to shift from one strategy to another in the face of conversation difficulty. The PWA with a significant increase in strategy use on the ACM (Barry) and the PWA whose increase in strategy use was approaching significance (Simon) performed within normal limits ('high average' and 'low average' respectively) on a test of cognitive flexibility, the Brixton Spatial Anticipation Test (Burgess and Shallice, 1997), whereas five of the remaining six PWAs were classified as 'abnormal' or 'impaired' on this test. Since other evidence is beginning to point to the relevance of cognitive flexibility for strategy use in aphasia (e.g. Purdy and Koch, 2006), this area may prove to be important for maximally successful response to conversation training for PWA. We intend to pursue this line of research in future projects.

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The Effect of Direct Speech on Liveliness and Comprehensibility in Individuals with and without Aphasia

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Introduction

In conversation, direct speech (e.g., 'John said: "Gosh! I'm exhausted"') is assumed to constitute a *demonstration* of a reported utterance, whereas its indirect speech counterpart (e.g., 'John said that he was exhausted') provides a *description* of what was said (Clark & Gerrig, 1990). Direct speech constructions are perceived as more vivid and perceptually engaging than their indirect speech counterparts (Wierzbicka, 1974; Macaulay, 1987). This theatrical nature of direct reported speech is argued to be caused by the fact that its deictic center is that of the original event (Mayes, 1990). The distinction between direct and indirect speech exists in many languages and has been a major focus in linguistic studies, including aphasia research.

Several studies have shown that the relatively intact pragmatic (e.g., Hengst et al., 2005; Ulatowska et al., 2010), conceptual (Goodwin, 1995, 2003), and kinesic, prosodic and paralinguistic (Lind, 2002; Wilkinson et al., 2010) resources of aphasic speakers enable them to use direct reported speech. Building on these findings, in a previous study we compared the forms and frequencies of direct speech constructions in elicited speech between aphasic and non-brain-damaged (NBD) speakers. These comparisons showed that aphasic speakers produce more direct speech constructions than NBD individuals. This finding raises questions on the motives for and the effects of this type of construction. So far, no quantitative evidence has been provided for the difference in perceived liveliness between direct and indirect speech. Therefore, we investigated the effects of direct speech constructions on perceived liveliness of speech produced by individuals with and without aphasia. In addition, trying to explain the motives for the frequent use of direct speech by individuals with aphasia, its effect on comprehensibility was investigated.

Methods

Data collection

30 fragments from answers to the standardized questions of the Aachen Aphasia Test (Graetz et al., 1992) produced by aphasic (n=10) and matched

non-brain-damaged speakers (NBD; n=10) were auditorily presented to naive listeners (n=37). Both sets consisted of 5 fragments with direct speech, 5 fragments without direct speech which originated from the same speakers as the fragments containing direct speech, and 5 fragments without direct speech which originated from different speakers. This design enabled us to compare fragments with and without direct speech directly while controlling for individual effects like voice and speaking style. For the evaluation, listeners were asked to give a grade for liveliness (1-10) and evaluate comprehensibility by responding to the following propositions on a 6-point Likert scale: *in general, I can follow the message; I have to make an effort to understand this speaker; this person is able to put his/her thoughts into words well.*

Analysis

Two items of one speaker were not taken into account for the analysis because of poor sound quality. The results for liveliness were compared within and between subgroups and conditions. For the comprehensibility results, the scores were collapsed and analyzed as a single score, since the mutual correlation indicated that the three propositions on comprehensibility reflected a single one-dimensional latent construct (Cronbach's α = 0.8). As a consequence, the new maximum score for comprehensibility was 18.

Results

Paired-samples t-tests were used to assess the effect of type of speaker for both liveliness and comprehensibility. For liveliness, the average scores of the NBD speakers (M=8.0, SD=0.60) were higher than those of the aphasic speakers (M=6.6, SD=0.67); $t(36)=-11.6$, $p=0.00$. As expected, the average scores for comprehensibility of the NBD speakers (M=16.8, SD=0.89) were at ceiling, and higher than those of the aphasic speakers (M=10.4, SD =1.31) as well; $t(36)=33.3$, $p=0.00$. There were no interaction effects between speaker and condition for either liveliness or comprehensibility.

Table 1: Average scores and standard deviations for liveliness and comprehensibility for fragments from NBD and aphasic speakers in direct speech and no direct speech condition.

		Direct speech	No direct speech
Liveliness	NBD speakers	M=8.3, SD=0.64	M=7.8, SD=0.68
	Aphasic speakers	M=6.9, SD=0.83	M=6.4, SD=0.69
Comprehensibility	NBD speakers	M=16.7, SD=1.03	M=16.8, SD=0.91
	Aphasic speakers	M=10.1, SD=1.76	M=10.7, SD=1.35

To compare the scores for liveliness in the direct speech and the no direct speech conditions, paired-samples t-tests were conducted. For the NBD speakers, the

average scores on liveliness were higher for the direct speech condition (*M*=8.3, *SD*=0.64) than for the no direct speech condition (*M*=7.8, *SD* =0.68); *t*(36)=5.48, *p*=0.00. Similarly, for the aphasic speakers the scores were higher in the direct speech condition (*M*=6.9, *SD*=0.83) than in the no direct speech condition (*M*=6.4, *SD*=0.69); *t* (36)=3.83, *p*=0.00.

The aphasic samples with direct speech (*M*=10.1, *SD* =1.76) were not better comprehensible than those without direct speech (*M*=10.7, *SD*=1.35); *t*(36)=-1.96, *p*=0.06.

Discussion

Prior studies indicated that the use of direct speech contributes to the perceived liveliness of speech (Wierzbicka, 1974; Macaulay, 1987; Mayes, 1990). The current study provides support for these observations: fragments containing direct speech received a higher grade for liveliness than fragments without direct speech which originate from the same speakers. Since the main difference between these two conditions is the occurrence of direct speech, possible interference effects caused by different speaking styles such as voice and speaking manner were avoided. Importantly, the positive effect of direct speech on liveliness was found for both NBD and aphasic speakers. Direct speech did not contribute to the comprehensibility of speech. This means that it is unclear why aphasic speakers frequently use direct speech: should it be interpreted as a strategy to mask word finding and/or grammatical difficulties or should the absence of direct speech be read as an inability to use it? An experimental study on the effect of direct speech constructions on comprehensibility of aphasic speech using long stretches of talk rather than short fragments may provide answers to these questions.

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Assessment and Treatment of Adjectives with Emotional Connotations: A Single Case Study

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Introduction

Word retrieval difficulties (anomia) are known to be the most common and persistent symptoms in aphasia. However, most evidence of word retrieval difficulties and their treatment comes from studies that have examined word retrieval in concrete categories including for example objects, actions, and animals. Other word classes, such as adjectives and adverbs, differ in critical ways from concrete nouns and verbs, having different and often more complex grammatical properties, and more abstract meanings. The aim of this study was to extend anomia treatment into a new and more abstract group of words, namely adjectives with emotional connotations.

Adjectives with emotional connotations are words related to expressing people's mental states and feelings, such as 'happy', 'ecstatic', 'sad', and 'intimidated'. These words are also often used to make evaluations and express opinions in everyday conversations as in "Wasn't it beautiful/awful" and "Didn't she look happy/sad". There is some prior research showing that the use of evaluative language in general is compromised in aphasic monologues (Armstrong & Ulatowska, 2007). There is also some evidence that people with aphasia have restricted abilities to produce evaluative verbs as part of narratives (Armstrong, 2005). It is our aim here to provide some preliminary data which aims to facilitate further research in this field. First, we will describe novel measures that were created in order to assess production of adjectives with emotional connotations. Then, we will describe our first attempt to treat word retrieval of these 'emotional words' in a person with aphasia.

Methods

Development of new measures

First, we created or extended (in the case of task number three, see below) four tasks and collected normative data from 20 university students. Three of the tasks were word-generation tasks in which people were asked to produce as many labels as possible in a given time-limit for:

1) a set of 35 photocards selected from Emotion ColorCards© (Speechmark);
2) a set of 12 photographs of facial expressions (from the Karolinska Directed Emotional Faces; KDEF) which aim to depict six basic emotions including happy, sad, surprised, angry, fearful, and disgusted (two of each expression);
3) seven categories extending the commonly used semantic word-fluency category – animals – with six less often used categories including those aiming to prompt abstract words, namely countries, colours, religions, emotions, personal traits, and sensations (inspired by Franklin & Howard, 1995).
The fourth task was created to tap production of adjectives with emotional connotations in connected speech. We used 10 picture cards from Social Behaviour ColorCards© (Speechmark) and asked participants to describe using sentences what was happening and how people in these cards were feeling. Based on the normative data, we selected 24 pictures from the set of 35 Emotion ColorCards (task 1) to be used as stimuli in the subsequent treatment study. In addition, all of the above-mentioned tasks (1-4) were used as outcome measures in the study.

Single-case treatment study

The participant of our treatment study (GEC) was a 66-year-old man who presented with moderate word retrieval difficulty. He had suffered from a left middle cerebral artery infarction three years prior to the treatment. Before treatment, he underwent a comprehensive assessment of his language skills. Background testing was followed by a stimulus selection and baseline phase (10 weeks) including 3-4 pre-treatment baseline probes for the four newly developed language tasks. Treatment was then provided for two weeks and used 12 pictures depicting 'positive' emotions. This was followed by a one-week break with within-treatment assessment and then two weeks of treatment with 12 pictures depicting 'negative' emotions. Finally, there were two post treatment assessments, one immediately after and one nine weeks after the treatment. In order to track the possible improvement in naming, we also conducted two naming probe sessions after the first week of practice for both positive and negative items. The treatment comprised self-paced home-practice and weekly meetings with a clinician. The treatment method consisted of repeating three selected target words, one at a time, in the presence of a corresponding picture that was shown on a computer screen. There were altogether 24 pictures and 73 target words used in the treatment.

Results

The results show statistically significant improvement in producing treated items (task 1) in both sets (Mann's test for trend: positive items, $t(11)=2.09$, $p=0.03$; negative items, $t(11)=3.42$, $p=0.003$). As illustrated in Figure 1, significant results were also observed when all positive and negative adjectival

labels (including names of practised items and all other labels that could be considered acceptable labels of the pictures) were included in the analyses (Wilcoxon matched pairs test, two tailed: positive items, z=2.75, p=0.006; negative items z=2.25, p=0.024). No significant improvement was observed in the other word- and discourse-level tasks (tasks 2-4).
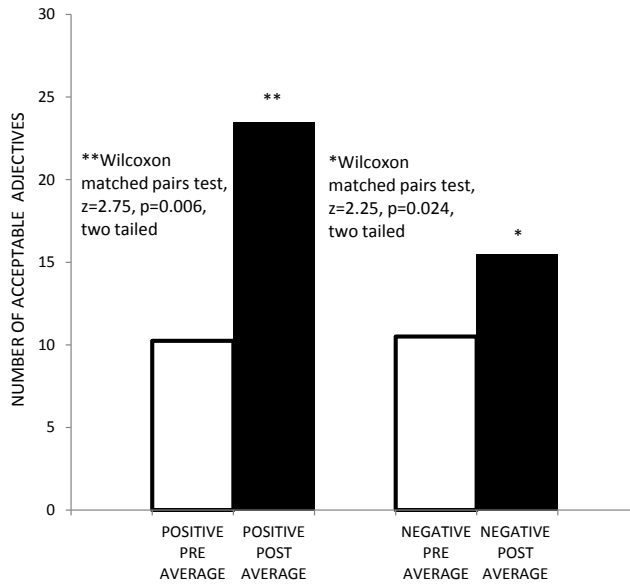
Figure 1: Average number of unique positive and negative adjectival labels produced (in task 1) by the aphasic participant ('GEC') before and after the treatment. The pre-treatment scores were retrieved from the naming measurements preceding the treatment of the same set of items (i.e. four measurements for positive items and six measurements for negative items). For the post-treatment scores, we used two measurements; the one administered right after the treatment of the same items and the next one administered a week later.

Discussion

This is the first study to create specific measures and treat production of adjectives with emotional connotations in aphasia. The results bring preliminary evidence that it is possible to improve production of these abstract words at least in the short-term. Importantly, treatment does not seem to only improve the production of treated items but also other words with slightly different connotations indicating possible generalisation across items.

However, these positive effects were mainly restricted to production when prompted by the pictures used in the treatment. Thus, even after the treatment, the participant showed a persistent tendency to use two opposites, 'good' and 'not good' marking all positive feelings as 'good' and all negative feelings as 'not good'. Furthermore, while in word-generation tasks, GEC was sometimes able to produce some morphologically complex and relatively low-frequency items, most of the same items were never encountered in his connected speech. In our presentation, we will address some of the complex challenges we have come up against in attempting to tackle the issue of extending anomia treatment to yet unexplored categories of words. We will conclude, however, that treatment of abstract words could and should be incorporated in the clinical practice.

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The Karolinska Directed Emotional Faces (KDEF), CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institutet.

Interaction between Central and Peripheral Processes in Handwritten Word Production: Insights from two ERP Experiments

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Introduction

Case studies from patients with agraphia have permitted to know more about the main processes involved in written language production. Models of handwritten language production that have been then described make a distinction between central (access to semantic, orthographic and phonological information) and peripheral (allographic and gesture planning) processes (see for instance van Galen, 1991; Rapp, 2002). Though, this is still a matter of debate whether these central and peripheral modules are processed in a cascaded or in a serial way. In this study, we aimed at contributing to this debate using the ERP methodology in order to be able to determine when and how peripheral processes might interact with central stages. In this view, we choose to conduct the same experiments with handwritten and oral response modalities in two different tasks. The Stroop color-word paradigm (Stroop, 1935) and a picture-word interference paradigm (Meyer & Schriefers, 1991) were chosen. They stand for appropriate models to investigate automatic language production both at the lexical/lemma and output levels (MacLeod, 1991)

Methods

Population

16 healthy right-handed subjects were recruited (mean age 25 years old). The same subjects performed both tasks.

Stroop task

Two different response types (oral or hand-written) and two different sub-tasks were used: the experimental tasks where the subjects had to name (speaking or writing) the color of the ink of a color-word (color processing) and the control tasks where the subject had to read/copy the color-word (word processing). The same stimuli were used in all the tasks and were either congruent (same

ink/name color) or incongruent (different ink/name color). Reaction time (RT) was recorded for both response types using Presentation softwareR (via a microphone for the oral response and a digitalized tablet for the handwritten response).

Picture naming task

The subjects had to name (oral or handwritten modality) the picture under which a distracter name was displayed (three conditions: expected label 'banana', correct phonology/incorrect spelling 'bananna', incorrect phonology/incorrect spelling 'bamana'). As in the Stroop task, RT was recorded.

EEG recordings and data analysis

Event Related Potentials (ERPs) were obtained from a 64 electrodes cap with a BiosemiR amplifier. Statistical analyses of ERPs were conducted on the mean amplitude on a medial line (Fz, FCz, Cz, CPz, Pz and POz) and on three groups of 6 frontal, central and posterior electrodes for each hemisphere (eg. on the frontal left position; F5, F3, F1, FC5, FC3 and FC1). For the Stroop tasks, we conducted ANOVAs on the mean amplitude from 50ms time windows from 300 to 600ms (as in Liotti et al., 2000). For the picture naming task, we conducted ANOVAs on P1 [70-130ms], N1 [130-200ms] components and, according to Indefrey & Levelt (2004), on [200-400ms] and [400-600ms] time windows respectively supposed to reflect lexical processing and syllabic/articulatory encoding.

Results

Behavioural results

The Stroop interference effect was observed in both response modalities as was a facilitation effect in naming a picture when the distracter was the expected label. In the latter task, handwritten response was about 100 ms longer than oral response.

ERP results

In the Stroop color-processing task, ERPs results showed a significant difference between the incongruent and congruent conditions mainly from 450 to 550 ms for both response modalities. Though we observed a difference in the topography of the effect; central and posterior for the oral modality; frontal and localized in the left hemisphere for the written modality.

In the picture naming task, no condition effect was observed for the oral modality. In the handwritten response modality, the condition factor was significant in the late window [400-600 ms] with an interaction with brain

topography, the behavioural effect being replicated specifically in the frontal left area.

Discussion

Considering the oral response Stroop task, we obtained partly concordant results with Liotti et al. (Liotti, et al., 2000) with a color-word interference effect that occurred at medial sites around 400ms. They have also put forward different scalp topography depending on the response type. In this study we used manual verbal response. The lateralization of scalp topography in handwritten response is obviously due to the lateralized motor response (Perret & Laganaro, 2011). Observing an interaction between gesture preparation and central processes could support the view that peripheral processing start before lexical and orthographic selection ends (Delattre et al., 2006). Our results suggest that gesture planning affects written language processing and that the different stages involved in handwriting are processed in a cascaded way. Methodological issues and links with written language production impairments will be discussed.

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Evaluating Evaluative Morphology in Broca's Aphasia - An Italian Case Study

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Introduction

Evaluative Morphology (henceforth: EM), which prototypically includes diminutive, augmentative, endearing and pejorative morphemes, has been investigated in details in contemporary linguistic theory (Scalise 1984; Anderson 1992; Stump 1993; Bauer 1997; Cinque 2006). Nevertheless, in the neurolinguistic literature, to our knowledge, there are no previous attempts to systematically analyze possible deficits, specifically concerning EM in agrammatic speakers, or more generally, in aphasic populations. The aim of this study is properly to investigate EM in an Italian agrammatic Broca's aphasic. Scalise (1984) argued that Italian EM should be considered as a specific type of process, independent from both inflection and derivation, according to a set of peculiar features. For instance: (i) EM applies to different categories (nouns, adjectives, adverbs), without changing the category of the items involved in the process (e.g. $[fungo]_N \rightarrow [funghetto]_{N.endear}$, *mushroom*); (ii) EM can apply more than once to the a single lexical unit (e.g. $[orso]_N \rightarrow [orsetto]_{N.Endear} \rightarrow [orsettino]_{N.Endear.Dim}$, *bear*); (iii) EM usually does not alter the morpho-syntactic properties and/or the subcategorisation skeleton of the words it applies to (e.g. $[borsa]_{N[-abstract]} \rightarrow [borsone]_{N.Aug[-abstract]}$, *bag*). Further descriptive evidence for considering EM an independent process (an autonomous morphological *sub-component*) can be the following: in Italian, it standardly occurs between derivational & inflectional morphology (e.g. $[port_{Stem}\text{-}ier_{Der}\text{-}on_{EM}\text{-}e_{Infl}]_{N.Aug}$, *big/brave/good goalkeeper* from porta, *door*). Recently, Cinque (2006; 2011), basing its analysis on a comprehensive typological survey, argued that EM is associated to the presence of a dedicated functional architecture within an extended projection. *Positional* data - in accordance to Baker's (1985; 1988) *Mirror Principle*- provide evidence for a (partial) layered structure of this kind, e.g. for the noun phrase: $[DP...[Aug/DimP[ENDEAR/PejP...[NP]]]]$ (e.g. $[orso]_N \rightarrow [orsetto]_{N.Endear} \rightarrow [orsettino]_{N.Endear.Dim}$, but $*[orsinetto]_{N.Dim.Endear.}$, *bear*).

Methods

Participant

Our patient (SM) is a 56-year-old right-handed male with 10 years of education, who suffered of a hemorrhagic stroke in February 2011. He was diagnosed

with mild Broca's Aphasia on the basis of standard tests (e.g. AAT).

Stimuli

The stimuli consisted in: (A) a set of 250 words, comprising 180 items (nouns, adjectives and adverbs) with evaluative suffixes (30 of them apply more than once to the same lexical stem, e.g. [canzonettina] $_{N.Endear.Dim}$, *song*; [omaccione]$_{N.Pej.Aug}$, *man*, and 15 of them show evaluative prefixes, e.g. [super$_{Aug}$potenza]$_{N.Aug}$, *superpower*) and 70 items used here as distracters, consisting of words terminating with segments which, in principle, could signal plausible evaluative suffixes ([mulino]$_N$, *mill*, *vs.* [mulo]$_N$ → #[*mulino*]$_{N.Dim}$, *mule* or [merletto]$_N$, *lace*, *vs* .[merlo]$_N$ → [merletto]$_{N.Endear}$ *blackbird*); (B) a set of 50 words, consisting of 30 verbs with evaluative affixes (Bertinetto 2004) in the infinite form (e.g. cant$_{Stem}$ -icchi$_{EM}$-are, *to sing softly*) intermixed by 20 verbs in the infinite form which do not display markers of EM. The tasks were *Repetition* and *Writing*. The variables considered in our experiment were length, frequency and neighbourhood size. Frequencies of the *Stimuli* were collected from COLFIS (Bertinetto et al. 2005), a digital corpus of written Italian (http://www.ge.ilc.cnr.it/). Nouns, adverbs and adjectives have been included all together in the set (A) because commonly they share the same evaluative markers (e.g. [orsino]$_{N.Dim}$, *bear* ; [pochino]$_{Adv.Dim}$, *little* [giallino]$_{Adj.Dim}$, *yellow*).

