Poster Session 3: Syntactic Representations and Processes-1

84. Errors Patterns in Sentence Comprehension Among Malay Adults with Aphasia: A Case Series Study

A Razak R., A Aziz M., Hassan M.
Department of Audiology and Speech Sciences, Faculty of Allied Health Sciences, Universiti Kebangsaan Malaysia, Kuala Lumpur

Within the last three decades, individuals with aphasia have been observed to have difficulty understanding sentences despite having good performance in single word comprehension (Bastiaane, Edwards, Maas, & Rispens, 2003; Berndt, Mitchum, & Wayland, 1997; Caramazza, & Zurif, 1976; Hillis, 2002; Schwartz, Saffran, & Marin, 1980). These difficulties limit their ability to communicate and interact with people around them. The objective of this paper is to examine error patterns produced by Malay adults with aphasia in sentence picture matching. Five Malay adults with aphasia were given two sentence comprehension tasks: reversibility and complexity. The former contains 20 active and passive reversible sentences and the latter contains 26 sentences with increased sentence complexity. Five normal individuals were recruited as controls and were aged, education and L1-matched. Our findings showed that there were significant differences between the mean scores for reversible active vs. passive sentences for both groups, $F(1, 30) = 5.34$, $p < 0.05$, effect size = 0.352 and power of 0.56. Error patterns in the reversibility task consisted of lexical and thematic role assignment errors (mean=97.5%), thematic role assignment errors (mean=85%) and lexical errors (mean=75%). In the sentence comprehension task, normal adults (mean=25.7) performed better than adults with aphasia (mean=20.33). A two-way mixed (repeated measure) ANOVA was conducted to investigate effects between groups. It indicated that there were significant differences in the mean scores of both groups, $F(1, 10) = 6.45$, $p < 0.05$, effect size = 0.392 and power of 0.63. There were also significant differences observed in the mean scores for sentences with different numbers of arguments, $F(3, 30) = 117.04$, $p < 0.05$, size effect = 0.921 and power of 1.0. Results indicated that most comprehension errors were in the form of wrong argument structure and wrong thematic role mapping (41%, n=7), no response (29%, n=5), wrong verbs (18%, n=3). A case series presentation of the types of errors made by each individual Malay aphasic in the study will be presented. Implications for the management of sentence comprehension difficulties amongst the 5 aphasics will be discussed.

References
Bastiaane, R., Edwards, S., Maas, E., & Rispens, J. (2003) Assessing comprehension and production of verbs and sentences: The verb and sentence test (VAST). Aphasiology, 17, 49-73.
Berndt, R.S., Mitchum, C.C. & Wayland, S. (1997a). Patterns of sentence comprehension in aphasia: a consideration of three hypotheses. Brain and Language, 60, 197-221.
Caramazza, A. & Zurif, E. (1976) Dissociation of algorithmic and heuristic processes in language comprehension: evidence from aphasia. Brain and Language, 3, 572-582.
Grodzinsky. Y. (1995). A restrictive theory of agrammatic comprehension. Brain and Language, 50, 27-51.
Hillis, A.E. (2002). Sentence Comprehension Deficits: Independence and interaction of syntax, semantics and working memory. In The handbook of adult language disorders: integrating cognitive neuropsychology, neurology and rehablitation. 1st. ed. New York : Taylor & Francis Group.
Postman, W. A. (2004). Processing of complex sentences in a case of aphasia in Indonesian: Thematic vs. linear strategies, Journal of Neurolinguistics, 17, 455-489.
Schwartz, M. F., Saffran, E. M., & Marin, O. S. M. (1980). The word order problem in agrammatism. Brain and Language, 10, 249-262.

Presented by: **A Razak, Rogayah**

85. The Production and Comprehension of Grammatical Time Reference in Agrammatic Aphasia: A Cross Linguistic Study

Bastiaanse R. [1], Bamyaci E. [2], Hsu C. [2], Lee J. [3], Yarbay Duman T. [1], Thompson C. [3]
[1] University of Groningen, The Netherlands, [2] European Master's in Clinical Linguistics (EMCL), [3] Northwestern University, USA

Introduction
Data from Dutch (Bastiaanse, 2008), Greek (Stavrakaki & Kouvava, 2003) and Turkish (Yarbay Duman & Bastiaanse, 2009) suggest that verb inflection in agrammatic production is selectively impaired for reference to the past, raising the following questions:
• Is the selective deficit for reference to the past through grammatical morphology similarly impaired in languages with (1) a rich verb inflection paradigm (Turkish); (2) a poor verb inflection paradigm (English); (3) no verb inflection, but aspectual adverbs (Chinese)?
• Is comprehension of reference to the past selectively impaired as well?

For this study, simple past, present continuous and future were tested in English. In Turkish finite verbs were examined, rather than verb clusters (1), and in Chinese, freestanding grammatical morphemes were tested (2).

(1) adam   mektup   okuyor   okudu   okuyacak
       the man   a letter   [is reading]   read   [will read]
(2) zhe ge ren [zai du]   [du le]   [yao du]   yi fong sin
       the man   [is reading] read   [will read]   a letter

Methods
The Test for Assessment of Time Reference (TART: Bastiaanse & Thompson, experimental version) was used, which includes photographs of 20 verbs representing the action in past, present, and future. For the production test a sentence production priming paradigm was used, which involved prompting patients with the target verb form. A neutral form was added as a fourth condition for English (infinitive) and Chinese (neutral adverb + verb); Turkish has no neutral form. For comprehension, a spoken sentence-to-picture-matching test was used. For each language, 8 agrammatic patients and 10 control subjects were tested.

Results and Discussion
The control subjects scored maximally. The results for the agrammatic patients are shown in Figure 1. Two-tailed Wilcoxon-signed-rank tests were used for comparison. Only when $p < 0.05$ (*), a difference was accepted as reliable.
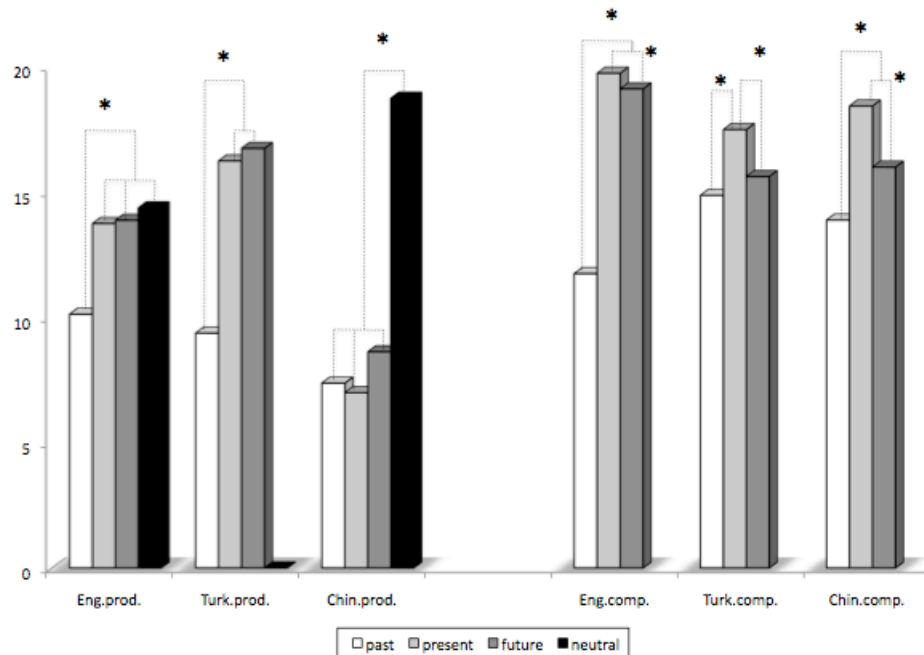
Figure 1: Mean number correct on the production (left) and comprehension (right) tasks in the three different languages (max. = 20). The broken lines represent the statistical comparisons (*p≤0.05).

Production: For English there is no difference between the neutral form and the present. For English and Turkish, past is more difficult than both present and future. For Chinese, the sentences with a neutral adverb are easier than those with an aspectual adverb referring to past, present and future. The latter three are equally difficult. Comprehension: For each language, reference to past and future is more difficult than to present. The past is more difficult than the future in English and Chinese, but not in Turkish.

Conclusion
Reference to the past by grammatical morphology is selectively impaired in both production and comprehension, regardless of the language. In Chinese production, however, present and future is relatively more severely impaired than in English and Turkish. It is not yet clear whether this is because in Chinese Aspect instead of Tense is used for time reference or whether aspectual adverbs are more difficult than verb inflections.

References
Bastiaanse, R. (2008) Production of verbs in base position by Dutch agrammatic speakers: Inflection versus finiteness. Journal of Neurolinguistics, 21, 104-119.
Stavrakaki, S., & Kouvava, S., (2003). Functional categories in agrammatism: Evidence from Greek. Brain and Language 86, 129–141.
Yarbay Duman, T. & Bastiaanse, R. (2009). Time reference through verb inflection in Turkish agrammatic aphasia. Brain and Language 108, 30‑39.

Presented by: **Bastiaanse, Roelien**

---

86. Treating Specific Verbs May Impede Generalization in Non-fluent Aphasia

Kempler D. [1], Goral M. [2]
[1] Emerson College, [2] Lehman College, CUNY

Aphasia treatment protocols often target specific items. For example, to improve action naming, a client will practice naming a pre-assembled list of items. The efficacy of the treatment is assessed by comparing pre- vs. post-treatment naming performance on this trained list. Generalization effects are assessed by comparing pre- vs. post-treatment performance on a comparable list of untrained items (e.g. Raymer & Ellsworth, 2002; Webster, Morris & Franklin, 2005). Studies have shown significant improvement on trained items alongside limited generalization to untrained items.

It is possible that we can increase generalization by focusing treatment on the general habit of producing verbs rather than practicing the production of specific verbs. To that end, we have compared two treatment protocols designed to improve verb production in people with non-fluent aphasia. In one protocol the participant produce specific verbs ("Specific Verb Training"). In the other protocol the participant was encouraged to produce appropriate verbs, but stimuli and responses were varied and multiple responses all semantically appropriate verbs were considered accurate ("Habit Training").

Methods
Two individuals with chronic non-fluent aphasia subsequent to unilateral left hemisphere stroke participated. Both participants' language production was non-fluent and agrammatic; both had relatively preserved auditory comprehension.

Treatment
Both participants received a total of 60 hours of treatment. Treatment was intense, averaging 7.5 hours per week. Both participants received a treatment block (30 hours) of drill-based therapy and a treatment block (30 hours) of informatively structured therapy. Drill-based treatment consisted of repetition, reading and picture description activities. Informative therapy consisted of language games that required exchange of new information (e.g., "go fish").

Participant 1 received therapy geared towards improving production of a specific list of 32 verbs (Specific Verb Training) in each treatment block; specific verb targets were practiced repeatedly. Participant 2 received similar treatment protocol but without a focus on specific verbs (Habit Training); a large variety of picture stimuli were used to elicit sentence production in both treatment blocks.

Pre- and Post-testing
Before and after each treatment block, the participants completed a 96-item action picture naming task and produced personal narratives.

Results and Conclusions
Participant 1 showed improved naming of the verbs practiced during treatment and little improvement on untrained verbs, regardless of treatment type (informative vs. drill). There was no change in narrative production, which remained very limited. Participant 2 demonstrated modest improvement on verb naming following the two treatment blocks as well as in narrative production (see figure 1). These findings suggest that therapy which aims to reinforce the habit of producing a general category (i.e., any relevant verb) rather than one that practices particular verbs, may lead to greater change in functional tasks such as narrative production.

References
Raymer, A. M., & Ellsworth, T. A. (2002). Responses to contrasting verb retrieval treatments: A case study. Aphasiology, 16, 1031-1045.
Webster, J., Morris, J. & Franklin, S. (2005). Effect of therapy targeted at verb retrieval and the realization of the predicate argument structure: A case study. Aphasiology, 19, 748-764.

Figure 1. After receiving therapy focussed on specific verbs, participant 1 improved in action naming, but not narrative production, as gauged by verb ratio in personal narratives (left panels). In contrast, after therapy focused on producing verbs generally ("Habit Training"), participant 2 showed no significant improvement in action naming but showed a clear increase in the verb ratio produced in narratives (right panels).

Presented by: **Kempler, Daniel**

87. Neural Correlates of Functional Category Learning and Recovery: An fMRI Study of Verb Inflection Production

Kielar A. [1], Fix S. [1], Bonakdarpour B. [1], Parrish T. [2], Thompson C. [3]
[1] Northwestern University, Aphasia and Neurolinguistics Research Laboratory, [2] Northwestern University, Department of Radiology, [3] Northwestern University, Aphasia and Neurolinguistics Research Laboratory, Department of Neurology

Introduction

Many individuals with agrammatic aphasia demonstrate impairments in production of functional categories (i.e. morpho-syntactic elements) such as verb tense and agreement (Benedet et al., 1998; Dickey et al., 2008; Lee et al., 2008). However, little is known about behavioral and/or neural patterns of functional category recovery. Thus, the goal of this research was to study the learning and generalization patterns associated with treatment of grammatical morphology and to examine associated pre and post-treatment neural patterns using fMRI.

Methods

An event-related fMRI design was used to examine verb inflection production in 14 healthy adults, and 5 patients with agrammatic aphasia who underwent functional category training. Production of verbs inflected for tense (V + -ed) and agreement (V + -s) was elicited using temporal adverbs (i.e. Yesterday, Nowadays), and the cue word "Say" was used to elicit production of verb stems. For example, the cue word 'yesterday' and the verb 'paint' were visually presented and the participants responded "painted". Both patients and normal controls performed overt and covert versions of the task.

Results

When activation of tense and agreement was contrasted with that of the stem condition normal participants recruited a widely distributed neural network involving the frontal (BA 44/47), temporal (BA 22) and parietal brain areas (BA 7 & 37). The exact pattern of activation varied with the demands of the production task. Although several regions in the anterior and posterior cortex were activated in both conditions, activation in the overt task extended more posteriorly into the right fusiform gyrus (BA 37), and bilaterally into the inferior and middle occipital regions (BAs 17, 18). Additionally, tense activated a greater number of brain areas than agreement, including inferior frontal (BA 47), cingulate (BA 24) and supra-marginal gyri (AB 40). For individuals with aphasia, the analysis revealed changes in brain activation coinciding with treatment effects. Patients who improved on the functional category inflection task showed a shift towards more posterior temporo-parietal areas (BAs 40/39 and 7) at post-treatment. The treatment related activation was also observed in the homologous right hemisphere language regions (BAs 40, 7, 44/45/46 and BA 6). One participant who failed to learn during treatment, showed no task related activation at post-treatment.

Conclusions

The results of this study indicate that in healthy adults inflecting verbs for grammatical morphology involves a distributed neural network in both right and left hemispheres. For agrammatic participants, results revealed changes in the neural activation associated with functional category treatment. However, the exact pattern of treatment related activation was contingent on the extent and the location of the lesion and reflected individual responses to the intervention.

References
Benedet, M. J., Christiansen, J. A., & Goodglass, H. (1998). A cross-linguistic study of grammatical morphology in Spanish and English speaking agrammatic patients. Cortex, 34, 309-336.
Dickey, M. W., Milman, L. H., & Thompson, C. K. (2008). Judgment of functional morphology in agrammatic aphasia. Journal of Neurolinguistics, 21, 35-65.
Lee, J., Milman, L. H., & Thompson, C. K. (2008). Functional category production in English agrammatism. Aphasiology, 22, 893-905.

Figure 1. Pre and post-treatment fMRI activation patterns in an agrammatic participant.

L **R**

☐ Pre-Tx

☐ Post-Tx
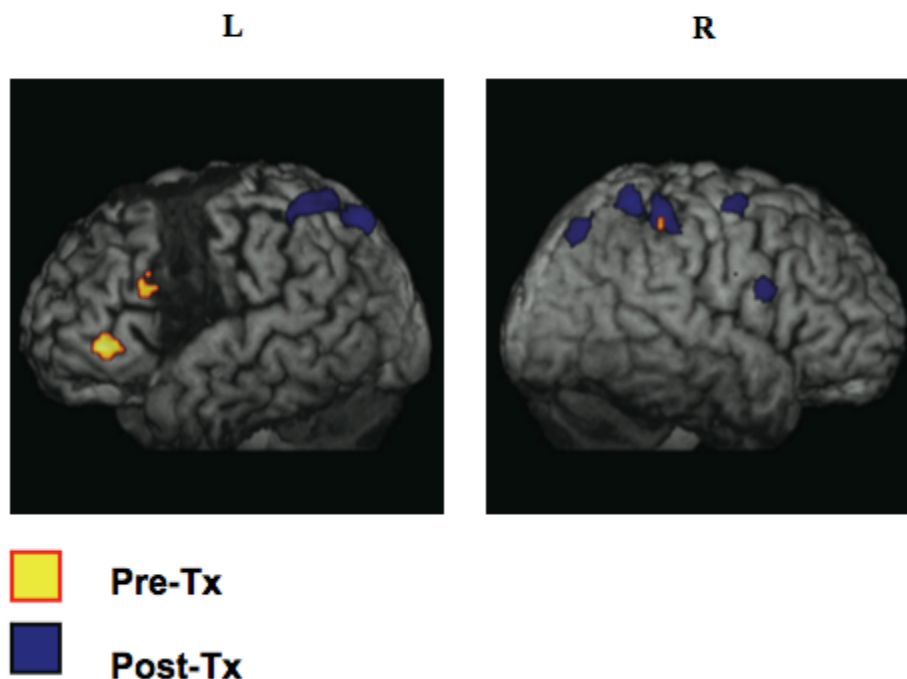
Presented by: **Kielar, Aneta**

---

88. Constrained Sentence Production in Semantic Dementia

Graham N. [1], Rochon E. [1], Tang-Wai D. [2], Black S. [3]
[1] Department of Speech-Language Pathology, University of Toronto, [2] Department of Medicine, University of Toronto, [3] L.C. Campbell Cognitive Neurology Research Unit, Sunnybrook Health Sciences Centre, Toronto

The speech of people with semantic dementia (SD) is usually described as fluent, well-articulated and syntactically correct, but empty and lacking in content words. Recently, closer scrutiny has suggested that syntactic processing may not be entirely normal in this disorder (Benedet et al., 2006; Patterson & MacDonald, 2006). This study examined syntactic production in SD using a constrained sentence production task which is designed to elicit specific syntactic structures (Caplan & Hanna, 1998).