Results

In the repetition task, SM performed very well and made only 2/250 errors with items of set (A) and 3/50 errors with verbs of set (B). The general performance with verbs is significantly worse than with other categories (3/50 *vs.* 2/250 [$\chi^2(1)$=6.4; p=.0112]), but neither verbs bearing an evaluative affix nor items in the set (A) are significantly more impaired with EM than with distracter (for verbs 2/30 *vs.* 1/20 [$\chi^2(1)$=.05; p =.8186]; for nouns, adjective and adverbs 2/180 *vs.* 0/70 [$\chi^2(1)$=.8; p=.3786]). In the writing task, unfortunately, SM in general performed extremely poorly, with only 2/50 [4%] correct answers with verbs and 39/250 [15.6%] correct answers with the words of set (A). Again, these data confirmed that there are no significant traces for a specific deterioration of SM's performance with words bearing evaluative markers (for the task (A) 157/180 errors with EM *vs.* 54/70 error with distracters [$\chi^2(1)$ = .3; p= .5614]; for the task (B) 29/30 errors with verbs bearing EM features *vs.* 19/20 errors with distracters [$\chi^2(1)$=.002; p=.9664].

Discussion

Our results show that, on the basis of our tests, it has not been possible to detect a (even minimal) specific deficit for evaluative morphology in an agrammatic Broca's aphasic speaker. Interestingly, if we compare our data

with previous results from another experiment with SM, it emerges that, in repetition, words bearing EM markers are significantly more preserved that other morphological units manifestly encompassing a functional skeleton, such as Italian (*head*)Noun-Preposition-(*dependant*)Noun (N-P-N) compounds (e.g. coda di cavallo, *horse-tail*): SM made only 2/180 errors with items bearing EM in the task (A) *vs.* 47/154 errors with N-P-N compounds(see also Mondini et al. 2005), where SM's untargeted responses were almost invariantly represented by the omission or -less frequently- the substitution of the functional preposition involved [χ^2 (1)=42.513 p <.0001)]. This fact seems to weaken a syntactic approach *a la* Cinque to EM, where evaluative markers are treated as (ordered) functional heads within an extended projection. Our data -given the fact that agrammatic speakers are standardly assumed to be impaired with the production of (free and bound) morpho-syntactic functional items (Berndt & Caramazza 1980; Caplan, 1985; Miceli et al. 1989; Grodzinsky 1990; Friedmann & Grodzinsky 1997, among many others)- can be interpreted as strongly enforcing (against expectations) a *lexicalist* account for words bearing evaluative features, namely items with evaluative suffixes appears to be stored in the Lexicon and not morpho-syntactically derived. However, if we adopt a *tree pruning* model *a la* Friedmann & Grodzinsky (1997) and we *broadly* apply it to extended projections (of nouns, verbs, etc.), in principle, we may argue that the *mild* agrammatic deficit of SM spares evaluative heads, which, can be assumed to be structurally low and quite close to the *host* of an extended projection (hence, requiring only a relatively effortless movement). Nonetheless, a lexicalist account seems to be more natural/ecological given the results of our case study. A population experiment is necessary to enhance our findings, but this work is by itself a *probe* for investigating EM in Broca's Aphasia.

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Left Brain Damage And Memory Deficits: Does Aphasia Play a Role?

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Introduction

Memory deficits in aphasia have been reported in several studies (e.g. Laures-Gore, Marshall, & Verner, 2011; Beeson, Bayles, Rubens, & Kaszniak, 1993). Nevertheless, it has been suggested that these deficits are not due to the presence of aphasia, but rather to the left hemisphere lesion per se (Burgio and Basso, 1997). We investigated this hypothesis, and we are discussing memory impairments in the context of aphasia and left hemisphere lesions in general.

Methods

Participants

64 (14 women) aphasic patients and 15 (8 women) non-aphasic patients with left hemisphere lesion participated in this study. Mean age for the two groups was 60.19 (SD: 14.44) and 57.93 (SD: 11.04) years respectively. CT and/or MRI scans were obtained for 61 patients (50 aphasics) and lesion sites were identified by two independent neuroradiologists. Severe fluency and/or comprehension deficits could lead to falsely low scores in memory span tasks. In order to avoid such a confounding, patients with severe language deficits were excluded, before conducting the statistical analyses. For digit span forward and backward, patients who could not repeat at least one 2-syllable word (of the BDAE-SF word repetition subtest) or lacked the ability to execute a simple, one-item command (from the BDAE-SF sentence comprehension subtest) were excluded. Thus, 49 patients (11 women), 24-84 years old (mean: 59.80; SD: 15.21), were finally included in the analyses regarding digit span forward and backward. For the Corsi block-tapping task, since a verbal response is not required, only patients who could not execute a simple, one-item command (from the BDAE-SF sentence comprehension subtest) were excluded. In this case, 54 patients (12 women), 24-84 years old (mean: 60.15; SD: 14.75) were finally included in the analyses regarding Corsi block-tapping task.

Materials

Aphasia was assessed using the BDAE-short form. Memory span was tested in verbal and spatial modality through WAIS-III digits forward and backward, and the Corsi block-tapping task respectively.

Results

Product scores (span length * span score) were first calculated separately for forward and backward digit span, and forward and backward spatial span, based on performance on WAIS-III verbal span tasks and the Corsi block-tapping task respectively. Then a critical value was set for each of the four product scores on the basis of normative data by Kessels, van den Berg, Ruis, and Brands (2008), where mean performances for 246 healthy older adults were presented. One sample t-tests revealed lower than expected performance on all four memory tasks for the aphasic [critical value for forward digit span product score: 50 ($t = -15.994$, $p < 0.001$), critical value for backward digit span product score: 26 ($t = -15.851$, $p < 0.001$), critical value for spatial forward span product score: 38 ($t = -3.440$, $p < 0.01$), critical value for backward spatial span product score: 38 ($t = -8.793$, $p < 0.001$)], but not for the non-aphasic group [critical value for forward digit span product score: 50 ($t = -2.047$, $p = .060$), critical value for backward digit span product score: 26 ($t = -1.846$, $p = .086$), critical value for spatial forward span product score: 38 ($t = .501$, $p = .624$), critical value for backward spatial span product score: 38 ($t = -.723$, $p = .482$)]. Moreover, independent sample t-tests, revealed significant differences regarding performance on all memory tasks between the two groups (forward digit span product score: $t = -4.029$, $p < .01$, backward digit span product score: $t = -3.318$, $p < .01$, spatial forward span product score: $t = -2.408$, $p < .05$, backward spatial span product score: $t = -3.519$, $p < .01$). Lesions were defined as posterior, anterior, deep, and global, based on the criteria used by Basso and Burgio (1997). Since patients with deep lesions were very few (3 aphasics and three non-aphasics), they were excluded from the following analysis. For the entire sample, comparison of the three lesion groups using the non-parametric Kruskal-Wallis test did not reveal any statistically significant differences. The same result was obtained when we compared the three groups, including only aphasic patients in the analysis.

Discussion

The present data show that aphasic patients do demonstrate memory deficits, not specific to verbal modality. This is in accordance with numerous previous studies reporting verbal (e.g. Laures-Gore, Marshall, & Verner, 2011) but also spatial (e.g. Martin & Ayala, 2004) memory deficits in aphasia. Moreover, our results contradict the notion that memory impairment is not due to the

presence of aphasia, but rather to lesion in the left hemisphere per se. One possible explanation of this finding could rely on the selection of patients. Burgio and Basso (1997) included only mild aphasics in their study. In contrast, our inclusion criteria were wider, thus including patients with more severe language deficits. Since aphasia severity is reported to be correlated with severity of memory impairment (Potagas, Kasselimis, and Evdokimidis, 2011), it could be the case that only moderate to severe aphasia is accompanied with evident memory deficits. However, such selection criteria pose great limitations concerning testing, since more sophisticated neuropsychological batteries for memory cannot be administrated to patients with severe language disturbance. Finally, analyses showed that memory impairment did not differ between patients with anterior, posterior, and extensive perisylvian lesions. This finding is consistent with the results of Burgio and Basso (1997). Overall our study suggests that memory deficits in patients with left hemisphere lesions are possibly dependent on the presence of aphasia, but not on lesion location.

Acknowledgements

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Episodes of Transient Language Impairments During Hypoglycemia in a Trilingual Individual with Type 1 Diabetes

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Introduction

Hypoglycemia can induce different symptoms such as dizziness, sweat, loss of balance, doubled or blurred vision, palpitation, hemiparesis, and some cognitive disorders concerning memory and language (Kodl & Seaquist, 2008; Malouf & Brust, 1985). These symptoms are intra- and interindividually variable, and the symptomatology of hypoglycemia is unpredictable, i.e. the duration of hypoglycemia and the rate of glycemic changes are hardly determinable. Moreover, some patients suffering from hypoglycemia are thought to have had strokes (Malouf & Brust, 1985). The purpose of our study is to observe and analyze possible language impairments during hypoglycemia and their patterns in order to provide patients, their families and medical staff with better information on hypoglycemic symptoms to prevent misunderstandings that might cause more serious problems such as coma or death.

Methods

Participant

A 24 year-old woman diagnosed with type 1 diabetes at the age of 10 was tested. Her diabetes had been very well controlled with 5.8%-6% of HbA_1C. No complication was reported. The participant was mixed handed and trilingual in Korean (L1), English (L2), and French (L3) that were sequentially acquired. The rate of language use was very high (L3), moderate (L2), and low (L1). She had moderate hypoglycemia every two or three days and severe hypoglycemia twice or three times a month. No neurological problem was observed by magnetic resonance imaging (MRI) and sleep deprivation electroencephalogram (EEG).

Method

The participant was asked to carry out two tasks to examine both induced and spontaneous language production during hypoglycemia: reading aloud

and narrative discourse tests. A short text from MT 86 (Protocole Montréal-Toulouse d'examen linguistique de l'aphasie) was used for the reading aloud test. The little mermaid was chosen for the narrative discourse test. The participant carried out the two tasks once in a euglycemic state as a reference before undertaking them four times at 3-week intervals at least.

Results

Each recording presented different types of errors. Speech rate was normal, very slow, very fast, or irregular. Change in speech rate between two tasks was observed in every sequence, i.e. rate decreased in the narrative discourse tasks. The most frequent types of errors in both tasks were vowel lengthening and misplaced pauses. In one of the reading aloud test sequences, consonant devoicing (/d/→[t]: 4 in 6; /b/→[p]: 1 in 6) was noticed. The participant used filled pauses and repetition in all narrative discourses. Some grammatical errors were also observed. The most particular "error" in her utterances was a mixture of three languages (L1, L2 and L3). She replaced a French word (L3) with an English word (L2), e.g. *mermaid* for *sirène*. Some sentences were syntactically misformulated, i.e. S-O-V (Korean (L1) syntax), followed by autocorrections.

Discussion

The primary aim of this study was to observe and analyze possible language impairments during hypoglycemia in a trilingual individual with type 1 diabetes. Different types of transient language impairments were observed and some outcomes showed hypoglycemic symptoms changed even between 2 tasks in the same sequence, which confirms intra-individual variations.

During the four reading aloud tasks, the participant made three recurrent errors consisting of vowel lengthening, consonant devoicing, and misplaced pauses whereas no error was observed in the two tasks carried out in a euglycemic state. Vowel lengthening is a filled pause that allows the speaker to gain time (Maclay & Osgood, 1959). Misplaced pauses could demonstrate either the participant's difficulty reading a sentence/text in its entirety or her reading without deciphering the text. Considering the two "errors" observed at the same time, the former explanation would be more plausible. As to consonant devoicing, the phenomenon was not steady and it did not occur in other phonemes such as /v/ or /g/. It could be then argued that these errors would possibly be phonemic substitutions rather than a phonetic deficit or both (Nespoulous, 1990).

Three of the four recurrent types of errors in the four narrative discourse tasks pertained to a strategy to gain time: vowel lengthening, filled pauses, and repetition. In view of the feature of this task, it could be argued that the participant "naturally" used these strategies when searching for words or

recalling the story. The forth type of error is a mixture of three languages that could emanate from a pragmatic disorder/a problem of inhibition (Green, 1986, 1998) or an attempt to use all available language codes to make up for linguistic deficits in all the languages that the patient had acquired (Ijalba, Obler, & Chengappa, 2004). In our study, the word substitution was not recurrent and some other grammatical errors were observed at once. Therefore, it could be considered that the participant had difficulties accessing lexicon and her capacity for syntactic organization (in French) was momentarily disrupted. This strengthens the latter explanation that the participant may have had recourse to compensate for linguistic deficits.

Even though this case study could show some evidence on language impairments during hypoglycemia, it would be necessary to carry out further studies in order to better understand the variability of symptoms and better understand how different language systems are organized and react to cerebral disturbance in bilinguals or polyglots.

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Measuring the Effect of Naming Therapy

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Introduction

Anomia is a common characteristic of aphasia. Its remedial treatment takes up a large place in the language therapy for individuals with aphasia. The treatment of word-finding disorders in aphasic patients is effective, but improvement often only concerns the trained words (Nickels, 2002; Wisenburn & Mahoney, 2009).

Nevertheless, the measurement of treatment effects is of great importance. Without a standardized test it remains unsure whether progress is due solely to a retest effect or goes beyond such an effect. The aim of this study is to measure the progress of an aphasic patient in confrontation naming compared to the progress of a control sample consisting of a healthy and an aphasic subgroup.

Method

Material

180 pictures (black and white line drawings) from the database of Bonin et al. (2003) with a name agreement of over 75% were selected. More then 50% of these items are based on low frequency words.

Control sample

In general, a control sample contains only healthy individuals. In order to measure the progress of aphasic patients, chronic aphasic patients were also included in the control sample. It comprised 30 healthy persons (48 to 67 years old) and 21 aphasic patients (51 to 81 years old). All subjects were native French speakers. With the exception of four subjects, all were monolingual.

Procedure

The 180 pictures were submitted to the subjects of the control sample in randomized order. After an average of 41 days, the same individuals were tested again.

Data analysis

The data was processed by a regression analysis (Crawford and Garthwaite, 2007, 612). These authors present formulas to compare the progress of an individual with that of a small-sized control sample. Thus, the regression of

the posttest results is calculated as a function of the pretest results. If the results of a new patient exceed the upper confidence limits, he or she shows a significant improvement. If the results fall below the lower confidence limits, he or she shows a significant deterioration.

Results

The method was applied to values (correct responses) between 50 and 167. The results can be obtained from the following correlogram.
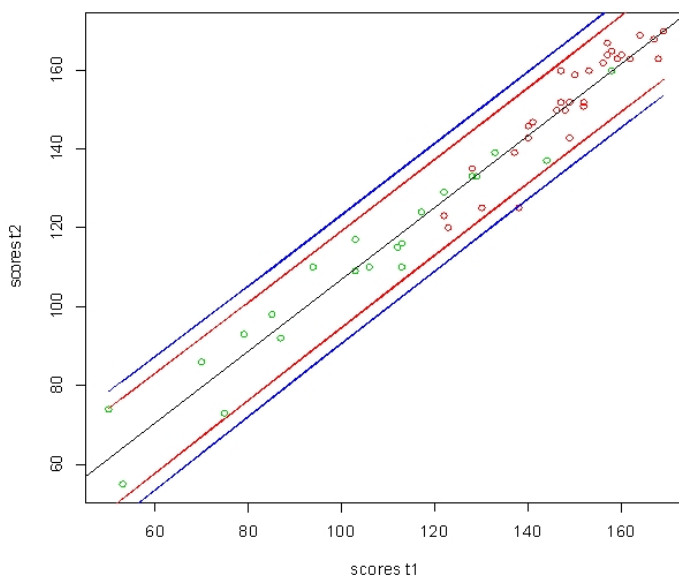
Figure 1: Correlogram of the pre-test scores (t1) x post-test scores (t2), green circles: aphasic subjects, red circles: control subjects, black line: regression line, red lines: 5% confidence limits, blue lines: 1% confidence limits.

For example, if a patient has achieved a score of 60 in the pre-test and a score of 83 or more in the post-test, then this points to a significant improvement on the 5% significance level. If the same patient had achieved a score of 58 or less in the post-test, this would indicate a significant deterioration on the 5% significant level. An improvement on the 1% significance level is reached at 87 or more correct answers in the post-test; a deterioration at 54 or fewer correct answers.

Conclusion

We drew up a test for confrontation naming. Since this test includes a high percentage of low frequency words and a large number of items, it should be used for subjects with moderate anomia. Comparing the results at different times, i.e. pre- and posttherapy, improvement or deterioration of naming performance can be shown. The results will be discussed in the poster presentation.

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Transient Mutism Following Right Hemisphere Cerebrovascular Accident: A Case Study

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Introduction

Mutism, defined as inability to speak, may be observed following bilateral damage to the anterior cingulate, anterior limb of the internal capsule, diencephalon and anterior insula (Dyukova et al., 2010; Foix et al., 1926; Mariani et al., 1980; Duffy, 2005), as well as after unilateral damage to the dominant hemisphere (Dyukova et al., 2010; Duffy, 2005). However, few studies have reported mutism following damage to the non-dominant hemisphere (1; Chaudhuri et al., 1999; Starkstein et al., 1988), and these usually included areas of the parietal lobe and posterior insula (Chaudhuri et al., 1999; Starkstein et al., 1988). We present a clinical case of transient mutism after a right hemisphere cerebrovascular accident (CVA).

Methods

A.S., a 49 year old, right-handed woman suffered a right hemisphere CVA. Damage extended from mid temporal gyrus and supramarginal gyrus to the parietal operculum, including the posterior part of the upper temporal gyrus, transverse temporal gyrus and posterior insula. Speech was examined using Boston Diagnostic Aphasia Examination, short form (Tsapkini et al., 2010) while Edinburgh Handedness scale was used to assess handedness.

Results

During acute phase, clinical picture included mutism and loss of ability to write, while understanding of oral and written language was preserved. Ten days after CVA, the ability to write recovered and thirteen days later A.S. was able to speak, though with speech characterized by dysarthria and phonemic paraphasias. One year later, significant improvement is observed. Oral speech is characterized by normal flow, length of sentences, use of grammar, oral and written comprehension, though some dysarthric and paraphasic symptoms are still present.

Discussion

The presence of mutism after right stroke is extremely rare (Dyukova et al., 2010). Diaschisis or impaired modulation of left hemispheric function due to right hemisphere CVA is proposed as a possible explanation for this transient appearance of mutism. However, since this phenomenon has rarely been described in right-handers, an increased involvement of the right hemisphere in A.S.'s language functions is considered. Additionally, paraphasic symptoms have been previously related to left inferior parietal lesions as well as lesions of the arcuate fasciculus in right-handers (Maldonado et al., 2011) while in left-handers, paraphasias have been observed after right inferior parietal and posterosuperior arcuate fasciculus lesions (Duffau et al., 2008). In our patient this correspondence is reversed. Finally, the inclusion of the right posterior insular cortex in the affected areas could also explain the remaining dysarthric symptoms, since unilateral lesions in these sites of both left and right hemisphere have been related in the past with the occurrence of dysarthria in right handed patients (Baier et al., 2011). The present case underlines the significance of areas such as posterior insula and certain temporoparietal areas on phonation, speech articulation, and higher coordination of speech functions.

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Clustering, Switching, and Time Course Analyses of Verbal Fluency Tasks in People with Right Hemisphere Damage

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Introduction

In the context of ongoing debates on the disputed role of right hemisphere in lexico-semantic processing, we investigated the clustering, switching, and time-course of lexical retrieval in right hemisphere damage (PwRHD). "Clustering refers to the production of words within the semantic or phonemic subcategories and switching refers to the ability to shift between the clusters" (Troyer, Moscovitch, & Winocur, 1997, p. 140). Time course analysis permits variation in retrieval process with passage of time. Previously, Beausoleil, Fortin, Le Blanc, and Joanette (2003) investigated the time course of lexical retrieval in people with RHD and reported that their subjects retrieved the most words at the beginning of the trial, a pattern similar to that exhibited by people with left hemisphere damage and non-brain damaged groups of their study. However, the clustering and switching remain to be investigated in people with right hemisphere damage.

Methods

A group of 22 subjects with CT/MRI-evidenced lesion in the right hemisphere cortical areas were selected to the clinical group. An equal number of age, gender, and literacy matched normal participants served as a control group. All participants were required to retrieve as many names as possible from eight semantic categories (animals, vegetable, birds, fruits, vehicle, clothes, furniture, & verbs (concrete actions words)) and three phoneme categories (*p*, *a*, & *s*) within 60 seconds. The audio-recorded responses were orthographically transcribed by three speech-language pathologists. A score of one (1) was provided to each accurate response and zero (0) to each inaccurate response. The transcribed data was analyzed for clusters, switches, and the time course of lexical retrieval. For the analysis of clusters and switches, the guidelines set forth by Troyer et al. (1997) were used. To analyze the time course of lexical retrieval, the 60 second response time was divided into four 15 second quarters and the number of accurate responses under each quarter was calculated.

Results

The between-group comparisons were performed using a paired *t* -test. The RHD group obtained significantly lower accurate scores compared to the control group under semantic (p < 0.001) and phonemic (p < 0.05) conditions. However, the RHD subjects showed significantly small cluster size only in the semantic condition (p < 0.05), not in phonemic condition (p > 0.05). Further, the clinical and control groups did not differ in terms of the number of switches under both the tasks. The time course of lexical retrieval was compared between the two groups across four time quadrants using repeated measures ANOVA under the semantic and phonemic criteria. Under the semantic criterion, the comparison of scores showed a significant main effect for the groups (F (3, 126) = 469.99, p < 0.001) (η^2 = .918), but not for the interaction between the groups and time quadrants (p > 0.5). Similarly, the phonemic condition showed a significant main effect only for the groups (F (3, 126) = 291.64, p < 0.001) (η^2 = .874), but not for the interaction between the groups and time quadrants (p > 0.5).