The test comprises 20 items corresponding to 4 different sentence types: active, passive, dative, dative passive. For each sentence, subjects are shown a picture which illustrates the message to be conveyed and are provided orally with the verb; arrows indicate the people/things to be mentioned and a dot indicates which thing should be mentioned first. The measures used to assess each response include the adequacy of the thematic role assignment as well as the accuracy of the verb morphology. Verb morphology was scored as correct in 2 distinct ways: 1) with respect to the target syntactic structure and 2) with respect to the rules of the language.

This task was administered to 9 individuals with SD and 6 age- and education-matched control subjects. The performance of the control subjects was at or near the ceiling, as previously found by Caplan and Hanna. Individuals with SD were less accurate than controls at conveying thematic roles, but still managed to assign all of the roles correctly at least 80% of the time in all conditions. This group showed impaired performance on production of passive verb morphology in both the passive and dative passive conditions (see Table). Although subjects often failed to produce the target verb morphology required by the test, the vast majority of error responses were

syntactically correct. For example, the response "The dog is going to chase the cat" does not include the required passive verb morphology, but it is a correct English sentence.

These results confirm that syntactic production is disrupted in SD, in association with the semantic impairment. This group had difficulty with production of passive sentences, but still made few frank syntactic errors. The fact that the greatest difficulty was observed on the lower frequency sentence structures is in keeping with other studies demonstrating the pervasive effects of frequency on linguistic output in this syndrome. The findings are consistent with a view of the language system in which there is a high degree of interdependence between syntax and semantics.

References

Benedet, M., Patterson, K., Gomez-Pastor, I. & Garcia de la Rocha, M.L. (2006). Non-semantic aspects of language in semantic dementia: As normal as they're said to be? Neurocase, 12, 15-26.

Caplan, D., & Hanna, J.E. (1998). Sentence production by aphasic patients in a constrained task. Brain and Language, 63, 184-218.

Patterson, K., & MacDonald, M.C. (1996) Sweet nothings: Narrative speech in semantic dementia. In S. Andrews (Ed.), From Inkmarks to Ideas: Current Issues in Lexical Processing, (pp. 299-317). Hove, UK: Psychology Press.

Table

Results from assessment of constrained sentence production for each of the 4 sentence types. Accuracy on production of thematic roles is reported as a proportion because the number of thematic roles differs across conditions (active, passive: agent, theme; dative, dative passive: agent, theme, goal).

	Active	Passive	Dative	Dative Passive
Subjects with semantic dementia				
Proportion correct on thematic roles	0.9	0.8	0.9	0.8
Mean number of times that verb morphology was correct for the target sentence structure (max=5)	4.7	2.8	4.4	1.9
Mean number of times that verb morphology was syntactically correct (max=5)	5.0	4.8	5.0	4.7
Control subjects				
Proportion correct on thematic roles	1.0	1.0	1.0	1.0
Mean number of times that verb morphology was correct for the target sentence structure (max=5)	5.0	4.8	5.0	4.8
Mean number of times that verb morphology was syntactically correct (max=5)	5.0	5.0	5.0	5.0

Presented by: **Rochon, Elizabeth**

89. Chance in Agrammatic Sentence Comprehension – What Does It Really Mean? Evidence from Eye Movements of German Agrammatic Aphasics

Hanne S. [1], Sekerina I. [2], Vasishth S. [1], Burchert F. [1], De Bleser R. [1]
[1] *Linguistics Department, University of Potsdam, Potsdam, Germany,* [2] *Psychology Department, College of Staten Island, City University of New York, New York, USA*

Background
For various languages, it has been shown that aphasic individuals suffering from sentence comprehension disorders perform at chance level when confronted with non-canonical sentences (cf. Grodzinsky et al., 1999). The Trace Deletion Hypothesis (Grodzinsky, 1995, 2000) claims that chance performance is due to permanently impaired syntactic representations which force patients to rely on a guessing strategy when trying to comprehend non-canonical sentence structures. This assumption is incompatible with recent on-line investigations of sentence processing in aphasia (Caplan et al., 2007; Dickey et al., 2007) which revealed that patients' sentence processing routines do not always mirror aberrant strategies but exhibit divergences depending on whether comprehension has been successful or has failed; this points rather to a processing deficit explanation.

Method
We report an eye-movement study investigating controls' (n=8) and agrammatic aphasics' (n=7) on-line processing of German canonical (SVO) and non-canonical (OVS) sentences during a sentence-picture matching task. In addition to eye-movements, participants' accuracy and reaction times were measured. This enabled us to investigate on-line and off-line performance simultaneously, allowing for separate analysis of patients' correct and incorrect responses.

Results and Discussion
While patients' off-line pattern was compatible with the TDH (chance performance for non-canonical sentences and above chance performance for canonical ones), the on-line results constitute novel evidence against attributing aphasic individuals' chance performance with non-canonical structures to mere guessing. Instead, we found evidence for slow-down, intermittent sentence processing deficits and inefficient reanalysis abilities to be the underlying cause for aphasics' syntactic comprehension deficits.
In addition, we also demonstrate how linear mixed-effects models (Bates & Sarkar, 2007) can be used to characterize individual differences in the reaction times and eye-movements of aphasics and normals. We show that mixed-effects models allow us to treat patients as random factors (i.e., as samples from the population of aphasics) without giving up the assumption that each individual patient is likely to behave significantly differently from others.

References
Bates, D. M. & Sarkar, D. (2007). lme4: Linear mixed-effects models using S4 classes, R package version 0.99875-6.
Caplan, D., Waters, G., DeDe, G., Michaud, J., & Reddy, A. (2007). A study of syntactic processing in aphasia I: Behavioral (psycholinguistic) aspects. Brain and Language, 101, 103-150.
Dickey, M.W., Choy, J.J., & Thompson, C.K. (2007). Real-time comprehension of wh-movement in aphasia: Evidence from eyetracking while listening. Brain and Language, 100, 1-22.
Grodzinsky, Y. (1995). A restrictive theory of agrammatic comprehension. Brain and Language, 50, 27-51.
Grodzinsky, Y. (2000). The neurology of syntax: Language use without Broca's area. Behavioral and Brain Sciences, 23, 1-71.
Grodzinsky, Y., Piñango, M. M., Zurif, E., & Drai, D. (1999). The Critical Role of Group Studies in Neuropsychology: Comprehension Regularities in Broca's Aphasia. Brain and Language, 67, 134–147.

Non-canonical sentences: Patients' looks to correct picture (CP) and wrong picture (WP) for correct and incorrect responses
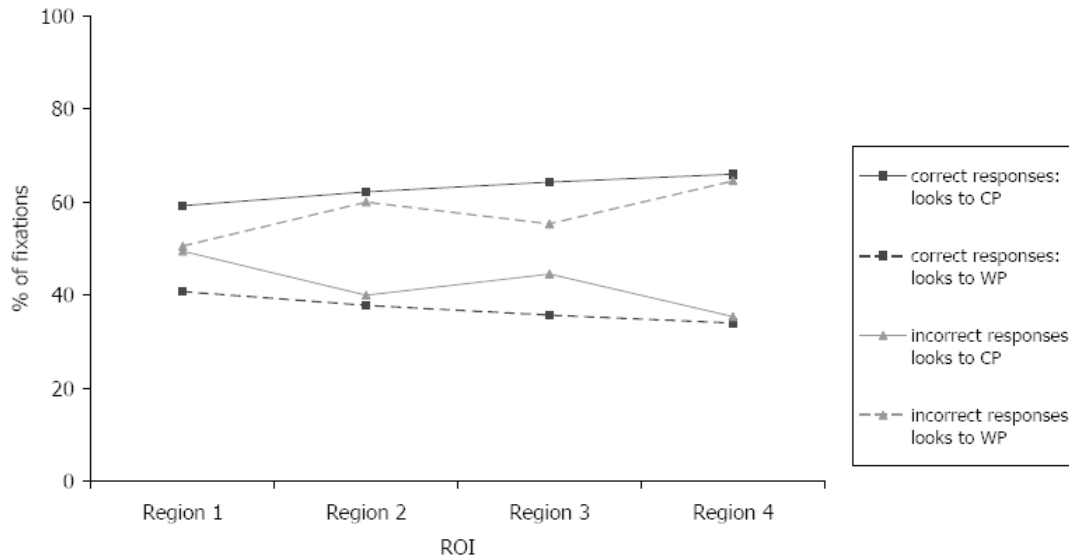
Presented by: **Hanne, Sandra**

---

90. Rehabilitation of a Pruned Syntactic Tree of an Italian Aphasic Patient

Pivi M. [1], Garzon M. [2], Cardinaletti A. [1], Meneghello F. [3], Chinellato P. [1], Semenza C. [4]
[1] Ca' Foscari University, Venice, [2] IRCCS San Camillo Hospital - Neurorehabilitation Department, Venice, [3] IRCSS San Camillo Hospital - Neurorehabilitation Department, Venice, [4] Neuroscience Department, University of Padua

This study describes the case of an Italian-speaking 35y.o. man who suffered from concussion in the left temporal lobe. He showed a fluent (par)agrammatic speech with a specific deficit for verbal tense inflection and function words – complementizers, prepositions and clitic pronouns.

In the framework of Friedmann's (2002) Tree Pruning Hypothesis (TPH), we conjectured that the deficit pruned his syntactic tree at T(ense)P. According to the TPH, all nodes above TP are also not accessible. The TPH suggests beginning the therapy from the highest node of the tree, C(omplementizer)P, which hosts interrogative items and subordinating conjunctions. Once the CP is reactivated, the reactivation of all the projections below would follow.

In order to verify if rehabilitation from lower nodes was effective, the patient was asked to transform 36 active declarative sentences into passive. After 8 hours of therapy, he retrieved passive constructions, but could not produce Wh-questions yet. Wh-questions were transformed into yes/no questions by omitting the Wh-item. Rehabilitation of lower nodes did not reactivate the higher ones.

For two weeks, 1 hour per day, we tested the patient with an elicitation of Wh questions task and a completion task with Wh-items, consisting of 81 questions with present tense and 91 questions with past tense. The easier Wh-items were chi, che cosa, perché (who, what, why), while he found it difficult to produce come, quando, dove, con chi, a chi (how, where, when, with whom, to whom).

To test the results of therapy, we prepared elicitation and completion tasks with embedded sentences, clitic pronouns

and present/past verbs, in order to check whether both CP and TP were reactivated. He had to complete 30 sentences with complementizers che, se, di, (that, whether, to) and 22 with interrogative items (quando, come, che cosa, dove, perché, quale, when, how, what, where, why, which). The patient made only 6 errors. The greater difficulty was with interrogative complementizer se, while he had no problem with declarative complementizers di, che. In the completion task with clitic pronouns, he made only 9 errors in 83 sentences. The major difficulties were with locative ci (3 errors), masc. sing. dative gli (2 errors), 2° plural dative vi (3 errors) and masc.plur. object li (1 error). In the completion task with past verbs, he made 21 errors in 118 sentences: he found it difficult to produce plural persons (7 errors with they, 4 with plural you, 5 with we). In the elicitation task with a past tense, he made only 1 error in 13 sentences. In the description task he produced 14 past verbs, 12 of which were correct.

In conclusion, the method suggested by the TPH led the patient to a great improvement in verb inflection and function words production. Rehabilitation from the highest node reactivated all nodes below.

References
Friedmann, N. (2002). Question production in agrammatism: The Tree Pruning Hypothesis. Brain and Language, 80, 160-187.

Presented by: **Pivi, Margherita**

---

91. Comprehension of Passive Sentences in a Bilingual Aphasic Speaker: Strategies Across the Language

Venkatesh M., Edwards S., Saddy D.
University of Reading, UK

Introduction
The competition model (Bates and MacWhinney, 1989) claims that there are many ways in which the form and functions in languages map and that there are a variety of cues available within a language which helps with direct mapping. In English, word order provides a cue to thematic role assignment in active but not passive constructions. The non-canonical word order in English passives is associated with reduced aphasic performance on passives compared with active constructions. Hindi, on the other hand, allows free word order. In passive constructions in Hindi, the instrumental case –se or the post position –ke dvaaraa follow the logical subject irrespective of its position in the sentence and the passive auxiliary jaa carrying the tense and agreement morphology follows the perfective form of the verb making surface morphological cues available.
We predict that if cues across languages are of uneven weight, a bilingual speaker may perform differently in the two languages on the classic active/passive paradigm. Both word order in English and –se (or –dvaara) in Hindi are obligatory in their respective languages and possibly provide different cue strengths for the interpretation of a passive sentence and appropriate thematic role assignment. If instrumental case –se in Hindi is stronger in cue validity and lower in cue cost than the word order cue in English, then differences in performance may be seen across languages in a bilingual speaker.

Method and Results
These preliminary data are taken from a larger study on verb production in Hindi and English. Here we examine one bilingual patient with non-fluent aphasia following a stroke, looking at the Bilingual Aphasia Test (Paradis, 1987) which offers comparison between two languages on equivalent rather than translated items. NG's overall scores on the syntactic comprehension section showed a marked contrast in the two languages: Hindi (70/87) and English (37/87) even though she learnt both Hindi and English at roughly the same time and in a similar manner. The most striking contrast was observed in the passive constructions. Classically, sentence comprehension for active English sentences was better than for passives. However, NG could process passives as well as active Hindi sentences.

Conclusion
We suggest that the cue provided by the morphological marker in the Hindi grammar was facilitative. A similar

facilitative cue was not available in English passives and the lexical cue (the PP) was insufficient or too costly to override the non-canonical word order. The instrumental case marker in Hindi, additionally, may provide a stronger cue in negative sentences. We are currently collecting further data to test the strength of these proposals.

References
Bates, E., & MacWhinney, B. (1989). Functionalism and the competition model. The crosslinguistic study of sentence processing. B. MacWhinney and E. Bates. Cambridge, Cambridge University Press.
Paradis, M. (1987). The assessment of bilingual aphasia. New Jersey, Lawrence Erlbaum Associates.

Table 1: NG's scores for sentence comprehension on the BAT

Sentence types	English	Hindi
Passive affirmative	0/8	7/8
Passive negative	1/12	9/12
Standard affirmative	10/13	13/13
Standard negative	4/12	6/12

Presented by: **Edwards, Susan**

---

92. Word and Sentence Production after Destruction of Broca and Wernicke Regions

Shankweiler D. [1], Conway Palumbo L. [1], Fulbright R. [1], Mencl W. [1], Van Dyke J. [1], Kollia B. [1], Thornton R. [1], Crain S. [2], Harris, K.S. [1]
[1] Haskins Laboratories, [2] Macquarie University

Introduction
Three cases of chronic nonfluent aphasia stemming from major stroke are described in which there was appreciable recovery of language production capabilities despite severe damage to both anterior and posterior language regions. We created new tools based on elicited production methodology (Crain & Thornton, 1998) with the aim of testing the limits of language competence. We asked: 1. Whether the elicited production method can reveal aspects of spared function not readily evidenced in spontaneous utterances or on standard aphasia tests? 2. Which language production abilities survive destruction of both Broca's region and Wernicke's region?

Materials & Methods
Targeted words and syntactic structures were elicited by sentence completion with supporting linguistic and non-linguistic context (see Crain, Ni, & Shankweiler, 2001). Targets were never modeled during the procedure. For verbs, visual and auditory contexts emphasized completed actions, targeting past tense forms. Standard aphasia tests were administered for comparison purposes. Lesion analysis is based on structural MRI scans.

Results
The three participants were agrammatic in production, but they differed in functional communication abilities. The elicitation method revealed more spared lexical and grammatical function than was evident in standard assessment procedures. Each participant showed partially spared ability to produce nouns, adjectives, and verb stems in context. Past tense inflections were frequently omitted; one participant produced none appropriately. Hence, stems and inflections were dissociable (see Kemmerer & Tranel, 2000). Concerning production of complex syntax, two participants showed partial success with the passive, but only one produced a full verbal passive that included a by-phrase. No participant produced a full relative clause, including the relative pronoun, but two individuals produced

reduced forms of subject relatives.

Conclusions
This application of elicited production methodology demonstrates possibilities of language production, lexical, morphological and syntactic, not evident in spontaneous production or by conventional aphasia tests. This was especially true for word retrieval by the most impaired participant. In all participants some grammatical capability survives destruction of Broca and Wernicke regions (see Indefrey et al., 2001), but there were large differences among them in residual function. To the extent that surviving lexical and grammatical functions are dependent on remaining left-hemisphere regions, they are mediated in these cases by surviving extrasylvian cortex.

References
Crain, S., Ni, W., & Shankweiler, D. (2001). Grammatism. Brain and Language, 77, 294-304.
Crain, S., & Thornton, R. (1998). Investigations in Universal Grammar: A Guide to Experiments on the Acquisition of Syntax and Semantics. Cambridge, MA: MIT Press.
Indefrey, P., Brown, C. M., Hellwig, F., Amunts, K., Herzog, H., Seitz, R.J., Hagoort, P. (2001). A neural correlate of syntactic encoding during speech production. Proceedings of the National Academy of Sciences, USA, 98, 5933-5936.
Kemmerer, D., & Tranel, D. (2000). Verb retrieval in brain-damaged subjects: 1. Analysis of stimulus, lexical, and conceptual factors. Brain and Language 73, 347-392.