Discussion

The comparison of accurate scores contradicted the previous findings that subjects with RHD perform poorly in the semantic, but not in the phonemic criterion (Joanette & Goulet, 1986). Impaired performance on phoneme fluency task, in turn, supported the findings from several other investigations (e.gs., Adamovich & Henderson, 1984; Albert & Sandson, 1986; Bolter, Long, & Wagner, 1983). Analysis of clusters revealed that the clinical group showed significantly smaller mean cluster size compared to the control group. Considering the assumption behind clustering in verbal fluency tasks that it involves accessing and using a word store (Chertkow & Bub, 1990; Wixted & Rohrer, 1994), the reduced number of clusters in PwRHD could be taken as an evidence for their impaired access and retrieval of category exemplars from the semantic store. The results from the analysis of switches revealed that the cognitive strategies of word retrieval did not differ between the two groups. Finally, the absence of interaction between the group and time quadrants in the time course of lexical retrieval reveals that, the two groups showed a similar pattern of word retrieval across the time quadrants. Thus, the present study showed that subjects with RHD exhibited impaired word retrieval. Further, it showed that the impaired performance was not associated with any cognitive strategies employed in the word retrieval process.

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Conceptualisation in Language Production: An Investigation Using Event-Related Potentials

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Introduction

The experiments described below deal with conceptualisation processes, being the first stage in language production. Levelt (1989, 1999) assumes two successive steps which take place when putting thoughts into words: during macroplanning, the speaker decides what needs to be conceptualised. Furthermore, he has to decide in which order events are sequenced. One principle that is described is natural order. Subjects prefer to describe events in their natural, thus chronological order. A sentence such as "After she married, she moved away", follows chronology; whereas in "Before she moved away, she married", temporal order is reversed. Another principle that has been identified is the amount of information speakers tend to give in descriptions.

During microplanning more linguistic constructions are done. Both steps may partly overlap in time. In addition to the question of what stages can be distinguished in language production, it is interesting to know when different types of information become available and thus shedding light on the processes being involved. Event-related potentials (ERPs) are considered to be a sensitive tool to unfold temporal aspects in neural processes in real time.

For language production it was shown that that syntactic information precedes phonological information (Turenhout et al., 1998) and that conceptual knowledge is activated prior to gender access (Schmitt et al., 2001). However, the exact time course and the neural correlates during conceptualisation remain still unclear. The aims of this study therefore are:

1. the influence of planning complexity in speech planning,

2. the effects of temporal sequencing of events (linearization), and

3. the role of selection processes in picture descriptions, resp. the amount of information given by the speaker (minimal specification)

Methods

Experimental set ups

In three experiments, different aspects of macroplanning are investigated. Experiment I looks at the role of conceptual complexity in sentence planning by varying the amount of information the speaker needs to express. Experiment II investigates temporal linearization processes; subjects either describe two events in chronological or reversed order. Experiment III focuses on selection processes in picture descriptions, and thus on specifying relevant informational structures. Utterances are elicited by presenting visual stimuli on a video screen. The first two experiments make use of the network paradigm (Levelt, 1983), in experiment III the referential communication task is used (Glucksberg et al., 1966).

Data analysis

To capture the neural aspects of conceptualisation processes, event-related potentials were recorded from young healthy native speakers of German. They were analysed for epochs starting 100 ms prior to the presentation of the critical stimulus until 600 ms resp. 800 ms thereafter, to avoid contamination by speech artefacts. The EEG was recorded with 28 tin electrodes mounted in an electrode cap (*Electro-Cap International,* Eaton, Ohio). Both speech and EEG data were analysed. Artefact-free and correct trials were averaged separately for each condition. Mean amplitudes were measured by means of T-tests and repeated measures ANOVA.

Results

Speech data partly show significant differences between the examined tasks. Electrophysiologically, reliable differences between conditions emerge in all three investigations. From 300 ms onwards a positivity with a centro-parietal distribution is visible, furthermore, an early negative distribution is revealed with a maximum at the frontal electrodes.

Discussion

Both timing and distribution of the centro-parietal maximum suggest that it is an instance of the P300 response, which can be explained with increased attention requirements; the positive amplitude correlates with the specific demands resp. task difficulty. Furthermore, an early negative distribution is revealed with a maximum at the frontal electrodes, pointing to an involvement of working memory during the tasks. This supports the fact that attention and working memory need to be coordinated in spoken word planning. The results are discussed in relation to neuroimaging, electrophysiological and lesion studies. Finally, prospects for further possible investigations are outlined.

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Broad Focus versus Narrow Focus in Turkish Broca's Aphasia

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Introduction

In Turkish, grammatical relations are expressed by morphological marking, and certain pragmatic - discourse functions (e.g., topic, focus, stress) are given by word order. The interaction between grammatical and pragmatic-discourse functions of word order influence sentence production in Turkish agrammatic aphasia. For example, Turkish agrammatic speakers have more problems producing sentences in *syntactically* derived order (object scrambling, subject and object relatives) than sentences in base subject-object-verb (SOV) order (Yarbay Duman et al., 2007, 2008). When the patients fail to produce the right order, they produce sentences in base order. Accordingly, the sentences the patients produce are not only simplified in terms of syntactic complexity but also limited in their pragmatic-discourse functions e.g. Turkish patients hardly topicalize the object (Yarbay Duman et al., 2007). The question arises whether the effect of the interaction between grammatical and pragmatic-discourse functions of word order is bi-directional. More specifically, this study investigates whether pragmatic-discourse structure impacts word order as well when sentences are comparable from a syntactic point of view.

In Turkish, accusative-case-marked objects can appear to the right (subject-adverb-object-verb) or left (subject-*object* -adverb-verb) of the manner adverbs (see Table 1). In both positions, the accusative-case-marked object is assumed to have been moved from its base position to another position in the sentence (e.g., Untak-Tarhan, 2006). When the adverb is on the left of the accusative-case-marked object, the object is moved from its base position to [spec, AspP] and gets its case at the moved position. When the adverb is on the right of the accusative-case-marked object, the object moves to a higher position, namely to [spec, vP]. The latter order (object-adverb) is called object shift, which takes place at the phonological level.[1] Object shift is a prosodically motivated displacement in Turkish although the same operation takes place in syntax in Dutch, i.e. scrambling, in which the object is *in situ* in adverb-object order (see

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[1]Note that I do not use the term scrambling since scrambling in Turkish refers to derived OSV order.

e.g., Neeleman and Reinhart, 1998; Nakipoglu-Demiralp, 2004; Untak-Tarhan, 2006). If the accusative-case-marked object is at a non-basic position in both orders in Turkish and the position of the object is determined on the basis of prosody, it can be assumed that object-adverb order and adverb-object order are equally complex at the syntactic derivation level. Note that the height of the syntactic elements in the phrase structure does not affect sentence production in Turkish agrammatic aphasia (Yarbay Duman et. al., 2007).

Table 1: Sentence Types and Examples in the testing format [the parts expected from the patients are in brackets]

Sentence Type	Object/Focus Shift	Discourse Structure
S-Adv-Obj-V		
Bu adam oturarak kitabı okuyor ve bu adam ... [expected: uzanarak gazeteyi okuyor] This man sitting the book reads and this man . . . [expected: lying the newspaper reads]	no	broad focus
S-Obj-Adv-V		
Bu adam kitabı oturarak okuyor ve bu adam ... [expected: gazeteyi uzanarak okuyor] This man the book sitting reads and this man . . . [expected: the newspaper lying reads]	yes	narrow focus

However, sentences with and without object shift differ regarding their discourse structure i.e. their focus domain are different. There is narrow focus in the Object-Adverb order i.e. the focus is on small constituents (Kahnemijipour, 2004): the object is out of the VP and it can host only new information at that position (Nakipoglu-Demiralp, 2004). There is broad focus in the Adverb-Object order i.e. the focus is on VP/vP/IP (Kahnemijipour, 2004; Untak-Tarhan, 2006): the manner adverb takes the object in its scope, contrastively focus the object and form a VP/IP focus.

Object shift in Dutch, a syntactic operation, has been shown to be difficult for Dutch agrammatic speakers (Bastiaanse, Koekkoek, van Zonneveld, 2003). In sentences with object shift, the patients either descrambled or omitted the object or the adverb. In experiment 1, when the focus was on the object, the patients omitted the adverbs. In experiment 2, when the focus was on the adverb, the patients deleted the objects. These data suggest that knowledge of pragmatics-discourse structure is in general intact in Broca's aphasia, i.e., Dutch patients are sensitive to the given/new distinction and delete only given information as in line with topic/focus theory. Similar findings have been reported for Turkish patients i.e. they do not delete new information in a sentence (Yarbay Duman et. al., 2007).

There are no aphasiological hypotheses that take different types of focus domain into account, i.e., broad focus versus narrow focus. If the deficit is

an integration problem, as proposed in the Integration Problem Hypothesis (IPH: Yarbay Duman et. al., 2011), sentences with broad focus/no object shift are expected to be more difficult than sentences with narrow focus/object shift since translating broad focus information into a structure is predicted to require a more complex integration process, i.e., the patient has to keep focused and non-focused elements (e.g., the object, verb) together, while contrastively focusing a specific constituent (i.e. the object) in preverbal position.

Methods

Subjects

Three individuals with Broca's aphasia were tested. The diagnoses were based on the Gülhane Aphasia Test (Tanridag, 1993) and the clinical judgments of a speech therapist. All the patients were at least seven months post onset of left CVA, except one of the patients who had had traumatic brain injury. All were right-handed, and suffered from right-hemiplegia at the time of testing. Ten non-brain-damaged Turkish speakers participated (and performed at ceiling) on the test.

Materials

The agrammatic speakers were presented with two pictures in which the same person is performing the same action with a different object (e.g., book-newspaper) and in a different manner (e.g., sitting-lying) (see Figure 1). There were two conditions: sentences with broad focus/no object shift and sentences with narrow focus/object shift (14 items in each). The experimenter read aloud a prompting sentence, followed by an incomplete sentence (see Table 1). The subject was asked to complete the final sentence in a similar way. All the adverbs were morphologically derived manner adverbs. Half of them were with a noun and the other half with adverb root.
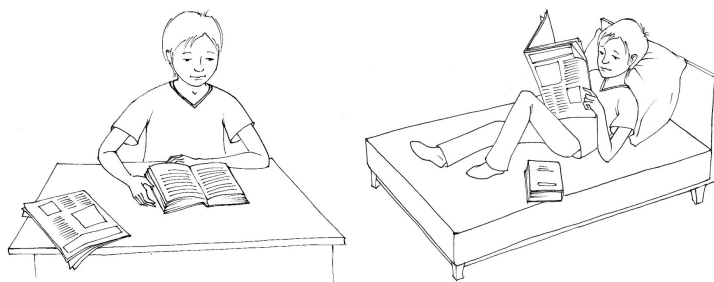
Figure 1: Example Picture-Set

Results

Sentences with broad focus/no object shift (23.8% correct) were significantly more difficult to produce than sentences with narrow focus/object shift (61.9% correct; $chi^2 = 10.94$, df = 1, p< 0.01). In the sentences with broad focus/no object shift most errors were production of sentences with narrow focus/object shift ($chi^2 = 10.92$, df = 1, p< 0.001). There was no significant difference between production of adverbs with a verb and a noun root ($chi^2 = 0.34$, df =1, p>0.05).

Discussion

There are two major findings. First, as correctly predicted by the IPH, producing sentences with broad focus/no object shift is more difficult than producing sentences with narrow focus/object shift for Turkish agrammatic speakers. Second, when agrammatic speakers are unable to translate broad focus information into a structure, they prefer producing sentences with less complex discourse-structure i.e. narrow focus, which, in turn, results in an easier syntactic frame for them(object-manner adverb). Apparently, it is easier to keep focused and non-focused elements separately in a syntactic frame by using narrow focus. The data indicate that the patients' ability to produce sentences is influenced by the type of discourse-structure, which impacts word order.

Crucially, the easier discourse structure and/or syntactic frame for the patients might differ per adverb type used. For example, temporal adverbs, unlike manner adverbs, characterize entire events and they reside mostly out of the VP '*today* she reads the book', and they do not contrastively focus the element that follows them. This study used only manner adverbs whereas manner and temporal-adverbs were mixed in the Dutch study.

The overall findings complement previous studies on Turkish and Dutch in that knowledge of pragmatics-discourse structure is in general intact (e.g. Bastiaanse, Koekkoek, van Zonneveld, 2003; Yarbay Duman et al., 2007; this study), although the patients cannot always adequately translate discourse-information such as broad focus into a structure. Furthermore, aphasiological data support different linguistic analysis of object shift in Turkish and Dutch.

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An fMRI Investigation of Semantic and Phonological Naming Treatment in Aphasia

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Introduction

Difficulty naming objects is one of the most common impairments in people with aphasia post-stroke, irrespective of aphasia classification (Goodglass & Wingfield, 1997). Thus, remediation of naming impairments is often a focus of treatment in the rehabilitation of language. Such treatments typically employ phonological or semantic approaches, or a combination of the two, in order to target the major cognitive components involved in word retrieval (Nickels, 2002). Although individuals can show greater benefit from one approach over the other, the relationship between an individual's locus of breakdown in word retrieval and response to a particular treatment approach remains unclear, and knowledge of the underlying neural mechanisms which may be responsible for successful treatment is scarce. The aim of this study was to examine brain activity associated with successful phonological and semantic based treatments for word retrieval using functional Magnetic Resonance Imaging (fMRI).

Methods

Participants

Eight people with chronic aphasia (five female) participated in the study. Participants ranged in age from 41 to 69 years (M = 56.38, SD = 9.15) and were between 17 and 170 months post single left CVA at the time of the study (M = 52.25, SD = 49.84). Two participants were identified with predominantly semantic impairments, two participants were identified with predominantly post-semantic/phonological impairments, and four participants were identified with impairments in mapping semantics to phonology.

Imaging

A naming battery (476 items) was administered prior to scanning to determine known and unknown items for each participant. During the scan, participants overtly named 30 known items, and attempted to name 60 unknown items. A baseline condition of passive viewing of non-objects was also employed. Images were acquired using a 4 Tesla Bruker MedSpec scanner. Gradient-echo, echo planar images (GE-EPI) where acquired using a behavioural interleaved gradient acquisition sequence. Image processing was conducted using Statistical Parametric Mapping software (SPM8, Wellcome Department of Cognitive Neurology, London, UK). A whole brain analysis was conducted, where successfully named items post-treatment were compared with incorrectly named items pre-treatment for each participant.

Treatment

The 60 unknown items were divided into two treatment sets. One set was treated using Phonological Components Analysis (PCA; see Leonard, Rochon & Laird, 2008) and the other set using Semantic Feature Analysis (SFA; see Boyle & Coelho, 1995). The treatment tasks required the participant to analyse either the phonological features (e.g. first sound, syllables, rhyming word) or semantic features (e.g. group, use, action) of an object using a matrix of cue words to facilitate word retrieval. Each participant received 12 treatment sessions over four weeks, where PCA and SFA tasks were alternated each session and order of treatments counterbalanced amongst participants. A weighted Wilcoxon One-Sample test was used to identify significant differences in naming accuracy between three baseline scores and scores from assessment immediately post-treatment, as well as maintenance of treatment effects 2-3 weeks post-treatment.

Results

Behavioural

Seven out of eight participants improved significantly in naming items treated using PCA compared to baseline scores. Four out of eight participants improved significantly in naming items treated using SFA compared to baseline scores. Participants with primarily semantic impairments only showed significant improvements for items treated with PCA, whereas participants with primarily phonological impairments benefited from both treatments, with greater maintenance of items treated with SFA. Participants with difficulty mapping semantic information onto the word form showed more variable results.

Table 1: Significant results in language-related regions for each participant (p<0.01 uncorrected, clusters > 20 voxels). IFG = Inferior Frontal Gyrus; PCA = items successfully treated with Phonological Components Analysis; SFA = items successfully treated with Semantic Feature Analysis; INC = incorrectly named items pre-treatment.

	P01	P03	P04	P05	P07	P08	P09
Left hemisphere							
IFG (Opercularis)		SFA<INC					
Superior Temporal Gyrus							
Supramarginal Gyrus			SFA>INC PCA<INC	PCA>INC	PCA>INC		PCA>INC
IFG (Orbitalis)		SFA>INC PCA>INC					PCA>INC
IFG (Triangularis)							
Middle Temporal Gyrus	SFA>INC		SFA<INC		PCA>INC		
Inferior Temporal Gyrus	PCA>INC					PCA<INC	
Angular Gyrus							
Right hemisphere							
IFG (Opercularis)	PCA<INC	PCA<INC					
Superior Temporal Gyrus							
Supramarginal Gyrus		PCA<INC					
IFG (Orbitalis)				SFA<INC	PCA<INC	PCA<INC	
IFG (Triangularis)	SFA<INC PCA<INC						
Middle Temporal Gyrus	SFA<INC PCA<INC						
Inferior Temporal Gyrus							
Angular Gyrus				PCA<INC			

Imaging

For the seven participants who made significant improvements naming items treated with PCA, naming of successfully treated items was associated with

increased activation in predominantly left hemisphere regions, compared to incorrectly named items pre-treatment. These regions varied among participants, and included the left supramarginal gyrus, inferior frontal gyrus, inferior and middle temporal gyri, and the angular gyrus. Additionally, five of the seven participants showed decreased activity in right hemisphere homologues of language regions; including the right superior temporal gyrus, inferior frontal gyrus, and the angular gyrus. However one participant also showed increased activation in the right inferior temporal and angular gyri.

For the two participants with predominantly phonological impairments, who both made significant improvements for items treated with SFA, naming of successfully treated items was associated with activation changes in the right middle and inferior temporal gyri compared to incorrectly named items pre-treatment, as well as the angular gyrus bilaterally for one participant. The other two participants who made significant improvements for items treated with SFA, both with impairments mapping semantics to phonology, showed changes in the left inferior frontal gyrus (pars triangularis and opercularis), as well as the left supramarginal and inferior temporal gyri for one participant.

Discussion

Seven of the eight participants showed significant improvements in naming items treated with PCA, despite differences in locus of breakdown in word retrieval. Compared to incorrectly named items pre-treatment, naming of successfully treated items was associated with increased activity in a predominantly left hemisphere network, including regions associated with both phonological and semantic processing. Increased activation in these regions suggests that the treatment may have engaged both phonological and semantic levels of processing, or strengthened the mapping between the two. Additionally, decreased activation in right hemisphere homologues of left hemisphere language regions in five of the seven participants suggests that right hemisphere activity during incorrect naming pre-treatment may have been maladaptive. However decreased activity post-treatment may also reflect increased efficiency during word retrieval.

Only four participants showed significant improvements for items treated with SFA. Both participants with predominantly semantic impairments did not show a significant improvement, suggesting that therapy targeting the impaired process was not beneficial in the presence of a semantic deficit. Successfully treated items using SFA were generally associated with activation changes in regions associated with semantic processing for three participants. The SFA treatment may have directly targeted semantic processing, although involvement of these regions in phonological processing cannot be ruled out. Additionally, changes in contra-lesional activation for the two participants with temporal lesions and predominantly phonological impairments may

reflect the ability of the right hemisphere to facilitate semantic processing for these individuals.

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Decreased Relative Contribution to Language Processing of the Right Hemisphere after Language Therapy Assessed with fMRI in Chronic Aphasia Patients

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Introduction

Aphasia is a language disorder generally resulting from stroke in the left hemisphere (LH). The neuronal mechanism underlying language recovery is unknown. Neuroimaging studies provide some support for involvement of the right hemisphere (RH), taking over language function from the damaged LH (Thompson & Den Ouden, 2008). Some studies however suggest that for real language recovery, the LH needs to eventually resume its role in language processing (Saur et al., 2006). We use fMRI to assess the involvement of the RH in language processing in response to intensive cognitive linguistic treatment in chronic aphasic patients.

Methods

Twelve chronic (>1y post-onset) aphasic patients (mean age 57y, 6 male) diagnosed with semantic and/or phonological disorders were randomised to follow intensive treatment or no treatment during four weeks. Treatment focuses on the impaired linguistic levels: semantics and phonology, intensity: 1 hour a day. FMRI-examinations were performed before (T_0) and directly after (T_1) this period. Language function was assessed before each examination with an extensive test battery. All patients performed at 3T a blocked designed auditory rhyming and semantic decision tasks. Both tasks used tone decision as a control condition. Imaging data were analysed using Statistical Parametric Mapping 8 (London, UK). After preprocessing individual statistical t-contrast maps were calculated for pre- and post-therapy datasets. Lateralisation indices (LI) were calculated using the number of significantly (p<0.001) activated voxels in language regions of the LH and RH according to (LH-RH)/(LH+RH).

Results

Two patients with incomplete data were excluded. Pre-treatment language LI ranged from 0,89 to -1 and was right-lateralised in 6/10 patients (LI:-0.71). Four of five treated patients showed a leftward change on both language tasks of their language activation in the post-treatment session (LI T_0:-0,61;LI T_1:-0,12) which remained right-lateralised in two patients for both. In one treated patient, initial left-lateralised language activation became somewhat less left-lateralised in the post-treatment session (LI T_0:0,19;T_1:0,07). One of 5 patients without treatment showed a leftwards change in language activation on both tasks (T_0:-1 ;T_1:-0,93).