Elicitation of Verbs, Nouns and Adjectives
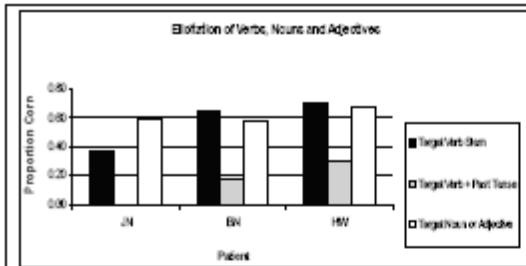
Note: Verb max score = 11, Noun/Adj max score = 12.

Elicitation of Passives and Relative Clause Sentences

	JN	BN	HW
Relative Clause (8)			
Subject Relative (4)			
Full Relative	0	0	0
Reduced Relative	0	2	4
Object Relative (4)			
Full Relative	0	0	0
Reduced Relative	0	0	0
Substitute subject relative	0	1	1
Passive (9)			
Full passive w/auxiliary	0	0	0
Passive w/auxiliary omitted	0	1	1
Adjectival passive	1	2	2
Sentence Total	1	6	8

Grammatical Complexity Composite Score

	JN	BN	HW
Verb Morphology Total			
Produce past tense inflection	1	2	4
Produce other inflection	3	3	1
Sentence Total			
Passive	1	3	3
Relative Clause	0	3	5
Grammatical Complexity Composite Score	5	11	13
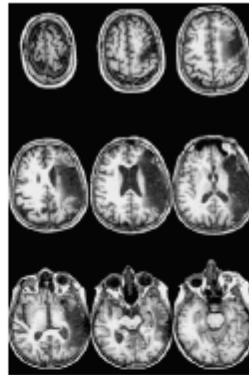
Participant JN
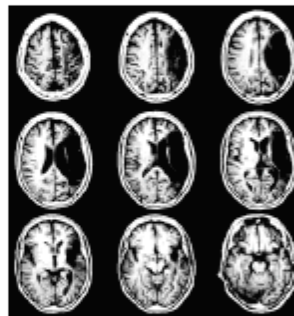
Participant BN
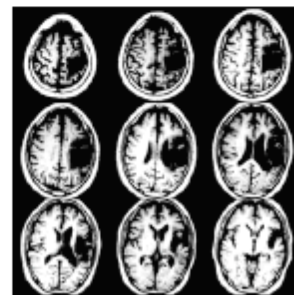
Participant HW

Presented by: **Shankweiler, Donald**

---

93. Predicting Outcomes for Linguistically-specific Sentence Treatment Protocols

Dickey M., Yoo H.
University of Pittsburgh

Introduction
Recent research focused on treatment of sentence-production deficits in aphasia has shown increasingly positive results. In particular, linguistically-motivated treatment protocols such as the Treatment of Underlying Forms (TUF: Thompson & Shapiro, 2005) have shown significant evidence of efficacy for agrammatic aphasic individuals. In a recent meta-analysis of existing aphasia treatment studies, TUF was shown to have the largest effect sizes of

existing sentence-production treatment protocols (Beeson & Robey, 2008). However, there is some variability in how successfully aphasic individuals treated using TUF acquire the sentences they are trained on, and in whether they will generalize to related but untrained forms. The current study analyzed existing treatment studies using TUF to examine what measures may be predictive of TUF treatment outcomes.

Method
The ANCDS Aphasia Treatment Evidence Tables (ANCDS, 2008) were surveyed to locate all published TUF treatment studies, a total of 14. These studies included language testing, treatment and generalization data from 30 unique individuals with aphasia. The magnitude of the treatment effect for each individual was estimated by comparing pre-treatment production accuracy for trained sentence types to post-treatment production accuracy for the same sentences. A treatment effect score was computed by subtracting the pre- from the post-treatment score. The generalization effect for each participant was estimated in a similar way, but targeting untrained structures, resulting in a generalization effect score.
Three different predictor measures were tested: aphasia severity scores (WAB AQ for all studies included), auditory comprehension scores (WAB auditory comprehension subtest), and complex sentence comprehension scores. Complex sentence comprehension scores were based on scores from assessments of comprehension of complex non-canonical sentences (object relative clauses, e.g.), either the Northwestern Sentence Comprehension Test or the Philadelphia Comprehension Battery for Aphasia.

Results
Correlation analyses examined which of the patient measures – severity, auditory comprehension, and complex sentence comprehension – were related to the treatment effect and generalization effect scores (see Figure 1). There was a modest-sized positive correlation between auditory comprehension scores and treatment-effect scores $(r[29]=.401, p<0.05)$, but no evidence of a correlation between treatment effect size and either severity or complex sentence comprehension (both $p>0.05$). There was also no evidence of correlations between any of these measures and generalization effects (all $p>0.05$)..

Discussion
The current results suggest that neither overall aphasia severity nor performance with complex sentence stimuli is a strong predictor of TUF treatment outcomes. These findings are surprising, especially if comprehension performance for complex sentences is indicative of relatively preserved access to the grammatical structures involved. However, general auditory comprehension does appear to be related to improved sentence production following TUF treatment. This finding suggests that TUF treatment effects are mediated by more general language-processing capacities, in addition to grammatically-specific processing abilities.

References
Beeson, P.M. & Robey, R.R. (2008, May). Meta-analyses of aphasia treatment outcomes: Examining the evidence. Invited platform presentation at the Annual Clinical Aphasiology Conference, Jackson Hole, Wyoming.
Thompson, C. K., & Shapiro, L. P. (2005). Treating agrammatic aphasia within a linguistic framework: Treatment of Underlying Forms. Aphasiology, 1021-1036.

Figure 1. Relationship between patient measures and treatment effects (lefthand graphs), generalization effects (righthand graphs).
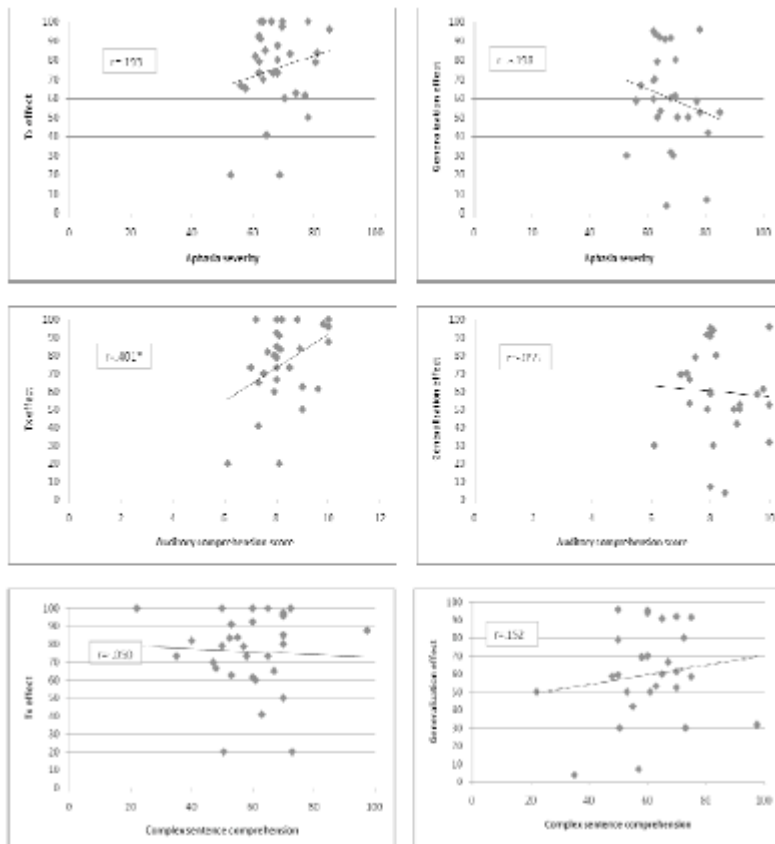
Presented by: **Dickey, Michael Walsh**

---

94. The assignment of gender in Greek: Evidence from aphasic and unimpaired adults

Nerantzini M.[1], Papadopoulou D.[2], Varlokosta S.[1]
[1] *University of Athens,* [2] *Aristotle University of Thessaloniki*

Background
Cross-linguistic studies on gender assignment in aphasia have shown contradicting results: a number of studies argue for relatively good performance (Luzzatti and De Bleser, 1996), while others observe severe difficulties (Hofmann et al., 2007). The present study investigates gender assignment in Greek adult native and aphasic speakers. According to Ralli (2002), gender in Greek is an inherent property of stems, which in certain cases can be predicted by semantics (sex) or morphology (inflectional class).

Method
Participants
Twenty adults, aged 19-57 years and four aphasic speakers, aged 37-74, were tested.

Materials

Two on-line tasks were employed. The first one consisted of 90 high-frequency nouns of the three gender values (masculine, feminine, neuter) and of all the inflectional classes. Each noun was presented in the nominative and in the accusative or genitive case. The other task included 60 pseudonouns with ambiguous or unambiguous suffixes, as far as gender marking, in the nominative case.

Procedure

Both tasks were timed. The nouns were presented orally one-by-one and the participants had to decide on the gender of the word they heard by pressing one of three buttons on the keyboard, which were pre-specified for each gender value.

Predictions

Within Ralli's approach, regarding words, lower accuracy rates and higher RTs are expected for aphasic than for unimpaired participants. Furthermore, both groups' accuracy or RTs on gender assignment will not depend on the case value of the noun. As for pseudonouns, the unimpaired subjects' responses will depend on the inflectional paradigm, as this is encoded on the inflectional suffix. On the other hand, if aphasic speakers have access to the lemma but not to the inflectional paradigm, they should provide mixed responses for all pseudonouns.

Results

We found that although the unimpaired adults had overall high accuracy, they were less accurate with masculine nouns marked for the accusative case than with those marked for nominative. Moreover, they had slower RTs with non-nominative cases than with the nominative case for all gender values. For pseudonouns, we found that gender assignment depended on the inflectional suffix for unambiguous cases, whereas for the ambiguous cases all possible gender values were yielded. For aphasic speakers, we found that they had similar patterns of responses for words compared to unimpaired speakers but lower accuracy rates. Moreover, higher RTs were observed. As for pseudonouns, we found that they did not rely on morphological cues to assign gender values.

Discussion

We argue that although aphasic speakers have access to the word lemma in their mental lexicon, given their relatively good performance on nouns, they seem to have severe difficulties with the morphological component of the lexicon since inflectional suffixes do not seem to guide them in the assignment of gender in pseudonouns. Given that the accuracy rate level for words is relatively high, but RTs are very slow, we claim that the deficit that aphasic speakers suffer from is not a deficit at the representational level but at the level of lexical access.

References

Hofmann, J., Kotz, S., Marschhauser, A., von Cramon, D.Y., & Friederici, A. 2007. Lesion-site affects grammatical gender assignment in German. Neuropsychologia 45, 954–965.
Luzzatti, C. & DeBleser, R. 1996. Morphological processing in Italian agrammatic speakers: eight experiments in lexical morphology. Brain and Language 54, 26-74.
Ralli, A. 2002. The role of morphology in gender determination: Evidence from Modern Greek. Linguistics 40/3, 519-551.

Presented by: **Despoina, Papadopoulou**

---

95. Grammatical Gender Information: Where is it Stored and When is it Accessed?

Biran M. [1], Friedmann N. [2]
[1] Tel Aviv University, Haifa University, Loewenstein Rehabilitation Center, [2] Tel Aviv University

Lexical-syntactic information – syntactic information stored in the lexicon, is an interface between lexical retrieval and sentence construction. In this study we focused on one type of lexical-syntactic information: grammatical

gender of nouns. Unlike natural gender of animate nouns, grammatical gender of inanimate nouns has no relation to their meaning, and is an idiosyncratic property of each noun.

We examined gender information for 14 Hebrew-speaking individuals with aphasia – 4 were diagnosed with agrammatism, and 10 with anomia: 2 had a lexical-semantic deficit, 3 a lexical-phonological deficit, and 5 a phonological output buffer deficit. The participants' grammatical gender knowledge was assessed using tasks of verb or noun completion in sentences, grammaticality judgment of phrases, and verb agreement in sentences produced to a given verb.

The main research questions we asked and their results were:

(a) Where in the lexical retrieval process is grammatical gender information stored?

We found preserved grammatical gender information for 3 participants with agrammatism, and for the 8 participants with a lexical-phonological and a phonological buffer deficits, indicating that gender information is encoded separately from sentence-level syntax, and separately from the phonological lexicon or the phonological buffer. Gender might be stored in the semantic lexicon, or in a separate syntactic lexicon, located prior, or in parallel, to the phonological lexicon.

(b) Can conceptual gender information be preserved when grammatical gender information is impaired?

For 3 participants, we found a dissociation between preserved conceptual gender information and impaired grammatical gender information, indicating that the semantics of animate nouns can assist when grammatical gender information is inaccessible.

(c) Is grammatical gender information always accessed or only at the sentence- or phrase level, when agreement is required?

Hebrew-speakers were found not to have gender information when failing to retrieve a word (Friedmann & Biran, 2003; Gollan & Silverberg, 2001), unlike many other languages in which speakers were found to have gender information about a word, even when their phonological information about it was incomplete (Kulke & Blanken, 2001, and many others). One explanation for this difference between languages might be that grammatical gender is only accessed when it is needed, i.e., in a syntactic context that includes an agreement of the noun, which is not necessary in bare noun retrieval in Hebrew. We examined gender information in the context of sentences, and found that grammatical gender information is accessed for subjects at the sentence-level even when it is not accessed at the single-word level.

The knowledge about grammatical gender information and about possible deficits in it can assist in diagnosis and treatment for each individual with aphasia, according to her deficit, and suggests new insights with respect to the theoretical model for the access of syntactic information in the lexicon.

References

Friedmann, N., & Biran, M. (2003). When is gender accessed? A study of paraphasias in Hebrew anomia. Cortex,39,441-463.

Gollan, T. H., & Silverberg, N. B. (2001). Tip-of-the-tongue states in Hebrew-English bilinguals. Bilingualism: Language and Cognition,4,63-83.

Kulke, F., & Blanken, G. (2001). Phonological and syntactic influences on semantic misnaming in aphasia. Aphasiology,15,3-15.

Presented by: **Biran, Michal**

96. Performance of Agrammatic and Non-aphasic Persons in Face-to-Face- versus Computer-Mediated Communication

Springer L.
School of Logopedics, University Hospital Aachen, Germany

Introduction

Impairments associated with agrammatism are generally considered to result from problems with syntax and/or morphology, although the exact nature of the syntactic deficit remains unclear (e.g. Beretta, 2008). Agrammatism seems to vary both in linguistic structure and underlying mechanisms of phrase structure generation according to the time of occurrence during the course of aphasia (cf. Springer et al., 2000; Saur et al., 2006). Based on the fact that agrammatic utterances show variant symptoms, the research aim was to investigate which factors impact language usage. This study follows a media-specific hypothesis, which refers to the concept of adaptation. It claims that the variation in agrammatic symptoms doesn't directly mirror the basic syntactic disorder, while showing adaptation to different interactive and media-specific demands. Therefore, the present study compares the impact of interactivity and modality-specific conditions on formulation in persons with chronic agrammatism and non-aphasic speakers (Springer, 2006).

Methods

This experimental study sets Face-to-Face dialogues against Computer-Mediated-Communication and non-interactive oral and written tasks in eight German-speaking agrammatic and eight non-aphasic persons. An ANOVA for repeated measures was performed on MLU and mean percentage of different syntactical and lexical parameters (finite phrases, complete, subordinated sentences, pauses and repairs within phrases as well as percentage of closed class words, type-token-ratio for nouns TTR-N and verbs TTR-V) with interactivity (interactive versus mono-active), modality (oral versus written) and group (agrammatics versus non-aphasic participants) as factors.
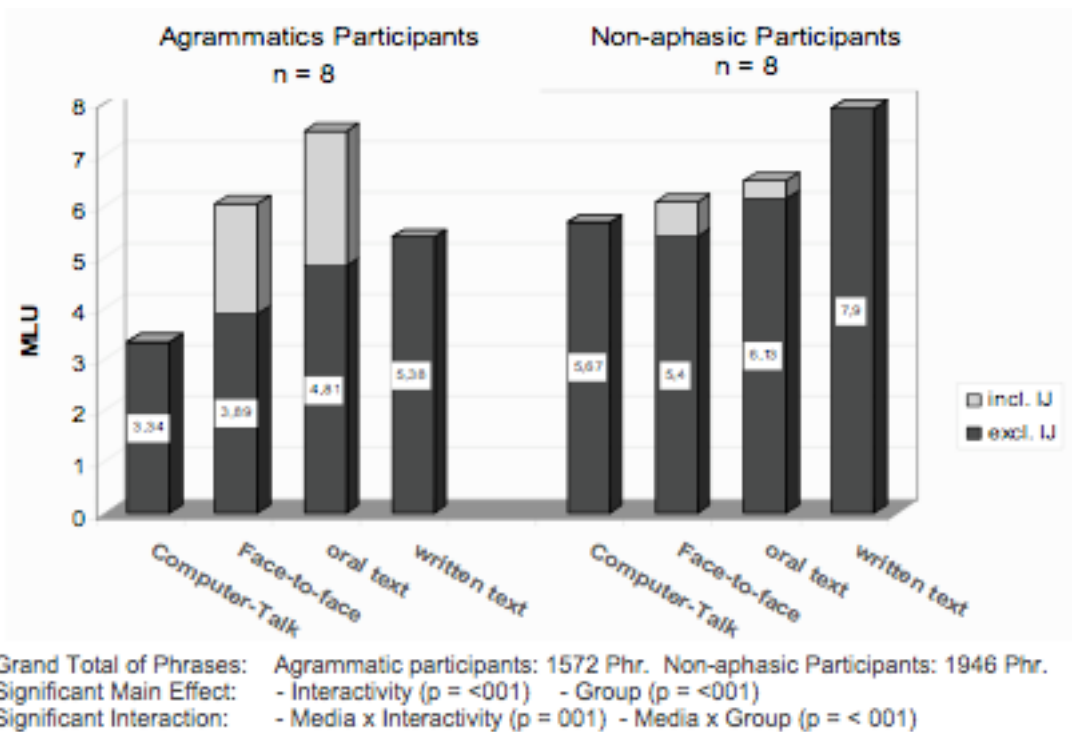
Results

The results of the study show that both interactive and media-specific factors impact the language performance in agrammatics and normal speakers. As expected, the agrammatic group differs significantly from the non-aphasic persons for most of the syntactic parameters. However, both groups show similar adaptation patterns with respect to communicative and modality factors. Main features seem to be the interactivity with the interlocutor and the visible, permanent and simultaneously presented language signs in written texts, which support the working memory and allow for repeated processes of reformulation. Actually, with most of our subjects we found a significant difference between the complexity of phrase and sentence structures and lexical variability in the written reports compared to Computer-Talk and Face-to-Face-Dialogues.