Discussion

Chronic aphasia is commonly associated with prominent RH language involvement. Language therapy in chronic aphasia seems to be associated with decreased involvement of the RH in language processing. Future efforts are to correlate language improvement after therapy with hemispheric involvement in a larger study population.

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SPEAK: Sequential Prognostic Evaluation of Aphasia after Stroke: Prognosis and Recovery

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Introduction

Several studies have investigated the recovery of aphasia post-stroke. However, none of these have studied the recovery pattern of the three main linguistic components, i.e. semantics, phonology, and syntax, which constitute the basis of diagnosis and treatment (Code, 2001). Whereas initial aphasia severity has been reported to be a robust prognostic factor (e.g. Pedersen, Vinter, & Olsen, 2004), no information is available about the significance of the separate linguistic components in predicting the final outcome. In this observational prospective follow-up study we investigated the recovery pattern of semantics, phonology, and syntax, and factors that predict the outcome at one year post-stroke.

Methods

Patients with aphasia (n=147) were assessed at 1, 2, and 6 weeks, 3 and 6 months, and 1 year after a first-ever stroke. We used the ScreeLing, a screening test for detecting deficits on the three main linguistic components, to assess the patients' performance on semantics, phonology, and syntax (El Hachioui et al., 2012; Doesborgh et al., 2003), and we used the Aphasia Severity Rating Scale (ASRS), a measure of verbal communication (Goodglass & Kaplan, 1972).

The differences in scores between the 6 time points were investigated with Mixed Model analyses. Logistic regression analyses were performed to examine the influence of the initial linguistic disorders on good outcome (ASRS of 4 or 5), and the influence of 13 non-linguistic factors, such as demographic, neurological, and stroke characteristics.

Results

Semantics and syntax improved up to 6 weeks ($p < 0.001$), and phonology up to 3 months ($p \leq 0.001$) after stroke. ASRS improved up to 6 months ($p < 0.05$). Univariable logistic regression analyses revealed a significant influence of each of the three linguistic baseline scores on good outcome: semantics, $R2 = 34.5\%$, odds ratio (OR) = 1.24 (95% CI 1.13 - 1.36); phonology, $R2 = 44.9\%$, OR = 1.33 (95% CI 1.18 - 1.49); syntax, $R2 = 33.2\%$, OR = 1.24 (95% CI 1.13 - 1.36). Multivariable analysis based on the three linguistic components explained 46.5% of the variance, with phonology as the only significant variable. Additionally, univariable logistic regression analyses showed that young age, high Barthel scores in the first week, high education level, and stroke due to hemorrhage were significant predictors. All significant predictors, including the phonology score in the first week, were selected for the final multivariable regression model which explained 55.7% of the variance (Table 1).

Table 1: Baseline prognostic model for good aphasia outcome (i.e. ASRS 4 or 5) at 1 year after stroke

		OR (95% CI)	p-value
Phonology score (0-24)		1.31 (1.15-1.51)	< 0.001
Barthel index (0-20)		1.11 (1.00-1.21)	0.03
Age (19-96)		0.94 (0.89-0.99)	0.03
Eduction level			
	Low*	0.47 (0.12-1.84)	0.28
Stroke subtype			
	Hemorrhage	8.85 (0.70-111.28)	0.09

OR, Odds Ratio; CI, Confidence Interval.
* Unfinished elementary school up to sophomore high school or lower vocational education.

Discussion

Semantics, phonology and syntax show different recovery patterns in patients with post-stroke aphasia. Phonology has the slowest recovery rate and is a strong predictor in the first week post-stroke of good outcome at 1 year, independently of Barthel score, age, education, and stroke subtype.

Future studies should clarify whether individualized treatment of aphasic stroke patients on the basis of the affected linguistic components improves outcome. If our findings with respect to the prognostic model are confirmed after external validation, a clinical prognostic tool, a score chart, may be constructed for use in the acute stage. The benefit of such an early prediction

is that patients can be more adequately informed about what to expect of their future verbal communication.

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Influence of Dopamine on Healthy Adult New Word Learning and Implications for Pharmacotherapy in Aphasia

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Introduction

It has been proposed that aphasia treatment outcomes (including treatment of word production impairments) can be boosted by pairing a pharmacological agent with behavioural therapy after stroke. However, results have been mixed and progress in this field has been limited. One key obstacle in exploring whether pharmacotherapy in aphasia is worth pursuing is the lack of fundamental knowledge regarding how pharmacological agents modulate relevant aspects of language in healthy individuals. Based on the concept that new word learning in healthy individuals may be relevant to language treatment in aphasia (particularly relating to word retrieval), and knowledge that dopamine can modulate brain regions implicated in new word learning (e.g. hippocampus, prefrontal cortex), the aim of this study was to examine whether levodopa (a dopamine precursor) boosted new word learning in healthy adults over one week of training.

Methods

A randomised double-blind placebo controlled between-groups design was employed, with 22 healthy participants receiving 100 mg of levodopa or placebo 45 min prior to a new word learning task that was repeated for 5 days. In one experiment, legal nonwords were paired with pictures of familiar objects and learning was probed using recall and recognition. In a second experiment, legal nonwords were paired with unfamiliar objects (ancient Finnish farm tools) with half of the objects also paired with a definition regarding use of the tool.

Results

Experiment 1 (familiar objects). There was no significant difference between the placebo and levodopa groups in recognising newly learnt items. However for word recall, there was a significant group by learning session interaction indicating superior recall of newly learnt names of objects in the levodopa

group compared to the placebo group at the end of training (day 5). At 1 month follow-up there was no longer a significant difference in recall accuracy between the two groups.

Experiment 2 (unfamiliar objects). The levodopa group showed superior recall and recognition accuracy for new words immediately . However, this difference was not present at the 1 month follow-up, except for recognition of names learnt with a description, which was superior in the levodopa group.

Discussion

These findings suggest that the influence of dopamine on new word learning depends on the stage of learning, the familiarity of the associated object, and the provision of semantic information. Dopamine appears to primarily boost early acquisition of new word forms, which may reflect dopaminergic modulation of hippocampal, prefrontal, and/or inferior parietal mechanisms proposed to underlie initial stages of new word learning. The effect of levodopa on consolidation appears restricted to forms of learning where semantic information is involved which is consistent with recent evidence that dopamine enhances semantic processing. These findings shed further light on the specific influence of dopamine on aspects of language function relevant to rehabilitation and will be considered in the context of both healthy dopaminergic mechanisms and pharmacotherapy in aphasia.

Lexical Ambiguity Resolution as a Function of Working Memory: Eye-Tracking Data from Agrammatic and Healthy Individuals[1]

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Introduction

Linguistic problems of individuals with agrammatic aphasia are not solely restricted to the grammatical domain: a considerable delay in lexical processing was also found in this clinical population (Prather et al., 1997). It was suggested that language processing abilities of aphasic individuals is predictable from their working memory (WM) capacities (Caspari et al., 1998; Friedmann & Gvion, 2003; Wright & Fergadiotos, 2012), however experimental evidence for that is still sparse.

The goal of the present study was to investigate the time course of lexical ambiguity resolution in healthy individuals and patients with agrammatism as a function of their WM span. We hypothesized that patients' poorer than overall normal performance could at least partly be explained by their reduced WM capacities. Specifically, patients and healthy low WM span individuals were expected to demonstrate similar processing strategies.

Methods

24 native Russian speakers participated in the experiment: 8 patients with aphasia (3 female; mean age 49 y.o; 28 months post onset on average) and 16 healthy individuals (13 female; mean age 44 y.o). Patients were diagnosed with efferent motor aphasia, according to Luria's classification, and showed classic agrammatic performance.

Linguistic paradigm

An eye-tracking-while-listening paradigm was administered to tap into the time course of lexical ambiguity resolution. 20 experimental stories interleaved

with 20 filler stories were presented auditorily, each with a visual panel containing 4 black-and-white drawings that represented critical referents from the story. An experimental story included two introductory sentences (1a), followed by a sentence with an ambiguous word balanced on frequency of its two meanings (1b), and a further disambiguation point (1c). The context preceding the ambiguous word did not bias its interpretation, it was part (1c) that resolved the lexical ambiguity provided in (1b). Filler stories retained the same structure, but contained no ambiguous words. A content question followed each trial to control for attention and comprehension accuracy.

1. An example of experimental items.

    1a. After the concert, the singer decided to have fund. First, he loosened his collar.

    1b. Then he took a shot[2] of

    1c. icy vodka.

For experimental stories, two visually presented referents corresponded to the two meanings of an ambiguous word, and two referents were distractors. All referents were matched on meaning frequency, length and phonological overlap of their names, as well as visual similarity. Participants' eye movements were monitored and recorded at the rate of 60 samples per second using an LC Technologies Eyegaze (Fairfax, VA, USA) remote eye-tracker.s

Working memory test

To investigate a possible relationship between linguistic processing and WM span, a WM test was also administered using the Modified Listening Span task (Ivanova & Hallowell, 2009), an adapted version of the classical complex listening span task (Daneman & Carpenter, 1980) specifically modified and simplified for individuals with aphasia. In the task participants were asked to match auditorily presented short and simple active sentences to one of the four visually presented pictures and also remember a distinct set of words for subsequent recognition. Items to be remembered were separate words presented after each sentence. At the end of each sentence set a picture set was presented for recognition; participants had to point to pictures representing words to be remembered.

Results

Overall analysis showed that healthy participants resolved ambiguity exactly at the region (1c), as soon as all required for disambiguation linguistic material

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[2]The corresponding ambiguous word in Russian has two meanings: "glass" and "pile"; two competing visual referents were used for this story: a glass of vodka and a pile of money.

was provided. It showed up as a significant prevalence of the proportion of fixation duration to the target referent, compared to the competing referent and distractors. In contrast, agrammatic patients showed a significant delay in resolving the ambiguity: the proportion of fixation duration on target significantly increased compared to the proportion of fixation duration on other referents only in the region following (1c).

However, healthy participants showed a significant correlation between WM span and the proportion of fixation duration to the target in the disambiguation region (1c) and the following 1500 ms region. Individuals with higher WM span tended to look more at the target referent compared to the competing referent (r= 0.52, $p < 0.04$). No such correlation was found in individuals with aphasia, who showed a significantly lower WM span overall, compared to healthy participants (t = -3.42, $p < 0.01$).

Discussion

The results show that lexical ambiguity resolution is more effective in healthy individuals with higher WM span: they activate the target lexical meaning more rapidly than individuals with lower WM span. WM span in the tested patients with aphasia was overall lower than in healthy participants, and individuals with aphasia demonstrated a significant delay in lexical ambiguity resolution. Although the reported data is not sufficient to claim that WM is the only determiner of lexical processing difficulties of agrammatic patients, the similarity found between them and healthy low

WM span individuals suggests that WM is at least one of the predictors of observed ambiguity resolution delay.

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Verb Production in Semantic Dementia: Evidence from Greek

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Introduction

Recent studies on demented patients indicated that the semantic representation of verbs is affected while argument structure (henceforth AS) remains intact. In particular, Kim & Thompson (2004) did not found any systematic effect of the number of arguments on verb naming and spontaneous speech production of 14 Alzheimer dementia patients. However, they produced general verbs significantly more often than specific verbs (the two classes differed in the specification of manner). They also substituted light, semantically underspecified verbs and general verbs for complex ones (heavy and specific) in a sentence completion task. In addition, Thompson et al. (2012) analyzed the spontaneous speech of patients with semantic dementia (henceforth SD) and found that they did not differ from healthy controls in terms of correct verb inflection and AS production. Nevertheless, the open-closed ratio in their sample was significantly lower than in the controls' sample, indicating a predominantly lexical-semantic deficit.

This study aims at investigating the effect of AS and tense marking on verb production by SD patients. To this end, we tested the production of sentences with unergative, unaccusative and transitive verbs, addressing the following research questions: 1) Does AS affect sentence production? 2) Does inflection affect verb and AS production?

The present study adopts particular linguistic assumptions concerning unergative, unaccusative and transitive verbs in Greek. First, we assume two distinct levels of lexical representation: a semantic one, the lexical conceptual structure (henceforth LCS) and a lexical-syntactic representation, AS (Anagnostopoulou, Alexiadou & Everaert, 2004). The LCS contains primitive predicates which convey the event type of a verb and the root which represents its idiosyncratic meaning (Levin & Rappaport-Hovav, 2011). The meanings of primitive predicates can be reduced to the meanings of light verbs like *make, do, go* (Pinker, 1989). Unergative verbs are represented at the LCS by means of an activity primitive and a (typically) manner Root (as in 1), unaccusatives by means of a change-of-state primitive and a result root (as in 2), whereas the representation of transitive verbs varies, depending on their semantics (as in 3).

1. [x ACTIVITY $_{<MANNER>}$]

2. [BECOME[y <RESULT>]]

3. [[x ACTIVITY $_{<MANNER>}$] CAUSE[BECOME[y<RESULT>]]]] or [x ACTIVITY $_{<MANNER>}$ y]

Second, we assume, following Alexiadou, Anagnostopoulou & Schäfer (2006), the following (argument) structural representations for Greek unergative, unaccusative and transitive verbs, respectively.

4. [v Voice [+Agentive] Root]

5. [v Root +Theme]

6. [v Voice [+Agentive] Root +Theme]

Methods

Procedures

Two tasks were administered: 1) a sentence elicitation task and 2) a tensed sentence elicitation task. Task 1 (T1) was a sentence elicitation task with video stimuli, in which the participant was presented with videos and had to describe what was happening. Correct responses were those including (i) correct verb and (ii) correct AS production.

Task 2 (T2) comprised sentence elicitation with tense/aspect marking. The participant was presented with the same video stimuli preceded by a phrase prompting for a specific tense/aspect (T/A) marking. They were instructed to combine the phrase and the video in order to produce a correct sentence. Correct responses were those including (i) correct verb (ii) correct AS production and (iii) correct T/A marking.

The actions depicted in the videos could be described by unergative, unaccusative and transitive verbs.

Participants

14 native speakers of Greek participated in the study (7 diagnosed with SD and 7 matched for age and education healthy controls). The SD speakers were assessed with the Boston Diagnostic Aphasia Examination (adapted for Greek by Tsapkini, et al., 2010) and the Greek version of Addenbrooke's Cognitive Examination-Revisited (Konstantinopoulou et al., 2010).

Results

The control group performed at ceiling in both tasks.

Task 1

SD patients gave significantly less correct responses than the controls overall (*M-W U*=1.5, *p*=0.002) and for transitive verbs (*M-W U*=2, *p*=0.003), while for the other two classes the difference with the controls just failed to reach significance (*M-W U*=9.5, *p*=0.078, for both). Within group, SD participants did not manifest any difference among the verb classes ($x^2(2) = 1.391$, *p*=0.535). Qualitative analysis of the errors showed that the SD participants produced different kind of errors for each verb class. Table 1 presents the percentage of each error type per verb class. For unergative verbs the predominant error type was the production of light verb constructions (existing or novel, like "do water" instead of *swim*). This error type appeared also for transitive targets (e.g. "do the carpet so" instead of *shake the carpet*) but not for unaccusatives. For unaccusatives and transitives the majority of errors involved production of incorrect AS.

Table 1: Percentage of each error type per verb class.

	Unergative	Unaccusative	Transitive
Incorrect Verb	20%	17%	7%
Light Verb Constructions	50%	0%	29%
Incorrect Argument Structure	10%	58%	57%
Other	20%	25%	7%

Task 2

The difference between the control and the SD group was significant for unergative and unaccusative verbs (*M-W U*= 4.5, *p* =0.041, *M-W U*= 3, *p*=0.019, respectively) and overall performance (*M-W U*= 2, *p*=0.013), but not for transitive verbs (*M-W U*= 7.5, *p*=0.141). Comparison between T1 and T2 showed that the performance of the group was not affected by the obligatory application of T/A marking neither for any particular verb class nor for overall performance, except for one patient whose performance dropped significantly ($x^2(1)=9.753$, *p*=0.005).

Discussion

Data from T1 provide evidence that AS production is not totally preserved in SD (contra previous findings), as AS errors are predominant at least for unaccusative and transitive verbs. AS complexity in terms of lack of agentivity (as is the case for unaccusatives) and increased number of arguments (as in transitives) affects SD performance. Second, the data suggest that verb

meaning is decayed in SD, with predicate primitives being preserved and roots affected, as shown by the production of light verb constructions. In particular, we argue that manner roots, present in unergative and transitive verbs, are decayed in SD. As a result, SD patients are based exclusively on the primitive predicates, which correspond to the light verbs, in order to transfer the relevant semantic information.

T2 showed that inflection operations do not affect SD verb production, which is in accordance with the findings of Thompson et al. (2012).

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Object and Action Processing in Alzheimer's Disease: The Embodied View of Cognition

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Introduction

In the literature there are conflicting reports concerning whether object and action processing differ in patients with Alzheimer's disease (AD). Studies have shown that objects are processed better than actions (e.g., Druks, Masterson, Kopelman, Clare, Rose, & Rai, 2006), actions are processed better than objects (e.g., Williamson, Adair, Raymer, & Heilman, 1998) and both are processed equally (e.g., Parris & Weekes, 2006). Based on aphasic performance, it is argued by several researchers that both objects and actions should not be treated as uniform categories (e.g., Martin, 2007; Jonkers & Bastiaanse, 2007). With respect to word processing in AD, the importance of subdivisions of these categories according to certain characteristics, such as living vs. non-living objects or actions with an instrument vs. actions without an instrument has been demonstrated (e.g., Almor, Arnoff, MacDonald, Gonnerman, Kempler, Hintiryan, Hayes, Arunachlam, & Anderson, 2009).

In the current study we elaborate on this by studying word processing considering different categories of nouns and verbs. The hypotheses of this study are based on the embodied cognition framework (see Wilson, 2002 for an overview), which states that semantic knowledge is partly grounded in sensorimotor systems. For example, when one reads the word 'walk' this would activate a part in the motor cortex that is activated when performing 'walking'. According to this theory, different semantic features of objects and actions relate to the different neuroanatomical distribution of various categories of nouns and verbs. In light of what is known about neurological impairment in AD, we hypothesized that specific semantic features would be impaired, namely *animals* for objects and *motion*, *change of state,* and *contact* for actions.

Methods

Participants

Eight native English speakers (6 female, 2 male) who had been diagnosed with early dementia, based on a score of 4 on the Global Detoriation Scale within

the past year, participated. Five participants had been clinically diagnosed with AD and three with probable AD. The mean age of the group was 82.75 years (SD=7.25, range: 70-91). A control group of twenty-four neurologically unimpaired elderly (14 female, 10 male) from the same local community were also tested, whose mean age was 73.42 years (SD=4.37, range: 67-83). None of the participants had a history of learning disabilities, neurological problems (prior to AD for the first group) or head injury or trauma, and all have normal or corrected-to-normal vision. The groups were matched on level of education and no correlation in the scores between age and accuracy or age and reaction time on the task was evident.

Materials and procedure

The task used was a semantic similarity judgment task. A triad of words was presented, with one word on the top line and two words on the bottom line. The task was to decide which of the two bottom words was the closest in meaning to the word on top (e.g., tiger: lion - rat). Each triad consisted of either objects or actions, and all three words were from the same semantic category. The materials were derived from the studies by Sabsevitz, Medler, Seidenberg, and Binder (2005) for the objects and Kemmerer, Gonzalez Castillo, Talavage, Patterson, and Wiley (2008) for the actions.

The different object categories were animals, tools, fruits/vegetables, household items, vehicles, and articles of clothing. Action categories were hitting actions, cutting actions, and change of state actions. A total of 173 triads were analyzed in this study, of which there were 119 object items and 54 action items. We looked at the effects among different categories within and between groups. Both correct answers and reaction times were calculated.

Results

In general, the results showed high accuracy scores with no overall difference in accuracy between the control and AD group, but the AD group took significantly longer to respond. There was no significant difference among object categories by either accuracy or reaction time measures in the AD group. However, in the control group a significant difference between object categories in both accuracy and reaction time was present. The pattern seen within accuracy is that animal items and tool items were answered less accurately than the other categories and within reaction times that animal items, tool items and vehicle items were answered less quickly than the other categories. As well, both groups showed significant differences among the action categories by both accuracy and reaction time measures. In the control group the pattern showed that cutting actions were answered more accurately, while hitting and change of state actions were answered with equal accuracy. Regarding reaction time, hitting actions were answered fastest, while change of state

actions were answered most slowly. The AD group showed the pattern of equal accuracy for hitting and cutting actions, while change of state verbs were answered least accurately. The reaction time pattern showed that hitting actions were answered most quickly, while cutting actions take the longest time. When comparing the groups, cutting actions were answered significantly less accurately by the AD group than the controls.

Discussion

Object and action categories were shown to affect processing both with respect to accuracy and reaction times in the current study. For objects, the control group showed an effect of object category both for accuracy and reaction times. This effect was not seen in the AD Group, but the tendencies in this group with respect to effect of object categories were comparable. For actions, significantly better results were seen in the control group for cutting actions as compared to the other actions, whereas the AD group showed the lowest scores on change of state actions as compared to the other actions. The scores of the AD group were also significantly lower for cutting verbs than the scores of the control group. As for reaction times, the control group showed faster reactions than the AD group for all verb categories, but also both groups showed significant differences in reaction times with respect to the categories, however with different patterns (hitting<cutting<change of state for the control group and hitting<change of state<cutting for the AD group). These results suggest the influence of different categories within objects and actions which should be considered in future studies.

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An Experimental Study on the Influence of Congenital Amusia on Speech Perception

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Introduction

Congenital Amusia is a neuro-developmental disorder that has a negative influence on pitch perception (Peretz et al. 2002, Foxton et al. 2004, Stewart 2008). It is not caused by insufficient exposure to music, a hearing deficiency, brain damage or intellectual impairment (e.g., Ayotte et al. 2002). Congenital amusics face lifelong impairments in the musical domain and their symptoms can be so severe that music sounds like 'banging' to them (Stewart 2008: 127). They have deficits in fine-grained pitch discrimination, i.e. they cannot detect that two adjacent tones are different in pitch if the difference is one semitone or less (Peretz et al. 2002; Foxton et al. 2004).

What makes this condition so particularly interesting is that there is an ongoing debate whether language is affected (cf. Patel et al. 2008, Liu et al. 2010) or not (cf. Ayotte et al. 2002, Hutchins et al. 2010). It has long been argued that congenital amusia is domain-specific to music and does not affect language (e.g. Peretz et al. 2002). However, growing evidence suggests that this view has to be reconsidered (Patel et al. 2008, Liu et al. 2010) and that congenital amusia influences linguistic pitch perception (intonation). Contrasting findings and different hypotheses of what the underlying cause of congenital amusia might be – a fine-grained pitch processing deficit (Ayotte et al. 2010) or a memory deficit for non-verbal sequences (Tillmann et al. 2009) – warrant further investigation.

The most fundamental issue that needs to be investigated is whether and how speech perception is affected by congenital amusia. If speech perception is affected, then it is also important to investigate which acoustic or linguistic factors may influence amusics' speech perception.

Methods

Participants & Design

We tested eight German amusics (diagnosed with the MBEA: Ayotte et al. 2002) and 32 matched controls in a same-different discrimination task.

Stimuli

The present pilot study examined the discrimination of linguistic pitch and two types of tonal analogs (sine tones and pulses) by amusics. We tested

whether the amusic group was at a disadvantage when linguistic material was removed in the sine tones and pulses. In addition, we looked at the influence of stimulus duration and continuity of the pitch. Spoken statement-question pairs were used to create our stimuli. The phonemic material (continuous and discontinuous sounds) and the duration of the sentences were varied. The final pitch contours were manipulated in steps of seven semitones. For questions, the pitch was changed downwards towards a statement intonation; for statements upwards towards a question. For each sentence we created tone analogues consisting either of simple sine tones or of complex tones (pulses). Participants had to compare stimulus pairs from the same condition (e.g., sine sounds from the long question intonation with discontinuous sounds).

Results

First results show that both groups performed worst for sine stimuli compared to voice stimuli and pulses, while non-amusics performed best for pulse stimuli, amusics showed an advantage in the linguistic stimuli. However, amusics performed worse over all conditions than non-amusics, even for stimuli pairs that differed in seven semitones. These results show that congenital amusia also affects speech perception.

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Effects of Typicality and Age of Acquisition on Auditory Semantic Processing – Behavioural and Electrophysiological Correlates

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Introduction

Various behavioural studies show that the typicality (TYP) and age of acquisition (AoA) of a specific word influence speed and accuracy during the performance of lexical-semantic tasks. These effects have been described in both healthy and aphasic language processing (e.g., Kiran & Thompson, 2003; Chalard & Bonin, 2006; Holmes & Ellis, 2006; Smith, Turner, Brown, & Henry, 2006). Typical words and words with an early AoA are processed faster and more accurately than atypical or late acquired words (e.g., Ellis & Nelson, 1999; Johnston & Barry, 2006; Ellis, 2011). Importantly, most of the studies do not disentangle the effects of TYP and AoA (Holmes & Ellis, 2006). In addition, ERP studies show an increased N400 amplitude for atypical words in healthy participants in visual category-verification tasks (e.g. Stuss, Picton, & Cerri, 1988; Heinze, Muente, & Kutas, 1998), providing further evidence that typicality affects online semantic processing. ERP studies investigating AoA-effects in semantic processing have to our knowledge not yet been published. Furthermore, none of the above mentioned studies investigated this effect in the auditory modality. Therefore an auditory study design is supposed to underline modality-independent effects of TYP and/or AoA during semantic processing. The purpose of this on-going study is to answer the question whether TYP and/or AoA affect participants' reaction times as well as the N400 amplitudes as an index of processing difficulty by means of an auditory semantic priming task in healthy young adults. Assuming that both TYP and AoA influence semantic processing, slower reaction times and a larger N400 amplitude are expected for atypical and for late acquired targets in comparison to typical and early acquired targets, respectively.

Methods

ERPs are recorded from young healthy participants performing an auditory category-member verification task. During this task, participants have to decide whether the presented target is a member of the preceding prime category or not. One third of the word pairs contain incongruent prime-

targets-pairs. The 240 targets systematically differ in TYP (typical/atypical) and AoA (early/late acquired). Moreover they are matched in terms of animacy, word frequency and word length. Reaction times and accuracy as well as ERPs are assessed. The target words have been selected from a database containing German norms of different linguistic parameters including TYP and AoA (Schröder et al., 2011).

Results

Preliminary reaction time data show main effects for both TYP and AoA, but no interaction of these parameters. Initial ERP data reveal a main effect of congruency in a way that the processing of incongruent targets results in a larger ERP amplitude than congruent targets approximately 400-800 ms post onset of the target word. Additionally, the ERP data confirm a typicality effect with a sustained N400-like effect over central areas while an AoA-effect cannot be observed at the current stage of data analysis. Full data will be presented at the conference.

Discussion

This on-going study uses the category-member-verification to determine whether, and to what extent, TYP and AoA influence semantic processing on a behavioural and electrophysiological level. Preliminary results reveal an independent influence of TYP and AoA at the behavioural level. First electrophysiological results do not entirely support these findings. However, it seems that differences of TYP significantly manipulate the amplitude of the N400. These preliminary findings replicate the results of previous ERP studies investigating the influence of TYP on visual semantic tasks (Stuss, Picton, & Cerri, 1988; Heinze et al., 1998). Further data are needed to fully analyse the scope of these parameters and their behavioural and electrophysiological correlates on semantic processing.

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Treatment of Function Word Reading in a German Case with Phonological Dyslexia

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Introduction

Aim of the present study was to evaluate the effectiveness of a grapheme phoneme correspondence learning approach in the treatment of function word reading in a relatively transparent orthography (German), applied within a clinical setting. The study was carried out with KS, who showed a preservation of reading of irregular and regular content words and a complete inability to read nonwords. Additionally, he showed an impairment in function word reading, a deficit often accompanied with phonological dyslexia (Tree, 2008). For the treatment of function word reading, approaches focusing on retraining of grapheme phoneme correspondences (GPCs, e.g., Sheridan, 1999) as well as those focusing on whole words using phonological priming (Lott, Sample, Oliver, Lacey, & Friedman, 2008) have been proposed. For English, it has been argued that the latter approach is more effective for the training of function words because of their irregularity or patients' additional deficits in phoneme blending, which would decrease the effectiveness of a GPC-based training (Lott et al., 2008). As German has a relatively transparent orthography with highly predictable GPCs, retraining of nonlexical reading should be effective for the reading of functions words in this language.

Methods

Participant

KS is a 55-year-old man who suffered from a left media-infarct 3;5 years prior to this study. He holds a PhD in Philosophy and Political Sciences and was employed as an academic researcher prior to his stroke. In addition, he was a freelancing writer of lyric poetry. At the time of the study he demonstrated a severe aphasia, dyslexia and dysgraphia. His spontaneous speech was nonfluent, auditory comprehension was relatively well preserved.

Pre-treatment assessment

The pre-treatment assessment of KS reading abilities was carried out with the German assessment tool LEMO (De Bleser, Cholewa, Stadie, & Tabatabaie, 1997). The results showed unimpaired reading of irregular and regular nouns

(55/60 correct), and a complete inability to read nonwords (no responses). Both, reading of concrete and abstract nouns was preserved (39/40 correct). In addition, a part-of-speech effect was shown with a significant difference in impaired reading of function words (pronouns, prepositions, adverbs; 18/30 correct) and preserved reading of nouns or adjectives (59/60 correct; Fishers exact, p<.05). Repetition of nonwords was also preserved (39/40 correct). The main error types in reading function words were function word substitutions (e.g., target: German: *auf* (English: *on*); response: German: *für* (English: *for*).

Treatment procedure

KS was involved in a treatment program focusing on multiple parts of his language deficits (training of lexical access in spoken and written word production, training of the graphemic output buffer in writing and training of his nonlexical reading abilities), carried out in in a routine clinical setting. As most of his reading errors were function word substitutions, aim of the reading treatment was to establish a non-lexical reading strategy by a retraining of GPCs and blending abilities. It was hypothesized that this should lead to an improvement of function word reading, with generalization to untrained function words. In addition, a generalization to untrained items (reading of nonwords) and a transfer to untrained contexts, such as reading of small phrases (headlines of newspapers), was expected.

10 CV syllables and 40 function words (pronouns, determiners, conjunctions, adverbs, prepositions) that are amongst the most frequent 100 syllables in German (Aichert, Marquardt, & Ziegler, 2005) were selected for treatment. Treatment consisted of a traditional GPC approach focusing on a reactivation of the nonlexical reading route (e.g., De Partz, 1986; Nickels, 1992; Stadie & Rilling, 2006; Sheridan, 1999). First, letter-to-sound correspondences were trained using individual key-words associated with single graphemes. After this, reading of CV syllables and function words was trained. Treatment consisted of 40 treatment sessions, 60 minutes each, 1-2 per week over a period of 9 months. The non-lexical treatment approach covered about one third of the whole treatment program (see above).

Results

Reading of trained CV-syllables and function words improved significantly after treatment (McNemar, both p <.05). In addition, generalization to untrained function words with significant improvements in the reading of untrained items taken from LEMO (De Bleser et al., 2004) was shown (26/30 correct, McNemar, p <.05). Reading of untrained nonwords and reading of small phrases (headlines from newspapers, own screening) did not improve after treatment (null responses).

Discussion

The results show that in German, a language with a relatively transparent orthography, impaired function word reading can be retrained using a GPC learning approach. The generalization to untrained function word reading shows that a general reading strategy has been established that can be applied to untrained function words. However, as a lack of generalization to untrained items (reading nonwords) and contexts (reading small phrases) was shown, future research needs to show which factors influence the presence or absence of these effects (e.g., treatment intensity, complexity of learning environment and material, personal relevance of targeted skills, cognitive status, ect., Raymer et al., 2008).

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Expert Versus Proxy Rating of Verbal Communicative Ability of People with Aphasia after Stroke

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Introduction

People with aphasia are known to communicate better in daily life than would be anticipated by results of standardized language tests, administered by professionals (Manochiopinig et al., 1992; Rautakoski et al., 2008). This indicates the importance of information on the daily functioning of the person with aphasia by a proxy: a significant other who is familiar with the person with aphasia, such as a partner, friend or caregiver. In randomized clinical trials of aphasia treatment, a functional outcome measure like the Amsterdam-Nijmegen Everyday Language Test (ANELT) (Blomert et al., 1995), administered by speech-language therapists, is often used. However, the agreement between this expert rating and the judgment of the proxy about the quality of the daily life communication of the person with aphasia is largely unknown. So, in planning and providing care for people with aphasia and in conducting trials, it is crucial to have insight into the extent to which the judgments of experts and proxies align.

The first aim of this study was to examine the association between the rating of everyday communication by the SLT (expert) and by the proxy of people with aphasia due to stroke, and the influence of time post onset (three versus six months) on this association. The second aim of this study was to determine which factors influence the level of agreement between both ratings at six months, a point in time at which language ability is more stable.

Methods

Participants and measurements

Participants were between 18 and 85 years and had aphasia due to acute stroke. Aphasia resulted in disruption of everyday verbal communication and an overt semantic and/or phonological disorder. All participants were assessed within three weeks after stroke and at three and six months. This study centers on the three and six month outcomes only.

We examined the association between ANELT scores by speech-language therapists and proxy judgments on the Partner Communication Questionnaire

(Blomert, 1995) both at 3 and 6 months in 39 participants. We determined if one of the following factors affected the level of agreement between expert and proxy judgment of the communicative ability at 6 months in 53 participants: aphasia severity (measured with the Aphasia Severity Rating Scale from the Boston Diagnostic Aphasia Examination; Goodglass & Kaplan, 1983), quality of life (measured with the European quality of life-5 dimensions [EQ-5D (Lamers et al., 1983)]), level of independence (measured with the Barthel Index; Mahoney & Barthel, 1965), age, sex, education level, stroke type and relation with the proxy (partner or other).

Statistical Methods

The association between the rating of the SLT (expert) and the rating of the proxy both at three and at six months after stroke was examined through scatter plots of the data and with Pearson correlation coefficients. We labeled the points in the scatter plots in order to explore agreement between both ratings as a function of aphasia type. To determine which factors affect the level of agreement between expert and proxy judgment at six months after stroke, we performed a hierarchical multiple regression analysis with the absolute difference between ANELT and PCQ scores (range 0 to 4) as dependent variable. First we used a base model that consisted of age, sex, education level and stroke type. Then, one variable at a time, we added the Aphasia Severity Rating Scale, Barthel Index, EQ-5D and type of relation with the proxy.

Results

Proxies tended to rate the verbal communicative ability of the person with aphasia somewhat higher than experts. We tested this by means of paired samples t-tests: mean difference at 3 months = .38 (95% CI=.05 to .71), p=.023; mean difference at 6 months=.35 (95% CI=.005 to .71) and p=.053. The correlation was moderate: at three months r=.662 (p=<.0001) and at six months r=.565 (p=<.0001). It appeared that the higher the scores (both on ANELT and PCQ), the better the agreement. For all aphasia types, proxies more often gave higher ratings than experts than vice versa. Also, the aforementioned effect of severity is reflected in the aphasia types: in the more severe types (Global, Wernicke and Broca), ratings diverged more strongly than in less severe types. The second aim was to examine which factors influenced the level of agreement between expert and proxy ratings of everyday verbal communicative ability at six months. The base model, which included age, sex, education, and stroke type, was not significant. Addition of Aphasia Severity Rating significantly increased the explained variance by 21.2% (p=.001). A higher, i.e. more favorable, Aphasia Severity Rating was significantly associated with better agreement between proxy and expert judgment (unstandardized regression

coefficient B=-0.261; p=.001). None of the other independent variables tested, including the Barthel Index, EQ-5D, or type of relationship between the person with aphasia and the proxy, accounted for additional variance relative to the base + Aphasia Severity Rating model.

Discussion

Our findings suggest that the judgments of verbal communicative ability by experts and proxies align reasonably well, especially in milder cases. The greater divergence between ratings of experts and proxies for persons with severe aphasia may reflect greater sensitivity of experts to formal deviations in verbal communication; the inability of the experts to witness the communication of the person with aphasia in everyday life situations; the requirement of the ANELT for some level of abstraction by the person with aphasia; and the difficulty of proxies in excluding nonverbal communication in formulating their judgments. Proxy views of the abilities of people with aphasia are important for planning rehabilitation goals and therapy and are crucial for the motivation and active involvement of people with aphasia and their relatives (Oxenham et al., 1995). Future research should focus on gaining more insight into mechanisms behind the diverging judgments.

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Is Covert A'– Movement Available in Agrammatic Broca's Aphasia? Evidence from Scope Ambiguity

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Introduction

Patients with agrammatic aphasia are impaired in comprehending constructions that contain displaced constituents, such as wh-questions, object relatives, object clefts and passives. This is probably due to complexity of processing sentences that involve overt movement operations. If syntactic movement yields comprehension impairments, the question arises whether this also holds for covert movement. The aim of this study is to investigate whether Greek-speaking agrammatic patients are impaired in processing ambiguous doubly quantified sentences, which – according to the standard theory (May, 1977) – involve covert A'-movement on their inverse scope interpretation.

An example of an ambiguous sentence is presented in (1a), with its two possible Logical Form representations in (1b,c). The first interpretation, represented by (1b), is that there exists a single man who waters all the flowers in the relevant domain. On this interpretation, the existential takes scope over the universal (surface-scope interpretation). The second interpretation, represented by (1c), is that some different man waters each flower. On this interpretation, the universal takes scope over the existential (inverse-scope interpretation).

(1) a. Enas adras potizi kathe louloudi
        A man waters every flower

    b. $\exists x$ [man(x) & $\forall y$ [flower(y) $\rightarrow$ water (x,y)]]

    c. $\forall x$ [flower(x) $\rightarrow$ $\exists y$ [man(y) & water (y,x)]]

Methods

Participants

Two Greek-speaking patients with Broca's aphasia (one agrammatic and one non-agrammatic) and 19 non-brain injured Greek speakers participated in

the study. The agrammatic patient was 47 years old with 6 years of formal schooling. The non-agrammatic patient was 60 years old with 12 years of formal schooling. Both participants were chronic aphasic patients (time post onset: 165 and 246 weeks for the agrammatic and the non-agrammatic patient respectively), and their language impairment was due to a left hemisphere stroke. Neurological examination did not show any sensory deficits. Aphasia classification was based on BDAE profiles.

Materials & Procedure

Participants carried out a truth-value judgment task. Each trial consisted of one picture and one sentence: the picture appeared at the center of a laptop screen and the spoken sentence was heard via two stereo speakers, and participants were asked to decide whether the sentence correctly describes the picture or not, by pressing the appropriate key. There were two types of experimental sentences: 1) sentences that involve overt movement operations (i.e. passives, object relatives and subject relatives), and 2) sentences that involve covert movement operations (i.e. ambiguous, doubly quantified sentences). There were six experimental conditions: 1) accept/ reject passives, 2) accept/ reject object relatives, 3) accept/ reject subject relatives, 4) accept surface scope interpretation, 5) accept inverse scope interpretations, and 6) reject both scope interpretations.

Results

In order to test whether there is an association between condition and accuracy, we carried out a chi-square analysis. The agrammatic patient's accuracy scores were different across conditions and the differences were significant (χ^2=21.82, p=0.001). Follow up comparisons showed that the differences between conditions with sentences that involve overt movement operations (conditions 1-3) were not significant. The agrammatic patient was impaired in processing this type of sentences. Also, the scores on the conditions with sentences that involve covert movement operations (conditions 4-6) did not differ. However, as shown in Figure 1, the overall difference between conditions 1-3 (sentences with overt movement) and conditions 4-6 (sentences with covert movement) was significant (χ^2=18.39, p<0.001), which indicates that the agrammatic patient was not impaired in processing ambiguous, doubly quantified sentences.

The picture looks different when the non-agrammatic patient's performance is considered. The non-agrammatic patient performed roughly the same in all conditions (Fisher's exact p=0.30).
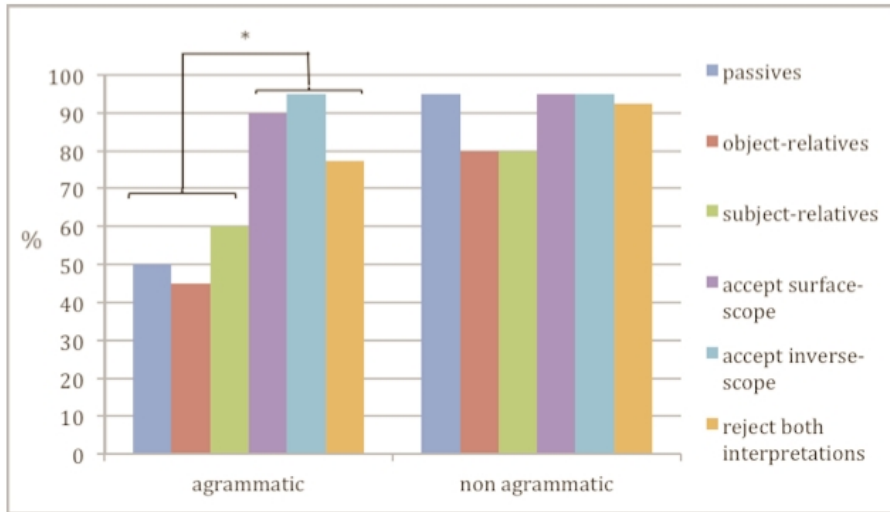
Figure 1: Patients' performance (%) on the truth-value judgment task.

Discussion

The results showed that the agrammatic patient was not impaired in comprehending ambiguous doubly quantified sentences. He had retained both scope interpretations (see also Saddy, 1995). This might be taken to indicate that covert movement does not affect patients' comprehension. However, there is no theoretical motivation to accept that covert movement is distinct from overt movement. We should therefore conclude that our results provide an argument against a movement-based account of covert scope extension, such as that proposed in May 1997 and much subsequent work. After all, if May were correct, the prediction for patients with agrammatic aphasia would be that they only comprehend the surface-scope interpretation, which involves no movement. However, this is not that case.

There are a number of proposals in the linguistic literature that deal with covert scope extension without movement. On the one hand, there are proposals that regulate scope in the semantic representation (see Montague, 1973; Partee & Rooth, 1983; Jacobson, 1996). On the other hand, there are syntactic proposals that rely on distinct mechanisms for overt and covert scope extension (see Pollard & Yoo, 1998; Williams, 1986). One account of the latter type, recently advanced by Neeleman and van de Koot (2011), is based on the idea that covert scope extension involves percolation of a scope index, and adopts a condition on index percolation that successfully accounts for the fact that covert scope extension is more restricted than its overt counterpart. Our results may

be interpreted as supporting such non-movement accounts of covert scope inversion. Processing of scope ambiguity, thus, involves operations that seem to be well preserved in agrammatic aphasia, in contrast to syntactic movement operations.