Conclusion and Perspectives

The consequences for communication of agrammatic persons vary according to the media-specific practices, contexts and participants present in a setting, and according to how interlocutors handle the situation. Computer-Mediated-Communication (CMC) provides possibilities for remote communication, even for patients suffering problems of sentence production, and thus offers the chance of greater independence. To enable aphasics to meet others over physical distances while protecting their privacy in an insular virtual community, a web-based Chat-tool called SOCRATES was developed.

References

Beretta, A. (2008). Disorders of Syntax. In: Stemmer, B. & Whitaker, H.A. (Eds.). Handbook of the Neuroscience of Language. pp. 155-163. Amsterdam/Boston: Elsevier

Saur, D., Lange, R, Baumgärtner, A., Schraknepper, V., Willmes, K., Rijntjes, M., & Weiler, C. (2006). Dynamics of language reorganization after stroke. Brain, 129, 1371-1384.

Springer, Luise (2006): Medienspezifische Sprachperformanz, Idstein: Schulz-Kirchner.

Springer, L., Huber, W., Schlenck K.J., & Schlenck C. (2000). Agrammatism: Deficit or compensation? Consequences for aphasia therapy. Neuropsychological Rehabilitation, 10 (3), 279-309.

Agrammatics Participants n = 8 | Non-aphasic Participants n = 8

MLU values shown: Agrammatics — Computer-Talk 3,34; Face-to-face 3,89; oral text 4,81; written text 5,38. Non-aphasic — Computer-Talk 5,67; Face-to-face 5,4; oral text 6,13; written text 7,9.

Legend: □ incl. IJ ■ excl. IJ

Grand Total of Phrases: Agrammatic participants: 1572 Phr. Non-aphasic Participants: 1946 Phr.
Significant Main Effect: - Interactivity (p = <001)   - Group (p = <001)
Significant Interaction: - Media x Interactivity (p = 001) - Media x Group (p = < 001)

Presented by: **Springer, Luise**

---

97. On Applying the Relational and Accessibility Hierarchy to Oral Sentence Production of Aphasic Clients

Stark J., Pons C., Fonyad G.
Departent of Linguistics, Austrian Academy of Sciences

Introduction
In language typology studies on universal grammar, the relational hierarchy (Perlmutter & Postal, in Pullum, 1977) and the accessibility hierarchy (Keenan & Comrie, 1977) have been
applied to characterize the order of occurrence of noun phrases, i.e. complements in the production of various syntactic constructions. The relational hierarchy is interpreted by
Perlmutter and Postal in the following way:

S < DO < IO < OO (= oblique objects)

where S (=subject) 'has precedence over' or 'outranks' the DO (=direct object) and so on. The accessibility hierarchy relates to the relative accessibility to relativization of noun phrase position in simple main clauses in universal grammar, whereby '>' means 'is more accessible than':

S > DO > IO > OBL (oblique) > GEN(genitive) > OCOMP(object of comparative)

Departing from these hierarchies, the aim of this explorative study is to determine whether they are adhered to in orally producing sentences by severely impaired aphasics of various types: Do the sentences produced by clients presenting with the various aphasia types reflect the order of occurrence expected by a version of this hierarchy, namely: S > DO > OOC (=other obligatory complements), where '>' means more accessible than?

Methods
Transcribed data from an oral sentence production task (n= 80 items) to picture stimuli from three non-fluent (AD, EK, FB) and three fluent aphasic clients (WG, EB, EH) were analyzed in terms of the presence of the obligatory complements and their ordering in relation to the verb (SVO) in main clauses.

Results and Discussion
With regard to the accessibility hierarchy, an analysis of the obligatory complements which were produced (+) and omitted (-) are presented in Table 1 for the possible structures.

Client	Aphasia Type (AAT)	S- * DO+	S+ * DO-	S+ * DO+ * OOC-	S+ * DO- * OOC-	S+ * DO+* Vinf.
AD (♂)	Broca's	1	3	2	1	5
EK (♀)	Broca's	2	7	3	2	16
FB (♂)	Global	2	6	-	1	9
WG (♂)	Conduction	-	2	5	-	-
EB (♂)	Wernicke's	1	14	-	1	1
EH (♂)	Anomic	-	13	3	3	-

Table 1: Omission of obligatory complements according to target sentence structure

The nonfluent aphasics' (EK and FB) most prevalent error type relates to the ordering of the verb in relation to the DO: SVO →SOV. This we assume to be due to impaired lexical retrieval and not to movement errors. Client AD produced fewer errors, however, he was less fluent than EK. The two Wernicke's clients show a similar pattern. The direct object is omitted most by these two clients. Client EK and FB also omitted the DO, but to a lesser extent.

Overall, even the utterances produced by severely impaired aphasic clients to picture stimuli appear to adhere to the relational and/or accessibility hierarchy. However, due to the severity of the oral sentence production impairment, it is often difficult to determine the target sentence. Those examples are not considered.

In summary, application of these hierarchies to aphasics' oral sentence production data is useful with respect to analyzing specific linguistic entities. They provide a framework for addressing the accessibility of subject, direct object and other complements. However, psycholinguistic counterparts such as conceptual accessibility (cf. Bock & Warren, 1985) should also be considered when assessing aphasic language production.

References
Bock, J. K. & Warren, R.K. (1985). Conceptual accessibility and syntactic structure in sentence formulation. Cognition, 21, 47-67.
Keenan, E. & Comrie, B. (1977). Noun Phrase Accessibility and Universal Grammar. Linguistic Inquiry, 8, 1, 63-99.
Pullum, G. (1977). Word order universals and grammatical relations. In: P. Cole & J. Sadock,(Eds.), Syntax and Semantics 8: Grammatical Relations. New York: Academic Press, 249-277.

Presented by: **Stark, Jacqueline Ann**

98. Verb-Form Regularity Facilitates Copula Verb Production in Spanish Agrammatism

O'Connor Wells B. [1], Obler L. [1], Goral M. [2]
[1] CUNY Graduate Center- 365 Fifth Avenue, New York, NY 10016, USA, [2] Lehman College- 250 Bedford Park Blvd., Bronx, NY 10468, USA

Introduction
Although numerous factors have been proposed to explain agrammatism and its cross-linguistic manifestation, none have been able to fully elucidate this disorder(see Menn & Obler, 1990). In a previous study (O'Connor et al., 2007)we reported that verb-form regularity predicted verb production in two Spanish-speakers with agrammatic aphasia, while word frequency did not. In the current study,we compared the effects of tense-aspect frequency,verb-form regularity and semantic obligatoriness on verb production in agrammatism. Again, we chose the Spanish dual-copula system because its two copula verbs: ser and estar (be in English), differ semantically, as well as in verb-form regularity.
We asked: Which factor best facilitates verb production in agrammatism: tense-aspect frequency, form-regularity or semantic obligatoriness?

Methodology
Six sentence types were created to compare these three factors:
1) High Tense-Aspect Frequency/Low Regularity (ser in present tense)
2) High Tense-Aspect Frequency/High Regularity (estar in present tense)
3) Low Tense-Aspect Frequency/Low Regularity (ser in imperfect past tense)
4) Low Tense-Aspect Frequency/High Regularity (estar in imperfect past tense)
5) High Tense-Aspect Frequency/High Semantics (sentences requiring either ser or estar in the present tense and result in a semantic change)
6) High Tense-Aspect Frequency/Low Semantics (sentences allowing a choice of either ser or estar in the present tense and do not result in a semantic change)
Participants were asked to complete 130 sentences with the correct verb-form.
E.g., "¿Donde _____ la pelota?" (está)- "Where is the ball?"

Participants
Four Spanish-speaking participants with agrammatism were tested. All had suffered left-frontal strokes at least two years prior to this study and were judged agrammatic based on the effortfulness of their spontaneous speech, short phrase-length, high substantive-word use, omission of functors, and relatively good comprehension. Twelve Spanish-speaking controls were matched for age and relative socio-economic status.