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Change in Naming Abilities between the Ages of 50 and 90: The Importance of Analyzing Naming Latency

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Introduction

This study tests the controversial hypothesis that word naming difficulties may arise in individuals as young as their 50s. According to Feyereisen (1997), these difficulties begin at the age of 70, but Nicholas, Connor, Obler, and Albert (1998); Connor, Spiro, Obler, and Albert (2004) observed subtle signs of decreased naming performance in participants in their 50s. However, these studies focused on naming accuracy. To our knowledge, no study has analyzed naming latencies in participants in their 50s in comparison with younger participants. We assume that such analyses may highlight more subtle difficulties in naming. In our study, both naming latencies and naming accuracy were analyzed in a picture naming task presented to 4 age groups: 25-35, 50-59, 60-69 and above 70 years old. If people in their 50s experience subtle naming difficulties, these should be reflected in longer picture naming latencies compared to younger participants. In participants above 70 years of age, the decline should be more apparent and may be underlined not only by slower naming latencies but also by lower picture naming scores.

The explanation for naming difficulties in aging is also a matter of debate. According to some authors (e.g., Salthouse, 1996), these difficulties are a consequence of a general slowing in all cognitive tasks, including language, in the elderly. However, other theories suggest that the relevant difficulties are more language-specific and are due to connection weaknesses across the entire language system, leading to more naming errors and longer naming latencies (e.g., Burke, MacKay, Worthley, & Wade, 1991). In order to determine the extent to which the slowing of naming latencies in the elderly is related to a slowing of cognitive processing, participants' cognitive processing speed was assessed with an odd/even judgment task. We were also interested in seeing whether slowing on the odd/even judgment task arises at the same age than slowing on the picture naming task.

Methods

Participants

Four groups of 30 participants took part in the present study: (1) between 25 and 35 years of age, (2) between 50 and 59 years of age, (3) between

60 and 69 years of age and (4) above 70 years of age (70+). All subjects were native French speakers and reported no history of neurological, cardiac, neuropsychological or psychiatric disorders, and no uncorrected hearing or visual problems. Dementia was excluded with the Mattis Dementia Rating Scale (Schmidt, Freidl, Fasekas, Reinhart, & Grieshofer, 1994). No differences between groups were found for vocabulary level (Mill Hill test; Deltour, 1993) or socio-economic background.

Materials

Participants performed a picture naming task (150 black and white drawings selected from the set of Bonin, Peereman, Maladier, Méot, and Chalard, 2003). Both the number of correct responses and naming latencies were analyzed. We also analyzed response latencies on an odd/even judgment task on 50 digits from 1 to 9, to assess cognitive processing speed.

Results

For the picture naming task, an analysis of variance (ANOVA) performed on the number of correctly named items revealed an effect of age, $F(3,116)=35.36$, $p<.001$. Tukey post hoc comparisons ($p<.05$) indicated that the 70+ age group named fewer items correctly than the 60-69 age group, which performed worse than the 25-35 and 50-59 age groups, which in turn did not differ from each other. However, the ANOVA performed on correct naming latencies did not show the same pattern of results. This analysis revealed an effect of age, $F(3,116)=35.36$, $p<.001$. Tukey post hoc comparisons ($p<.05$) indicated that the 25-35 age group responded faster than the 50-59 and 60-69 age groups, which did not differ from each other. The 70+ age group responded more slowly than the 3 younger groups.

For the odd/even judgment task, the ANOVA performed on response latencies indicated an effect of age, $F(3,116)= 96.40$, $p<.001$. Tukey post hoc comparisons ($p<.05$) showed that the 25-35 and 50-59 age groups did not differ from each other and responded faster than the 60-69 and 70+ age groups, which in turn did not differ from each other.

An analysis of covariance was also performed on naming latencies, using the latencies on the odd/even judgment task as covariate. There was a significant effect of age, $F(4,115)=54.56$, $p<.001$. Tukey post hoc analysis indicated that the 25-35 age group responded faster than the 50-59 and 60-69 age groups, which did not differ from each other. The 70+ age group performed more slowly than the 3 younger groups. Thus, a slowing of picture naming latencies was found in participants above 50 years of age. This slowing remained significant even when cognitive processing speed was controlled for.

Discussion

The increase in correct naming latencies on the picture naming task in participants in their 50s suggests the presence of subtle age-related word finding difficulties. In participants in their 60s, naming difficulties were highlighted by both a decrease in correct responses and an increase in naming latencies. Finally, in participants above 70 years of age, these difficulties became more pronounced in both naming accuracy and naming latencies.

Slowing on the picture naming task appears to be greater and to arise earlier in the adult lifespan (in participants in their 50s) than slowing on the odd-even judgment task assessing processing speed (in participants in their 60s). Moreover, this slowing of picture naming latencies in participants in their 50s remained significant even when processing speed was controlled for with an analysis of covariance.

In conclusion, these results support the importance of naming latency analyses in uncovering subtle naming difficulties. Furthermore, although we do not exclude a possible impact of general slowing on naming latencies in participants above 50 years of age, these findings suggest that the slowing in naming at this age observed here may be explained by a specific age-related slowing within the language system.

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Acoustic Voice Analysis in Patients with Subcortical Aphasia

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Introduction

With left-sided lesion to the thalamus, basal ganglia, and internal capsule, a heterogeneous collection of language disorders may occur, among which aphasia is very common. Hypophonia and dysarthria very often accompany subcortical forms of aphasia. The aim of this paper was to analyze acoustic characteristics of voice in patients with aphasia due to lesions in a subcortical structure.

Method

The acoustic tests were administered on fifteen female patients with subcortical aphasias and fifteen healthy female subjects. Each subject was asked to perform maximal vowel 'a' phonation. The acoustic parameters were Fo, Jitter, Shimmer, the Amplitude tremor frequency (Fatr) and Noise to harmonic ratio (NHR). The computerized voice analysis laboratory "Kay Elemetrics" (Multi-dimensional Voice Program) was used.

Results

The results showed increased values of Fo (mean: 170,28Hz), Jitter (mean: 8.450%), Shimmer (mean: 1.589dB), Fatr (mean: 7.580Hz) and NHR (mean: 1.248) compared with the voice parameters in the control group of subjects.

Discussion

Language disorders due to vascular subcortical lesion are often followed by voice impairment (Svetel et al, 1998; Tomic et al., 2009). We believe that neurolinguistic and acoustic voice analysis in patients with subcortical lesions can provide valuable information for understanding the nature of subcortical aphasia. It is pointed out that acoustic analysis of voice could have a significant role in evaluation of speech production deficits in patients with subcortical aphasia.

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Can Oral Reading Aid Reading Comprehension?

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Introduction

Reading comprehension difficulties are prevalent in people with aphasia. Despite this, reliable and comprehensive assessments and effective treatments have not yet been identified, particularly at text level. Previous studies (e.g. Cherney, 1995, Cherney, Babbit & Oldani, 2004) have suggested the potential value of oral reading as a strategy to target text level comprehension. Studies have reported some improvement in reading comprehension, with gains attributed to more automatic decoding of words allowing more processing resources to be allocated to comprehension. These studies have not, however, considered the relationship between fluency, accuracy and comprehension. This study evaluates Oral Reading for Language in Aphasia (ORLA) treatment, investigating whether increased reading speed and accuracy of oral reading results in improved comprehension.

Methods

Participants

Two men, EG and JB, were included in the study. They were right handed, monolingual English speakers. EG was 84 years old and was a marine engineer prior to retirement. He had a left PACS. JB was 73 years old. He worked as an engineer before retirement and had an infarct in the left middle cerebral artery. The men were four years post-onset at the time of the study. On reading assessments, they had retained single word comprehension, some impairment at sentence level and some impairment at paragraph level, particularly for specific detailed information and inferential material. JB presented with preserved oral reading of words and non-words and reported that oral reading was his preferred reading method. EG had mild apraxia of speech. He produced some phonological/phonetic errors in oral reading of words and was unable to read non-words. His oral reading of sentences and paragraphs was very hesitant and labored.

Procedure

A multiple baseline with control task single case study design was used to evaluate the impact of therapy on reading speed and comprehension. Performance was assessed pre-therapy, post-therapy and at one month

follow-up. Outcome measures included functional and paragraph reading from Reading Comprehension Battery for Aphasia (RCBA-2, Lapointe & Horner, 1998) and paragraphs from the Discourse Comprehension Test (DCT, Brookshire & Nicholas, 1993). Paragraph comprehension following silent reading and oral reading was contrasted and the accuracy of oral reading was monitored. Participants were also asked about their communication and reading difficulties using an adapted version of the COAST (Long et al., 2008). Therapy took place twice weekly for six weeks and involved repetitive, assisted oral reading of text (based on Cherney et al., 2004). Text came from local newspapers, with materials increasing in length. Materials were constrained for difficulty and all had a Flesch reading ease of 60 or above.

Results

JB: JB's oral reading during therapy and assessment was almost 100% accurate. Post-therapy, he showed no significant change in reading comprehension accuracy or rate on RCBA-2. Pre-therapy on DCT, there was no significant difference in comprehension accuracy or rate between silent and orally read passages. Post-therapy, there was no change in comprehension accuracy for oral reading but a significant decrease for silent reading (McNemar, p=0.042) resulting in an overall difference between the two. There was no change in reading rate. At follow up, there was no change on RCBA-2. On DCT, silent reading showed gains, returning closer to pre-therapy performance. Oral reading remained unchanged. At follow up, there was no significant difference between reading comprehension or rate between silent or oral reading. JB reported that therapy had resulted in no change in his comprehension but that he would continue to use oral reading as a strategy.

EG: EG's oral reading during was more variable but he still read aloud at greater than 90% accuracy. Post-therapy, he showed no improvement on RCBA-2. On DCT, there was no significant difference in comprehension accuracy for silent reading and oral reading at any testing period. Pre-therapy, there was a significant difference between silent reading speed (average of 114 wpm) and oral reading (27 wpm). Therapy resulted in no significant change in reading comprehension but did result in a statistically significant decrease in time taken for silent reading (t (9)=4.258, p=0.02) and oral reading (t (9)=3.50, p=0.006). At follow up, comprehension gains on RCBA-2 were significant (McNemar, p=0.016). The reduction in time taken did not reach significance. On DCT, silent reading speed was maintained, oral reading speed decreased significantly (t(9)=3.575, p=0.006) but remained significantly quicker than pre-therapy. There was no change in comprehension. EG found the therapy challenging due to his spoken output difficulties. He felt oral reading was not a strategy he would use in future, preferring to focus on key words, and reported the same level of frustration with everyday reading.

Neither participant showed any change on a control measure (spoken picture description).

Discussion

There is minimal evidence that therapy resulted in improved reading comprehension. Post-therapy, EG showed significant gains in reading speed for both silent and oral reading but these gains did not result in improved reading comprehension. He did, however, show significant gains at follow up on the RCBA2, possibly as these were much shorter passages. It is not clear why JB's reading comprehension in silent reading decreased post-therapy but at follow up, there was no change in either comprehension or speed. For both clients, there was no significant difference in reading accuracy between silent or oral reading, pre-therapy or at follow up. EG and JB both appear to have difficulties in text comprehension that are not related to their ability to read aloud fluently and accurately and it is questioned whether ORLA was the appropriate therapy choice. JB did not benefit, despite using oral reading as a strategy. EG found the therapy difficult, suggested he would not use oral reading and despite gains in speed, continued to have comprehension difficulties. The differences between this study and previous studies using ORLA will be discussed. There needs to be further investigation of the nature of reading difficulties in people with aphasia, examining the influence of linguistic and non-linguistic impairments. This would allow the development of therapy approaches to target those difficulties.

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Assessing Sentence Comprehension Abilities: A test for Relativized Minimality

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Introduction

Cross-linguistic studies in agrammatism have mainly attested asymmetries in the comprehension of semantically reversible structures with canonical vs. non-canonical argument order. In a recent innovation, these asymmetries have been interpreted within the Relativized Minimality approach (RM) to locality in syntax (Garaffa and Grillo, 2008). RM predicts that local relations cannot be established between two terms of a dependency if an intervening element possesses similar morphosyntactic features, since this element will be recognized as a possible candidate for the establishment of the dependency relation. In an extension of the RM approach to structures in which moved A'-elements and intervening subjects are considered structurally similar or dissimilar in terms of lexical NP-restriction, Friedmann et al. (2009) reported that good comprehension of object relative clauses (RCs) in children was due to the absence of a lexical NP-restriction in either the A'-element or the intervening subject, and that poor comprehension resulted from the presence of a lexical NP-restriction in both. The present study aimed at investigating whether the predictions within this extension of the RM framework can be confirmed by the data obtained from Greek agrammatic individuals.

Methods

Participants

We present evidence from a Greek agrammatic speaker. P.K. is a 43-year-old male, monolingual Greek speaker. In 2009, he suffered a left ischemic CVA including a focal lesion in Broca's area after a disruption of the middle cerebral artery. He was selected for inclusion on the basis of the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1983; Greek version by Papathanasiou, Feidatsi, Katsantoni, Panagiotopoulou, and Malefaki, 2004).

(1) a. Dikse mu opjon trava ton aθliti   (subject - FR_Q_NP)
         Show me whoever is pulling the$_{ACC}$ athlete$_{ACC}$
     b. Dikse mu opjon trava o aθlitis   (object - FR_Q_NP)
         Show   me   whoever   is   pulling   the$_{NOM}$
         athlete$_{NOM}$
(2) a. Dikse mu opjon jatro trava ton aθliti   (subject - FR_Q+NP_NP)
         Show me whichever doctor is pulling the$_{ACC}$
         athlete$_{ACC}$
     b. Dikse mu opjon jatro trava o aθlitis   (object - FR_Q+NP_NP)
         Show me whichever doctor is pulling the$_{NOM}$
         athlete$_{NOM}$
(3)   Dikse mu ton jatro pu kapjos travai   (object RC with Q)
         Show me the$_{ACC}$ doctor$_{ACC}$ that someone is
         pulling
(4)   Dikse mu ton jatro pu kapjos aθlitis travai   (object RC with Q+NP)
         Show me the$_{ACC}$ doctor$_{ACC}$ that some athlete
         is pulling

Materials-Procedure

We conducted three comprehension tasks: (i) *wh*-questions, (ii) RCs, and (iii) free relatives (FRs). Regarding (i), a total of 90 sentences was assessed, 60 non referential, *pjos/pjon* (= who/whom) and *ti* (= what) subject/object questions and 30 referential, *pjos jatros / pjon jatro* (= which-NOM doctor-NOM / which-ACC doctor-ACC), subject/object questions. Only the latter involves a moved wh-phrase that contains a lexical NP, so in this condition, comprehension is expected to be weak in the object sentences. The RC task (ii) consisted of 60 relative clauses in total, 30 right branching and 30 center-embedded, half of which were subject-extracted and half object-extracted; in the object-extractions, both the moved A'-structure and the intervening subject involved lexical NPs, so comprehension ought to be impaired. The FR task (iii) included 30 subject/object sentences in which the subject/object consisted of the free relative restrictor *opjon* (= whoever) (1), and 30 subject/object relatives in which the subject/object consisted of the free relative restrictor *opjon* and an NP (2); since the moved element lacks a lexical NP-restriction in (1), comprehension is expected to be good in the object sentences; however, poor performance is expected in the object sentences in (2) due to the presence of a lexical NP-restrictor in both the moved element and the intervening subject. Additionally, 15 object RCs were included in which the subject was a quantificational restrictor (3), and 15 object RCs in which the subject was a quantificational phrase (Q+NP) (4); in (4), but not in (3), both moved and intervening elements involve lexical NPs, so comprehension ought to be adversely affected in the former case.

Our participant was presented with pictures - one at a time - on a computer

screen, which depicted an action performed by three agents. While he was presented with a picture, a wh-question/ RC/ FR was orally presented to him and he was asked to point to the correct agent of the action.

Results

P.K.'s performance on RCs revealed a frequently observed pattern: significantly worse on object than on subject RCs. With regard to *wh*-questions, there was no difference between subject- and object-extracted *who-* and *what*-questions, but there was an asymmetry between *which-NP* subject and object questions (subjects, above chance; objects, at chance). However, turning to FRs in which the object has moved over an intervening subject, the difference in performance between cases where the moved element did not contain a lexical NP (1b) and those where it did (2b), was not significant. Similarly, the difference between RCs in which the subject included a quantificational restrictor (3) and those in which the subject included a quantificational phrase (4), was not significant either.

Discussion

Our results lend some support for the extension of RM proposed by Friedmann et al. P.K.'s pattern of performance on a sentence-picture-matching task was consistent to some extent with the idea that structural similarity/dissimilarity with respect to a lexical NP-restriction affects aphasic comprehension. Specifically, if both the intervening subject and the moved A'-element in an object-extracted RC or *wh*-question contained a lexical NP, that similarity was sufficient to compromise understanding. Nonetheless, our data from FRs (1 and 2) and RCs with a quantificational subject (3 and 4) indicate that lexical NP-restriction is not sufficient in all cases and that other features of the moved element or the intervening subject play also a significant role in the intervention effects.

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Executive Functions in Transcortical Motor and Conduction Aphasia

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Background

Recent findings suggest that there is a specific connection between cognitive control abilities and our ability to comprehend and produce language (Novick, Trueswell, & Thompson-Schill, 2010). Others reported aphasic patients whose language deficits arose only under certain conditions (Luria, 1973; Novick, Kan, Trueswell, & Thompson-Schill, 2009; Robinson, Blair, & Cipolotti, 1998). These patients, suffering from a particular subtype of transcortical motor aphasia (so-called dynamic aphasia), present a conspicuous lack of verbal fluency on tasks in which conflicting representations must be resolved by cognitive control. Some authors have proposed that transcortical motor aphasia (TMA) should be referred to as "dysexecutive aphasia" (e.g. Ardila, 2010). Although cumulative findings suggest that successful communication in persons with aphasia depends not only on intact language ability, but on executive functions (EF) too, systematic examination of executive functions in aphasia is still missing.

Aims

The purposes of the present study were (1) to further elucidate the status of EF in persons with aphasia, and in particular to test whether executive dysfunctions are specific to TMA (2) to examine the relationship between EF and naming ability, a core linguistic function.

Participants

A total of five individuals with TMA participated. As controls, a group with conduction aphasia (n=3) and a group of healthy subjects (n=6) were recruited. Participants with aphasia had a single left hemisphere infarct, confirmed by CT or structural MRI. All of them spoke Hungarian as their primary language and were right-handed. Their language impairment was classified by Western Aphasia Battery (Kertész, 1982; Hungarian adaptation: Osmánné' Sági, 1991). There were no significant differences between the subject groups in terms of age, education and intelligence (all $ps > .17$).

Methods

Naming abilities were measured by the Boston Naming Test (Kaplan, Goodglass, Weintraub, Segal, 1983). To assess EF, we designed four nonverbal tasks that reduced the influence of impaired linguistic ability on task performance. We focused on two major processes related to EF, updating and monitoring of working memory representations, and inhibition of prepotent responses.

All experiments were designed and run by experimental control softwares (E-prime and Presentation). Participants used buttons on the keyboard to respond, and RTs were collected for all responses.

Tasks measuring updating EF

We designed two modified n-back tasks. This task is generally used to index updating of information maintained in working memory.

Visual n-back task. Participants were exposed to a stream of pictures from different semantic categories (e.g. dogs, windows). One picture appeared on each trial and participants' task was to respond when the stimulus presented was from the same semantic category as the one presented *n* trials before.

Auditory n-back task. Participants were exposed to a stream of tones. One tone was presented on each trial and participants' task was to respond when the stimulus presented was identical to the one appearing *n* trials before. Participants performed a 1-back and a 2-back version of both n-back tasks.

Tasks measuring inhibitory EF

Stop-signal task. This task is generally used to index the ability to resolve response-based conflict (Novick, Trueswell, & Thompson-Schill, 2005). On each trial a stimulus (either a circle or a square) appeared in the middle of the screen and participants had to respond as fast as possible by pressing a corresponding button on the keyboard (c for circle, b for square). On some trials a loud tone was presented after the onset of the stimulus that signaled to the participant that they should refrain from responding. Delay of tone onset was increased from 50 ms to 350 ms by steps of 50, through seven consecutive blocks of the task.

Nonverbal stroop task. The Stroop task is generally used to index the ability to resolve representational conflict (Novick et al., 2005). In our nonverbal stroop task, on each trial an arrow was presented on the screen, with four possible directions (left, right, up, down) and four possible positions relative to the center of the screen (left, right, over, below). Trials were either congruent, i.e. direction matched position (e.g. an arrow pointing to the left presented on

the left side of the screen) or incongruent (direction not matching position). Participants' task was to press the arrow button on the keyboard corresponding to the direction of the arrow on the screen as fast as possible after the onset of the stimulus. This task involved three blocks. Only congruent trials were presented in the first and second block and only incongruent trials were presented in the third.

Results

Compared to healthy controls, patients with aphasia showed impaired performance on both updating and inhibitory tasks. However, TMA patients and their aphasic controls did not show a different pattern of performance. Therefore, in the results section we discuss differences between healthy controls and all patients with aphasia.

(1) Inhibition measures on the stop-signal task (correct rejection rates) were significantly smaller among patients compared to healthy controls.

(2) We detected a significant Stroop effect in both groups, and analysis of error rates revealed that aphasic patients showed significantly larger Stroop interference compared to healthy controls.

(3) There were no significant differences in visual n-back performance between the two groups. However, in the auditory n-back we found that aphasic patients' hit rates were significantly lower in the 2-back condition than hit rates of controls.

(4) Boston Naming Test scores correlated (positively) only with visual n-back performance.

Discussions

Our results are suggestive of a general executive deficit in aphasia. The correlation between BNT scores and the visual n-back performance might suggest that there is a relationship between EF and language abilities among aphasics. However lack of correlation between the auditory n-back and BNT scores might also suggest that our visual n-back task involved a verbal component. We found no clear evidence for a relationship between EF and naming abilities among patients with aphasia. This needs further investigation.

Also, our data suggests that TMA is not the only type of aphasia producing clear EF dysfunctions, though the small sample size of our study does not warrant firm conclusions on this issue.

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Eye Movement Guided Reading Intervention and its Impact on the Eye Voice Span in Acquired Dyslexia

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Introduction

Readers with acquired dyslexia show a deficient interaction of lexical and sublexical reading processes. As demonstrated in our recent work, analyses of temporal and spatial eye movement measures can serve as a useful tool for a precise specification of their lexical vs. segmental word processing strategies (Schattka et al., 2010; Ablinger et al., in press; Ablinger et al., in preparation). In addition, advanced eye movement methodology allows for a detailed examination of the relation between eye movements and simultaneous verbal productions in oral reading. Traditionally, this relationship is referred to as the Eye Voice Span (EVS; Buswell, 1921). In normal readers the EVS is influenced by individual differences, showing a high intra- and interindividual variability (Inhoff et al., 2011). Furthermore, pathological reading strategies are reflected in a characteristic EVS (Halm et al., in preparation). The present work examined the impact of a specific online reading intervention on the EVS in readers with acquired dyslexia. Based on the assumption that improvements in reading performance are associated with higher reading rates, a successful intervention should be reflected in a smaller temporal EVS and an increased spatial EVS.

Methods

Participants

We report data of four aphasic patients with acquired dyslexia. All suffered from infarction of the left middle cerebral artery. Their oral reading performance was characterized by the production of phonological and lexical errors. Compared to control data, the patients showed a substantial increase in both the number of fixations and total viewing time per word. Based on our previous work, initial fixation positions at the word beginning were taken to indicate an underlying segmental reading strategy, whereas in a lexical reading strategy landing site distributions initially peak left of the word centre.

Thus, two patients were classified as readers with preferred segmental reading strategy, while the other two patients appeared to prefer a lexical strategy.

Materials and Procedure

Over a period of four weeks, all patients received an intensive (5 days/week) reading intervention. Both lexical and segmental reading were facilitated using eye-movement-contingent display manipulations. More specifically, a lexical reading strategy was stimulated by guiding first fixation positions to the word centre. To this end, the complete word was demasked only after its initially visible center letters had been fixated. A segmental reading strategy was facilitated by gradually demasking letter clusters from left to right. All target words had to be read aloud.

Guided by individual baseline performance, 150 nouns were selected as items for diagnosis and therapy. These target words varied in word length from 6 to 9 letters and were balanced for frequency and semantics. Eye movement data were collected (EyeLink 1000, SR Research) before (T1), after two weeks of intervention (T2) and post therapy (T3), in combination with voice recording for subsequent EVS analyses.

Results

Reading performance

For all readers, the total number of correct reactions improved significantly from baseline to post-test performance. Analyses of oculomotor behavior indicated a decrease in total viewing time and number of fixations per word for trained as well as untrained items in all subjects. Moreover, a more detailed analysis revealed considerable differences between segmental and lexical readers. Apparently segmental readers benefited more from lexical therapy, whereas in lexical readers performance was strongly influenced by the sequence of therapies. The analysis of fixation positions did not suggest any changes in reading strategy.

Eye-voice Span

Overall, the segmental readers had a longer temporal EVS compared to lexical readers. However, they did not differ in spatial EVS. For all four subjects, we found a training effect after both reading interventions in the temporal EVS, i.e. a decreased temporal span for trained items. A more detailed analysis of the spatial EVS is currently underway.

Discussion

In the present study we examined the impact of an intensive reading intervention on reading performance as measured by eye movements and

the EVS. First of all, our specific eye movement-guided reading therapy leads to significant improvements in reading accuracy and oculomotor patterns. However, in none of our four participants changes in the preferred reading strategy were evident. Thus, our results indicate that improvements in reading performance are due to more refined and automatized word processing.

Segmental readers produce a longer temporal EVS compared to lexical readers, which is likely to reflect their processing difficulties in oral reading. Despite this difference, all four readers achieved a substantial training effect on the temporal EVS. These results contradict the assumption that the temporal EVS is mainly influenced by previous word properties, but rather points towards significant influences of the to-be-articulated word on the temporal EVS. To summarize, recovery in reading performance is reflected in faster word processing from initial fixation to articulation. This may be based on faster lexical access and/or higher capacity for parallel processing of visual input and articulatory output. Looking not only at eye movement patterns but also at simultaneous articulation provides new insights into oral reading processing.

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Learning in People with Aphasia: The Impact of Linguistic Load and Memory

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Introduction

The ability to learn new information may have a crucial impact in rehabilitation of people with aphasia (PWA). Yet, there is limited research into learning in PWA and the role that memory plays in learning new information in PWA. Also, the majority studies of short-term/working memory function in PWA involve tasks that require linguistic knowledge (e.g. Burgio & Basso, 1997; Christensen & Wright, 2010). According to Baddeley's Multicomponent Model of WM system (1998), the phonological loop is a key component of retaining information through articulatory rehearsal, which might be difficulty for PWA, due to the language deficits. Therefore, it is controversial whether a short-term/working memory deficit affects performance separately from language problems.

This study sets out to investigate 1) how learning by people with aphasia-differs from normal learning and whether the learning deficit in people with aphasia is language-specific or whether both linguistic and non-linguistic learning are impaired; 2) whether the capacity of short-term memory has an impact on language learning and makes the learning outcome predictable. With limited linguistic knowledge to perform articulatory rehearsal, we expect to find that the learning patterns of PWA differ from people without brain damage.

Methods

To answer the questions above, a pair association learning task consisting of three sets of picture-sound pairs differing in linguistic load was designed. Participants attended three separate sessions, in which they received a different set of picture-sound pairs to learn. In addition, the participants were given two memory assessments, one verbal (digit repetition) and one non-verbal (Corsi blocks), prior to the learning task to explore the relation between verbal/non-verbal memory span and the performance on learning new information with various linguistic load.

Participants and Material

Three groups of 18 participants were recruited, including young (age 18-30) and age-matched participants (age 50-80), and PWA. All participants had no severe visual or hearing deficit and healthy. As for PWA, the participants also

met the following criteria; they had 1) single left hemisphere CVA, were 2) six months post-onset, and had no other cognitive deficits or severe motor speech disorder.

Participants learned to associate auditory stimuli with meaningless visual forms. The auditory stimuli (sounds) varied the possibility of replying on language by using English real words, English non-words, and meaningless sounds (unfamiliar animal sounds). The meaningless visual forms were 1) Chinese characters, 2) non-objects, and 3) black-and-white nonsense line-drawings.

Procedure

In Part 1, the picture-sound pairs were presented to the participants one by one. Each picture was shown on screen for 8 seconds with its audio associate repeated within the interval. Part 2 was a computer-assisted training and assessment with six trials, in which participants were assessed on how many pairs they had learnt and feedback was available to reinforce the learning. In this part, the participants were assessed and re-learned at the same time. The task was to choose the picture that went with a sound with choice of four. After clicking on a picture, feedback was given by the computer, telling the participants correct/wrong. Then, regardless of whether they made correct a judgment or not, the target picture was shown again with its audio associate repeated. Part 2 was repeated until the participants had reached 100% of accuracy or they had completed 6 repeated trials.

The two memory assessments used staircase method. Starting with two digits/squares, one digit/square was added, if the participants gave a correct response. If not, the next list of digits/squares would be one digit/square shorter.

Results

The findings showed that the younger participants learnt better than the age-matched participants and PWA; PWA learnt the slowest among the three groups of participants. Different linguistic loads affected learning outcomes; the real words were learnt better than the non-words and the animal sounds. However, the main effect was restricted to the group of age-matched participants. Further, the main effect of different visual stimuli (pictures) was observed in both PWA and their age-matched participants. The patterns of learning in PWA fluctuated more than the patterns generated by the other two groups; also, the learning outcomes varied between individuals.

With the memory scores, the older participants were worse than the younger ones in the non-verbal span task (Corsi blocks). Despite poorer learning outcomes and lower verbal span (digit), the non-verbal span of PWA was similar to their age-matched participants. Neither verbal nor non-verbal span

was correlated with learning outcomes.

Discussion

Overall, the PWA performed much worse than the two groups of control participants. As a group, they learnt on average four associations on the first trial but showed little evidence of improving during the next six training experiences.   This average finding conceals substantial inter-individual variation: some of the participants were as good at learning these associations as age-matched controls. The extent to which PWA learned new associations was not related to measures of their verbal or non-verbal memory span.

In this study, all 10 picture-sound pairs were introduced to the participants at once; this method might over-load PWA and, potentially, cause proactive interference.   Therefore, to avoid these factors, a further study has been designed with an incremental learning method.   The incremental learning will involve the same material and all participants start the task with two picture-sound pairs. A new pair will be added when the participants have successfully learnt the existing pairs.

Moreover, more detailed background assessments (e.g. memory, attention, language, and cognition) will be conducted to explore how learning is affected by these factors and how we can account for the individual differences reported. In order to understand how different ways of instructing learning will affect learning outcomes, the results of incremental learning will also be presented and compared with the existing data.

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Zipf's Law in Non-Fluent Aphasia

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Introduction

In spontaneous speech, quantitative measures can provide valuable insight into general properties of words while generalizing over the content of the conversation. This renders it a suitable method to investigate word finding difficulties in aphasia. The quantitative measure employed in the current project is the distribution of word frequencies. Word frequencies in natural language texts typically conform to Zipf's law, a power law first noted by J.B. Estoup (1916) that became famous thanks to extensive studies by G.K. Zipf (1949). This law states that $P(k) \sim k^{\alpha}$, where p(k) is the frequency of the kth word if words are ordered by decreasing frequency. This power law can also be formulated as $p_f \sim f^{\beta}$, where p_f is the proportion of words whose frequency is f in a given sample text. Typically, it is found that $\alpha \approx 1$ and $\beta \approx 2$. Zipf's law has been shown to apply to every text in every language for which it has been tested (Baroni, 2008), but deviations from this typical value have been found for different types of texts and for different types of speaker (Ferrer i Cancho, 2005).

The meaningfulness of Zipf's law has been a topic of heated discussion. Zipf (1949) claimed that this word frequency distribution was due to the principle of least effort. But his opponents claimed that the statistics of simple random sequences of characters reproduce Zipf's law equally well (e.g. Mandelbrot, 1966). However, in both cases comparison between groups can reveal important differences between them.

The fact that aphasic speech conforms to Zipf's law has already been established in 1964 (Howes, 1964). However, in his analyses Howes included both function words and content words. People with aphasia are known for their problems with functional categories, so finding a difference if these words are included is to be expected and therefore not very interesting. We show that results for content and function words are markedly different: whereas content words only show a different slope, Zipf's law appears to be absent for function words. Contrary to most work on Zipf's law, we also provide a theoretical explanation for these findings. For content words, we demonstrate that the Zipfian distribution is observed in people with non-fluent aphasia even in samples much shorter than the 5000 word samples reported by Howes, which is a remarkable finding for population with speech production difficulties.

Methods

Spontaneous speech of four Dutch non-fluent aphasic speakers was recorded and analyzed, and compared to speech of four healthy speakers from the Corpus of Spoken Dutch. For all speakers, the same number of tokens was analyzed, which was the number of tokens of the smallest sample: 386 tokens in the all-words analysis and 102 tokens in the content words analysis.

Three analyses were performed: one with samples containing all parts of speech (all-words analysis), one with only content words while excluding function words (content words analysis) and one with only function words while excluding content words (function words analysis). Both α and β were measured. Two factors were distinguished: the presence of the power law which indicates that texts conform to Zipf's law and the slope of the power law which indicates the diversity of the words used in the sample. The first factor can be taken as the inevitable outcome of a normally functioning lexicon, while the second factor can be taken as an indication of the processing resources that are available to the speaker: if enough resources are available then speakers can access their full lexicon, but if resources are reduced then lexical retrieval fails for those words that require higher amounts of effort.

Results

The values of the coefficients for all analyses are given in the Table. Usually, Zipf's law is investigated in very large text samples such as books. Our samples are markedly smaller than that. It is therefore far from obvious that Zipf's law should apply. For the α-analysis, it was found that Zipf's law applies in all analyses, but α was found to be significantly higher for aphasic speakers compared to healthy speakers. For β, Zipf's law applies to all analyses for healthy speakers, but only to content words in people with aphasia; for function words it was found that Zipf's law does not apply. In the content words analysis, β was significantly lower for aphasic speakers compared to healthy speakers. Interestingly, in the all-words analysis in healthy adults both α and β were found to be lower than the typically reported values, which shows the importance of using control samples when investigating Zipf's law in impaired populations.

Discussion

We found that content words in speech from people with aphasia conform to Zipf's law, despite their considerable language problems. The slope of Zipf's law, however, deviated from what was found for healthy control speakers. Function words in speech from people with aphasia, on the other hand, do not conform to Zipf's law. We argue that β is more sensitive than α for mathematical reasons.

Table 1: Alpha and beta coefficients for full text analysis, the content words analysis and the function words analysis per speaker. Significance is tested through a permutation test (reallocation of groups, 1000 samples). This test and not the well-known t test was used, because the distribution of values is unknown and not necessarily normally distributed.

			All parts of speech		Content words		Function words	
			coefficient (std. error)	r^2	coefficient (std. error)	r^2	coefficient (std. error)	r^2
Alpha	Aphasic speakers	FvdL	0.933 (0.005)	0.988	0.855 (0.016)	0.956	1.120 (0.012)	0.971
		JJ	0.772 (0.006)	0.979	0.615 (0.011)	0.957	0.869 (0.009)	0.972
		JvdH	1.000 (0.008)	0.973	0.575 (0.014)	0.927	1.261 (0.013)	0.971
		PH	0.964 (0.005)	0.991	0.667 (0.010)	0.969	1.169 (0.008)	0.987
		Avg.	**0.917** (0.006)	**0.983**	**0.678** (0.013)	**0.952**	**1.105** (0.011)	**0.975**
	Healthy speakers	N01011	0.629 (0.007)	0.956	0.395 (0.013)	0.872	0.715 (0.014)	0.915
		N01005	0.665 (0.007)	0.963	0.501 (0.018)	0.860	0.687 (0.013)	0.917
		N01004	0.641 (0.006)	0.970	0.428 (0.012)	0.907	0.731 (0.010)	0.953
		N01010	0.701 (0.007)	0.964	0.451 (0.011)	0.922	0.786 (0.015)	0.918
		Avg.	**0.659** (0.007)	**0.963**	**0.444** (0.014)	**0.890**	**0.730** (0.013)	**0.926**
	Signif. test		p<0.01	p<0.01	p=0.01	p=0.02	p<0.01	p<0.01
Beta	Aphasic speakers	FvdL	0.973 (0.200)	0.630	1.091 (0.226)	0.824	0.644 (0.165)	0.559
		JJ	01.356 (0.216)	0.766	1.741 (0.226)	0.922	1.065 (0.213)	0.695
		JvdH	0.991 (0.189)	0.701	1.855 (0.206)	0.942	0.618 (0.142)	0.612
		PH	0.957 (0.177)	0.692	1.568 (0.336)	0.784	0.558 (0.138)	0.579
		Avg.	**1.069** (0.196)	**0.697**	**1.564** (0.249)	**0.868**	**0.721** (0.165)	**0.611**
	Healthy speakers	N01011	1.887 (0.102)	0.969	2.350 (0.332)	0.962	1.194 (0.147)	0.868
		N01005	1.672 (0.174)	0.894	1.827 (0.540)	0.741	1.234 (0.127)	0.905
		N01004	1.706 (0.189)	0.890	2.539 (0.174)	0.986	1.223 (0.200)	0.789
		N01010	1.555 (0.132)	0.932	2.591 (0.316)	0.944	1.095 (0.173)	0.770
		Avg.	**1.705** (0.149)	**0.921**	**2.327** (0.341)	**0.908**	**1.187** (0.162)	**0.833**
	Signif. test		p=0.02	p=0.03	p=0.03	NS	p<0.01	p<0.03

The fact that Zipf's law did not apply to function words in aphasic speakers while it did apply to function words in healthy speakers shows that Zipf's law can reveal important insights into the underlying system of word retrieval. We argue that these findings can be taken as an indication of reduced processing capacities (in line with e.g. Avrutin, 2006; Burkhardt et al., 2008). These reduced processing capacities have the strongest impact on those processes that require most effort, causing a breakdown of the system. From the data it follows that the process that is affected most is retrieval of function words but not content words, which is syntax (in line with Avrutin, 2006). In content words, the reduced processing resources are visible as a difference in slope. We argue that the mental lexicon of people with aphasia is not qualitatively different from that of unimpaired populations, which is shown by the fact that Zipf's law continues to apply to content words.

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Spontaneous Speech in Patients with Gliomas in Eloquent Areas before and after Surgery

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Introduction

Glioma (brain tumour) patients often complain pre-operatively about problems in daily conversation. However, a spontaneous speech analysis is not conducted yet in this patient group. Naming problems have been observed (Bello et al. 2007, Santini et al 2012), but a naming test does not cover all aspects of verbal communication in daily life. Glioma surgery could (further) deteriorate cognitive functioning. A spontaneous speech analysis could be a more sensitive tool than standardized language tasks, such as naming and verbal fluency, to measure language disorders in glioma patients before and after surgery.

Methods

Participants

We included 27 glioma patients (mean age 41 y., range 19-74 y.) and 21 healthy controls (mean age 39 y., range 19-62 y.). Spontaneous speech of the patients was collected pre-and 3 months post-operation.

Language assessment

Within a 300 word sample, spontaneous speech is analysed to ascertain Self-corrections, Repetitions, Type Token Ratio (all word types), Incomplete Sentences and Mean Length of Utterance (MLUw) using CLAN (MacWinney, 1991). A naming test (Boston Naming Test) (Kaplan et al., 2001) and a category fluency test (animals) (Luteijn & Barelds, 2004) were also assessed. A comparison was made between the spontaneous speech of patients and healthy controls, and of the patients pre-and post-operation. A correlation analysis was performed between the linguistic variables and tumour characteristics (localisation, volume, histopathology) and between the linguistic variables and the standardized language tasks.

Results

Pre-operatively, patients deviated on Repetitions, Self-corrections and Incomplete Sentences compared to controls (p<.001). Post-operation, similar differences were found in addition to one other linguistic variable (MLUw). Within the category Incomplete Sentences, content words were significantly omitted pre-and post-operation (p<0.05). Post-operation, also obligatory parts of speech and a category in which both content words or parts of speech could be filled out were missing (p<0.05, p<0.001)). Both pre- and post-operation, tumour type and tumour grade significantly influenced several linguistic variables: respectively Repetitions and Incomplete Sentences (p<.001) and Repetitions, Self-corrections and Incomplete Sentences (p<.05). No significant linguistic deterioration was found, nor an influence of tumour volume or treatment related factors on the spontaneous speech. Both pre-and post-operation, patients' performance on the BNT and the category fluency task deviated from normals (p<.001). A pre-operative positive correlation was found between the BNT and Incomplete Sentences (r=0.430, p=0.028), indicating that patients with higher BNT scores produce more Incomplete Sentences. No significant correlations were found between the deviant linguistic variables Repetitions and Self-corrections and respectively the BNT and Category Fluency. Post-operation, there was a positive correlation between the BNT and MLUw (r=0.449, p=0.041), indicating that patients with higher BNT produce longer utterances, and a negative correlation between Category Fluency Task and Repetitions (r= -0.512, p=0.011), indicating that the more animals the patients could name, the less Repetitions were observed. There were no significant correlations between the BNT and the other deviating variables.

Discussion

Pre-and post-operation there was a disorder in naming, category fluency and in spontaneous speech, partly influenced by tumour-related factors. The underlying language disorder may arise from a lexical and a syntactic problem, as evidenced by the Self-corrections, Repetitions (in both variables function and content words were involved), the omissions of content words and obligatory parts of speech in sentences and a shorter MLUw. A disability to construct a syntactic frame with correctly activated lexical items might be the background of the (unexpected) preoperative positive correlation between the BNT and the Incomplete Sentences. A spontaneous speech analysis seems to be a valuable addition to standardized language tasks. These study results can help to inform patients pre-operatively and to optimize the neurosurgical treatment plan to prevent further language deterioration.

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aPASia in Aphasia: Assessment and Treatment of Impairment in Complementation Information

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Introduction

Complementation information is a type of lexical-syntactic information that determines in which syntactic environments the verb can be inserted.

The complementation frame is included in the entry of each verb in the syntactic lexicon. It includes information about the predicate argument structure (number of arguments and number of complementation options), the thematic role of each argument (agent/theme, etc.), and the subcategorization frames (types of syntactic phrases that can complement the verb). Verbs differ in their complementation frames (Shapiro, 1997, 2000; Shapiro et al., 1987).

Only few studies examined structured treatment methods for impairment in complementation information. Treatment studies of aphasic patients used strategies of learning an association between the verb and one of its arguments (i.e., between *bake* and *cake*) as well as verb retrieval and sentence generation from its components (Kim et al., 2007; Webster et al., 2005; Webster & Gordon, 2009). These studies found an improvement in treated verbs, but with no generalization to untreated verbs. A different strategy, which was used for children with SLI (11;0-16;1 years old) by Ebbels et al. (2007), focused on the thematic roles of the verb - each role was marked with a different shape. After treatment, the children's utterances included fewer omissions of arguments, with generalization to untreated verbs.

In this study we examined whether complementation information is preserved or impaired for individuals with different types of aphasia, and evaluated a treatment procedure for complementation information, testing whether structured treatment can improve the production of verbs with their arguments.

Method

Participants

Eighteen individuals with aphasia with deficits in different levels of the speech production process: 4 participants had a syntactic deficit (agrammatism), 3 had

a lexical-semantic deficit, 3 had a lexical-phonological deficit, 5 had a deficit at the phonological output buffer, and 3 participants had a mixed deficit - syntactic and phonological. The locus of deficit was diagnosed by an extensive battery of tests that was administered to each participant, which included lexical and syntactic tasks (Biran & Friedmann, 2011).

Procedure

Assessment of PAS abilities: A battery of tests was constructed for this research - PASTA (PAS Tests for Aphasia). This battery included 4 tests: sentence production to a given verb (55 items), sentence repetition (80 items), verb completion in a sentence (35 items), and grammaticality judgment of PAS (65 items). In all tests, verbs with various types of complementation frames were included.

A deficit in complementation information, aPASia - evinced in omissions, additions, or substitutions of complements, was found for 7 of the participants. One of these participants had agrammatism, 3 had a lexical-semantic deficit and 3 had a mixed deficit. The other 11 participants - 3 with agrammatism, 5 with a phonological buffer deficit, and 3 with a phonological lexicon deficit - showed preserved complementation information, as evinced in their good performance in the tasks, as well as in the pattern of their errors, which did not violate complementation constraints. Namely, complementation frames might be preserved in aphasia, and should be examined for each patient individually.

Treatment: For one of the participants with aPASia (HY), a structured treatment was conducted. She was 13 years after the stroke that caused her aphasia, and after 5 years without language treatment. The treatment study started with baseline assessment, followed by the treatment, which consisted of 10 sessions. The first session included *instruction*, in which a structured explanation about predicate argument structure was given, with examples of unergative, transitive and ditransitive verbs. Each type of verb was presented with a different shape, to help HY recognize the type of verb.

The instruction session was followed by nine sessions of *practice*, in which HY was asked to produce sentences for the different types of verbs. The practice was organized hierarchically, with regard to the number of arguments the verb requires (one, two, or three) and the amount of cuing given. First, the verbs were presented with their matching shape and with questions regarding the arguments (who, what, etc.). HY was asked to write possible arguments (who can perform the action, on whom/what is it performed, etc.), and then to construct sentences with these components. Then, the verbs were presented with the matching shape, but without the questions about the arguments. Finally, only a verb was presented, without any cue. After practicing each type of verb separately, a "mixed practice" was administered, in which the same verbs were presented in random order - first, with their matching shapes,

and then without the shapes. HY was required to construct an appropriate sentence for each verb.

Results

Following *treatment*, a significant improvement in HY's sentence production was found - she produced grammatical sentences that included the verbs and the arguments they select. In the task of sentence production to a given verb, her performance before treatment was very poor - she produced only 13% correct sentences, but after treatment her performance improved to 78% correct (χ^2= 47.17, p < .0001). Importantly, the improvement was generalized to untreated verbs as well, and also manifested in a story telling task according to a series of pictures.

Discussion

The findings have implications for the locus in which complementation information is stored. The preserved lexical-syntactic information of 3 of the participants with agrammatism and of all the participants with phonological deficits (at the lexicon or at the buffer) indicates that lexical-syntactic information is stored separately from syntax and separately from phonological information. The participants with the mixed deficit had impaired complementation information but intact semantic information, indicating that complementation information is stored separately from the semantic lexicon. Therefore, the findings suggest that complementation information is stored in a separate syntactic lexicon.

The findings have clinical implications as well: The finding that individuals with agrammatism can have unimpaired complementation information suggests that treatment of syntactic movement can rely on the ability to identify the roles of the arguments each verb in a sentence selects. In addition, the findings of the treatment study suggest that a structured treatment, focused on complementation information, might improve this information - manifesting in the production of sentences with the arguments of the verb.

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Time Reference Teased Apart from Tense

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Background

One of the issues in neurolinguistics is to what extent language problems that people with aphasia suffer from are specific for their brain damage. Possibly, processes that require more cognitive resources for the healthy brain are vulnerable in aphasia. A way to tap into unimpaired language processing is to employ event-related potentials (ERPs). This study compares behavioral data from aphasic participants and ERP data from healthy participants on time reference of verbs in Dutch.

Agrammatic aphasic patients find it more difficult to produce and comprehend verb forms that refer to the past than verb forms that refer to the present, captured by the Past DIscourse LInking Hypothesis (PADILIH; Bastiaanse et al., 2011). The PADILIH predicts that verb forms referring to the past, such as 'wrote', are impaired in agrammatic aphasia, because they are discourse linked: in order to interpret past time reference, an additional link has to be made to some other event time in the discourse. Verb forms referring to the present, such as 'writes', are relatively spared, because they are locally bound: no additional discourse-link is needed because the event time the verb refers to is in the here-and-now of the moment of speaking.

Time reference processing has also been studied in non-brain-damaged individuals. Dragoy et al. (2012) performed an ERP study in Dutch. One of their results is that a violation of a past time reference context by a verb with non-past time reference in present tense such as *De kelner die zonet de peper *maalt,...* ('The waiter who a-minute-ago *grinds the pepper,...*) evokes a P600 effect, typical for morphosyntactic difficulties (Osterhout & Holcomb, 1992).

Predictions

The reported differences in present and past time reference processing have mainly been investigated in synthetic verbs (which are single verb forms such as 'writes'), in which the values for tense and time reference overlap. This makes it difficult to distinguish between the roles of tense and time reference processing. Interestingly in Dutch, reference to the past can be done by a synthetic verb in the past tense; the past imperfect (such as 'wrote'), but also

by *present tense* in the periphrastic present perfect (such as 'has written'). The latter form consists of an auxiliary in present tense plus a participle. This provides an excellent opportunity to determine whether it is tense or time reference that underlies the difficulties agrammatic speakers encounter with time reference of verbs. If it were past time reference through tense only, the present perfect and the present imperfect should both be relatively spared as compared to the past imperfect. Based on the PADILIH, it is predicted that reference to the past will also be impaired if it is done through the present tense.

In parallel, it is hypothesized that healthy participants treat reference to the past through past and present tense similarly. It is, thus, predicted that that in the healthy brain the ERP effects to time reference violations are caused by the *time frame* to which the verb morphology refers - and not by the tense value per se. If that is true, the P600 effect will occur if a time reference violation is made, also one that cannot be ascribed to tense. This can be done by comparing conditions in which past and non-past time reference are both expressed through present tense.

Method and results

Aphasia study

In the aphasia study, 11 Dutch agrammatic patients were tested in a sentence-completion paradigm on production of Past Imperfect, Present Perfect, and Present Imperfect, with 18 items per condition. In a mixed-effects regression analysis their average accuracy scores in the conditions with past reference past (15% on Past Imperfect correct and 28% on Present Perfect correct) were not significantly different ($z = 1.62$, $p > .1$). The average accuracy on Present Imperfect (46%) was significantly higher than on Past Imperfect ($z = -4.70$, $p < .001$) and on Present Perfect ($z = -3.21$, $p < .01$).

ERP study

In the ERP study, 32 healthy participants read sentences with auxiliaries followed by a participle or infinitive. The auxiliaries in the contrasts had the same (present) tense, but time reference values were manipulated. This means that any appearing effect cannot be attributed to tense, but has to be due to time reference. Verbs referring to the past, such as in: *De opa die zonet de peper heeft gemalen, . . .* ('The grandpa who a-minute-ago [has-ground] the pepper. . .') were contrasted with verbs referring to the non-past, such as in: *De opa die zonet de peper *gaat malen, . . .* ('The grandpa who a-minute-ago *will grind the pepper. . .'). These time reference violations evoked a P600 effect on the auxiliary.

Discussion

These studies teased tense and time reference apart and showed that the problems with time reference of verbs in agrammatic aphasia are not related to tense. Past time reference is impaired compared to present time reference, even when conveyed through a verb construction in present tense. The underlying problem is a deficit in referring to the past, as predicted by the PADILIH.

Healthy participants interpreted the past time reference of the Present Perfect already at the point of the auxiliary. When the present tense auxiliary cannot be used to refer to the past, a time reference violation occurs, reflected in the P600 effect. This outcome is similar to the one of Dragoy et al. (2012) for synthetic verbs and has been interpreted as a reaction to time reference violation by the verbs and not to a tense violation. It confirms that the healthy brain treats verb forms in past or in present tense in a similar way when they are used to refer to the past. Parallel to people with aphasia, non-brain-damaged people process verbs referring to the past differently from verbs that do not refer to the past.

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Time Reference in Spanish and Catalan Non-Fluent Aphasics

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Introduction

The vulnerability of tense in agrammatic aphasia has been established for an extensive array of languages both when it is marked by verbal morphology or adverbs (Chinese, Dutch, English, German, Hebrew, Indonesian, Italian, Palestinian Arabic, Turkish). However, the locus of impairment still remains under debate. Most hypotheses point towards a syntactic disruption (Friedmann and Grodzinsky's (1997) Tree-Pruning Hypothesis; Wenzlaff and Clahsen's (2004) or Burchert *et al.*'s (2005) Tense underspecification), or a morphosemantic one (Lee *et al.* 2008; Faroqi-Shah and Dickey 2009). Recent studies (Bastiaanse 2008; Nanousi *et al.* 2006; Lee *et al.* 2008; Bamyacil and Bastiaanse 2009; Martínez-Ferreiro 2010) have determined that far from general, the observed deficit is sensitive to tense differences with a clear asymmetry in between the past and the present forms. The present turns out to be less severely affected and its use is the preferred strategy for substitution independent of language or modality.

To account for these findings, Bastiaanse *et al.* (2011) formulate the Past Discourse Linking Hypothesis (PADILIH), in line with Avrutin's (2000) claim that discourse linking is impaired in Broca's aphasia. Present forms are spared opposition to past forms due to the fact that only the latter are discourse linked. However, this hypothesis entails further predictions: if the problem with tense is restricted to discourse linking, we expect non-past forms, i.e. present and future forms, to be spared or, at least, damaged to the same extent. Here we consider the predictions of such a hypothesis taking as empirical domain the results of the TART in two closely related languages pertaining to the Ibero-Romance group, namely Catalan and Spanish, and propose to weaken it to subsume the results discussed here.

Previous research in Ibero-Romance, including Catalan, Galician and Spanish data (Martínez-Ferreiro 2010), confirm the dissociation between present and past forms both in production and comprehension. However, the future is consistently found to be more impaired than the present across modalities. If we take production data alone, past tense errors amount to 30.5% while they decrease in the future (errors 14.1% errors) or, even more significantly, in the present tense where errors were scarce: 3.4%. There were no significant differences across languages. Errors in the production of tense involved

reverting to the same pattern: mostly to the present (62.8% of errors), the future (27.9% of errors) and, the past (9.3% of errors).

Methods

Participants

In order to obtain further data and to overcome for possible methodological effects on data collection, the TART (Bastiaanse, Jonkers and Thompson (unpubl.)) was adapted to Castilian Spanish and Catalan. Three native Spanish speakers and 7 Catalan native speakers with varying degree of L2 mastery in Catalan and Spanish respectively took part on the experiment. Subjects (6 males and 4 females), recruited in the Associació Sant Pau of Language Disorders of Barcelona, were diagnosed as Broca's aphasics and classified as agrammatics. Age ranged between 24 and 78 years with a mean age of 58.5.

Materials

The materials include both production and comprehension tasks. The experimental stimuli testing production were presented in the form of sentence completion with the visual support of 2 images depicting two situations: one, provided by the experimenter and one associated with the sentence to be completed. For both situations the main verb was provided both orally and in the written form. For the comprehension test, a sentence-picture matching paradigm was used. Subjects were required to select the picture that corresponded to the sentence read aloud by the experimenter.

Results

As illustrated in figure 1, Spanish and Catalan data samples confirm the hypothesized deficit with the past tense. This holds both for production and comprehension. In Spanish, simple present is correctly produced 80% of the time vs. 53.3% for the simple future and 41.7% for the simple past. Even if comprehension is better preserved, the same relative order of decreasing ratio of correct responses is documented (present 86.6% correct, future 78.3% correct and past 65% correct). The results from Catalan are slightly different. The future appears as the better preserved form in production (86.4% correct), followed by the present (76.4% correct) and finally the simple past (56.4% correct). This is mainly due to the abnormal behavior of two subjects, C03 and C04, who systematically substituted simple present by present continuous. These subjects only produced 52.5% instances of correct simple present sentences. The comprehension results, as in the case of Spanish show almost ceiling performance for the present (95.7% correct) with a percentage of correct responses as low as 67.1% for past entries. The future appears again in intermediate portions of the scale with 82.8% correct responses.
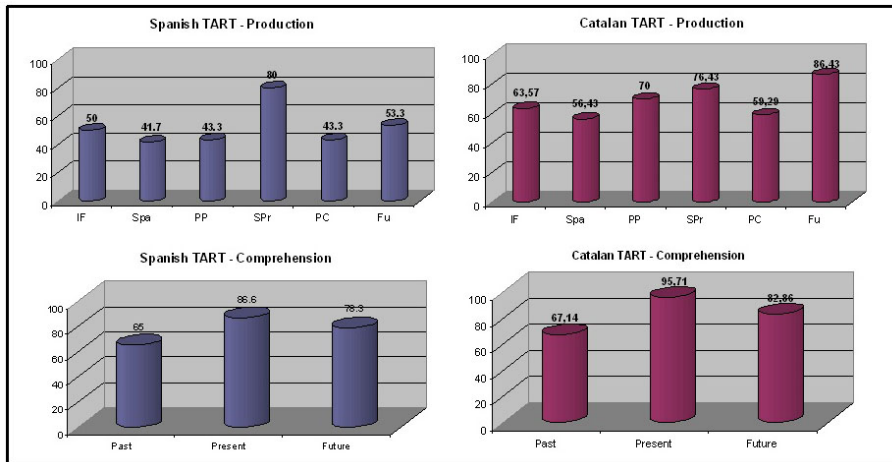
Figure 1: Spanish and Catalan TART results across modalities

Discussion

Reference to the past is impaired in Catalan and Spanish agrammatic speakers. Even if there is a dissociation between production and comprehension results, with the latter better preserved, the same conclusion holds across modalities. As expected by hypothesis, the present is the better preserved form. The difference is even more prominent if we analyze the substitution errors produced by the subjects. Most of them, consist of the substitution of the simple present by the present continuous. Consequently, there is no violation of the time frame, indicating that time reference is preserved as for present forms.

The case of the future is more controversial. According to the PADILIH (Bastiaanse et al. (2011), we would expect similar rates for present and future items. However, the future is more severely damaged not only in production but also in comprehension. These results call for an explanation. Frequency and morphological aspects may be seen as possible intervening factors.

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Comparing the Performance of German and Greek Aphasic Patients: The Effect of Syntactic Movement and Tree Hierarchy

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Introduction

Different theoretical accounts have been proposed to explain the range of symptoms in agrammatic aphasia. The Tree-Pruning-Hypothesis (TPH, Friedmann, 2001) postulates that syntactic trees in agrammatic performance are intact up to the Tense node but "pruned" further up. The Derived Order Problem hypothesis (DOP-H), on the other hand, postulates that agrammatics have problems with structures in which constituents have undergone movement (Bastiaanse & van Zonneveld, 2005, 2006; Dragoy & Bastiaanse, 2010).

Our still ongoing study aims at investigating the effect of (i) syntactic movement and (ii) syntactic hierarchy in sentence production in German and Greek aphasic patients' performance and, thus, evaluating the predictions of the TPH and DOP-H against a new cross-linguistic set of data from Greek and German aphasics.

The study

Participants

So far, three Greek and five German patients as well as 18 controls (10 Greeks, 8 Germans) have been tested. The German participants were Broca's aphasics suffering from a left CVA resulting in typical agrammatic speech. The Greek participants also all suffered from a left CVA. However, whereas two of them were characterized as Broca's aphasics with non-fluent speech, their spontaneous speech did not display the typical traits of agrammatism at the time of testing. The third patient was classified as an anomic patient with fluent speech.

Material

The material consisted of two experimental and a control condition:

Condition (i): -CP, +movement. Patients were tested on the production of *clitic doubling* in Greek and *object scrambling* in German. Both constructions

involve overt syntactic movement but do not target the CP-node. Following Alexiadou & Anagnostopoulou (1997), we assume that (a) clitic doubling is the Greek structural equivalent of object scrambling in German, (b) both clitic doubling and object scrambling do not target high positions in the syntactic tree (i.e. CP) but positions immediately above the VP boundary, and (c) scrambling in German is XP movement to [Spec, AgrOP] and clitic doubling in Greek is head movement to AgrO.

Condition (ii): +CP, +movement. Patients were tested on the production of *focus structures* in Greek and *topicalized structures* in German. Both derivations involve the highest nodes in the syntactic tree. In Greek, focus constructions (unlike topic structures) involve movement analyzed as an instance of Operator-movement to the Specifier position of the Focus Phrase (Tsimpli, 1995) immediately preceding TP (Rizzi, 1997). In German, topicalized constituents are moved to the Specifier position of CP (Haegeman, 1994).

Control condition (iii): -CP, -movement. We tested patients on structures with an SVO word order in Greek and German. These structures correspond to the thematic word order agent-action-theme in both languages. Although the basic word order in Greek is VSO, Tsimpli (1989) has argued that the purported basic word order is actually the result of V-to-T movement from the thematic SVO word order.

Method

Each condition contained 20 sentences. A training session aiming at familiarization with the experimental materials preceded the experimental task. In the test sessions, participants saw two pictures depicting different actions. First, the experimenter gave an example of the target structure using the first picture. Then, the participant was asked to produce the intended structure on his/her own by sticking as much as possible to the experimenter's example and using the second picture depicting a different action.

Predictions

The predictions for our study were the following:

1. If the deficit is *movement* related, similar performances in conditions (i) and (ii) are expected

2. If the deficit is *hierarchy* related, significantly lower performances in condition (ii) compared to condition (i) are expected, and

3. Better performance in the control condition (iii) is expected compared to conditions (i)/(ii)

Results

Controls showed a ceiling or near ceiling performance for all conditions. The number of correct responses of the aphasic participants is presented in Table 1.

Table 1: The patients' number of correct responses

	-CP, -movement *(control condition)*	-CP, +movement *(clitic doubling / object scrambling)*	+CP, +movement *(focus / topicalized structures)*
GERM1	11/20	5/20	0/20
GERM2	19/20	20/20	12/20
GERM3	17/20	19/20	4/20
GERM4	8/20	1/20	3/20
GERM5	2/20	2/20	3/20
GR1	19/20	17/20	14/20
GR2	13/20	6/20	6/20
GR3	20/20	2/20	3/20

Germans showed a heterogeneous performance: First, GERM1, GERM4 and GERM5 showed an overall impairment. Since these patients are agrammatic they may have even difficulties in producing structures with the canonical word order (control condition). However, their performance was not equally impaired in each condition. Notably, two of them showed lower performance on object scrambling and object topicalization compared to the the control condition, while they showed almost identical performance on the two experimental conditions (Wilcoxon test, $Z=.000$, $p=1$). Therefore, for these patients, the additional variable *CP* did not have an effect on their performance.

Second, GERM2 and GERM3 showed almost intact performance in the control condition as well as on object scrambling while their performance on object topicalization deteriorated (however, no significant difference between the two experimental conditions was found for these patients: Wilcoxon test, $Z=1,34$, $p=.18$).

With respect to Greeks, two (GR1 and GR3) showed ceiling or almost ceiling performance in the control condition while the performance of all of them was significantly lower in the production of clitic doubling and focus constructions (with the exception of patient GR1 whose performance on focus structures is slightly worse than on clitic doubling). Overall, all patients showed the same level of performance on clitic doubling and focus structures (Wilcoxon test, $Z=.45$, $p=.65$).

Discussion

Overall, we can tentatively (due to the small number of participants for each language up to now) conclude that the addition of the *CP* variable did not result in a significant deterioration in the performance in both groups of patients. We thus conclude that it is not the hierarchy of nodes that matters but the presence or absence of movement. Notably, the presence vs. absence of movement matters for non-agrammatic in addition to agrammatic patients. We, therefore, suggest that our findings can be better interpreted in terms of a non-hierarchcal procedural hypothesis, like DOP-H, which was nevertheless formulated to explain deficits in agrammatism, but it seems that it can capture a wide range of data coming from non-agrammatic patients too.

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