Results and Conclusions
Participants with agrammatism made markedly more errors on this task (60% accuracy) than control participants (95% accuracy), thus reinforcing the previous study's finding that despite high frequency in daily usage, ser and estar are not resistant to agrammatism. Participants with agrammatism made significantly more errors on sentences that required the irregular ser (47% accuracy) than on those requiring the highly regular estar (79% accuracy). Furthermore, they chose estar more often (59% of the time), than ser (41%) when copula verb choice was allowed, contra the control participants (34% estar and 58% ser; p= .05). With respect to tense-aspect frequency, participants with agrammatism performed with higher accuracy on the frequent present tense (71% accuracy) than on the less-frequent imperfect past tense (56% accuracy) and had lowest accuracy on the ser verb in the past, as revealed by a significant tense by verb-type interaction in a binary randomized block design (p =.001). The results suggest that verb-form regularity facilitates copula verb production in agrammatism.

References
Menn, L., & Obler, L. K. (1990). Agrammatic aphasia: Cross- language narrative sourcebook. (vol. 1-3).
Amsterdam: John Benjamins.

O'Connor, B., Obler, L. K., & Goral, M. (2007). The importance of verb form-regularity in agrammatism. Brain and Language,103, 1-2, 29-30.
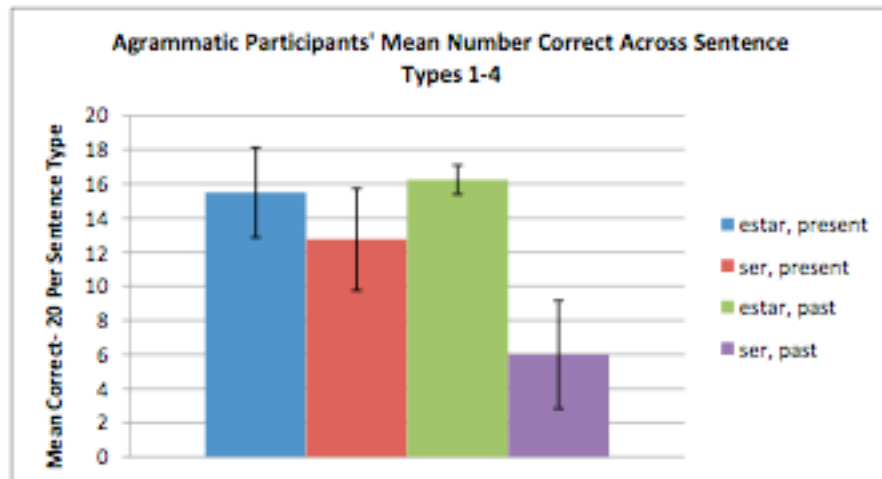
Presented by: **O'Connor Wells, Barbara**

---

99. Double Dissociation between Tense and Agreement in an Arabic-Speaking Fluent Agrammatic Patient

Al-Kaabi M. [1], Idrissi A. [2], Béland R. [3]
[1] New York University / United Arab Emirates University, [2] United Arab Emirates University, [3] Université de Montréal

Statement of the Problem
Case studies in Hebrew and Arabic showed that tense inflection was harder than agreement inflection for agrammatic patients in oral production (Friedmann & Grodzinsky 1997; Friedmann 2001; Tissen et al. 2007). Recent studies revealed that this dissociation was found in both oral production and grammaticality judgment in German (Wenzlaff & Clahsen 2004), Moroccan Arabic (Diouny 2007), Dutch (Kok et al. 2007), and English (Clahsen & Ali 2009). We report results from an Arabic-speaking fluent aphasic whose performance on sentence completion and grammaticality judgment tasks displays impairment with verbal inflections. We found that the patient was more impaired in tense than agreement in production. The opposite pattern characterized his performance on grammaticality judgment.

Methods
Patient. MT is a 56 year-old male native speaker of Jordanian Arabic. He had a stroke that caused him an acute left parieto-occipital infarction. He was initially diagnosed as global aphasic with cognitive impairment. His speech was then non-fluent, and his naming and repetition impaired. His oral reading was good but showed paraphasias. Two months post-onset, MT's performance improved drastically.

Stimuli and Procedure. We used grammaticality judgment and sentence completion tasks to investigate tense/agreement dissociation. The grammaticality judgment task involved 192 sentences, 96 grammatical and 96 ungrammatical. Within each set, 48 tested tense and 48 involved agreement. The sentence completion task consisted of 66 sentences made of two clauses, the second of which lacked the verb that MT was asked to provide. In this task 36 sentences tested tense inflection and 30 targeted agreement inflection.

Results. The results obtained show that scores in grammaticality judgment were significantly lower for agreement

(57/96) than for tense (86/96), (Chi2=20, p =.0001). By contrast, in sentence completion, scores were significantly lower for tense (11/36) than they were for agreement (27/30) (Chi2=23, p = .0001).

Conclusion
The present findings strongly support the proposal that tense and agreement can be independently impaired, not only across agrammatic patients (Burchert et al. 2005), but also across tasks/modalities within a single patient. These findings also pose a serious challenge to any purely syntactic/structural account of agrammatism, such as Friedmann & Grodzinsky's Tree-Pruning model and Wenzlaff & Clahsen's Tense Underspecification Theory.

References
Burchert, F., Swoboda-Moll, M., & De Bleser, R. (2005) Tense and agreement dissociations in German agrammatic speakers: underspecification vs. hierarchy. Brain and Language, 94, 188-199.
Clahsen, H. & Ali. M. (in press). Formal features in aphasia: Tense, agreement, and mood in English agrammatism. Journal of Neurolinguistics.
Diouny, S. (2007). Tense/agreement in Moroccan Arabic: The Tree-Pruning Hypothesis. SKY Journal of Linguistics, 20, 141-169.
Friedmann, N. & Grodzinsky, Y. (1997). Tense and agreement in agrammatic production: Pruning in the syntactic tree. Brain and Language, 56, 397-425.
Friedmann, N. (2001). Agrammatism and the psychological reality of the syntactic tree. Journal of Psycholinguistic Research, 30, 71-90.
Kok, P., Doorn A, & Kolk, H. (2007). Inflection and computational load in agrammatic speech. Brain and Language, 102, 273-283.
Tissen, A., Weber, S., Grande, M., & Grünther, T. (2007) The 'tree-pruning hypothesis' in bilingualism. Aphasiology, 21, 548-557.

Presented by: **Idrissi, Ali**

Poster Session 3: Phonology, Phonetics and Acoustics-2

---

100.   Influence of Word Stress in Patients with Apraxia of Speech

Aichert I., Ziegler W.
Clinical Neuropsychology Research Group, Munich

Introduction
Several factors are known to influence the error pattern of patients with apraxia of speech (AOS), e.g., word position, syllable structure, and word length (e.g., Odell et al., 1990; Ziegler, 2005). Though rhythm-based treatment methods have proved successful (e.g., Wambaugh & Martinez, 2000), the impact of word stress on apraxic speech has been neglected so far.
In the present study, we investigated the influence of word stress on error production in German patients with AOS. We compared two-syllabic words with stress on the first syllable (trochaic words) with words stressed on the second syllable (iambic words).

Method
The materials consisted of 48 two-syllabic, low-frequency words with trochaic and iambic stress pattern. Besides words with simple CV and CVC structures (e.g., 'Puma, engl. Puma vs. Me'nü, engl. menu) we also included words with complex syllables in the stressed word position (e.g., 'Plastik, engl. plastic vs. Kon'takt, engl. contact).
Each word was produced twice in a repetition task. The words were analysed with respect to correct / incorrect productions. Errors were classified as segmental (i.e., phonetic distortions, phonemic errors) and prosodic (i.e.,

intersyllabic pauses, phoneme lengthening), respectively. Furthermore, we also evaluated segmental errors on the word-initial syllable.

In the context of a larger-scale investigation we examined 42 patients with AOS in different clinical institutions in Germany. Twenty patients have finally been included in the study.

Results

First we compared all trochaic and iambic words irrespective of their syllable structure. The patients produced significantly more segmental and prosodic errors on iambic than on trochaic words (Chi2 = 15.99; p < .001, for segmental errors; Chi2 = 29.93; p < .001, for prosodic errors; see also figure 1). Whereas the complex iambic words turned out to be the most error-prone items, trochaic words with a simple CV structure proved to be easiest.

A further analysis which included only the words with simple syllable structure revealed a higher error rate on the word initial syllable for the iambic words as compared to the trochees (Chi2 = 6.77; p < .01).

Discussion

The present study showed an influence of word stress on the error pattern of patients with AOS. Trochaic words were produced with less segmental and prosodic errors compared to iambic words. Furthermore, the patients seem to have particular problems to accurately produce the initial syllable of iambic words. It is assumed that the regular metrical pattern in German, the trochaic form, has a facilitating effect on word production abilities in patients with AOS.

References

Odell, K., McNeil, M., Rosenbek, J. C., & Hunter, L. (1990). Perceptual characteristics of consonant production by apraxic speakers. Journal of Speech and Hearing Disorders, 55, 345-359.

Wambaugh, J. L. & Martinez, A. L. (2000). Effects of rate and rhythm control treatment on consonant production accuracy in apraxia of speech. Aphasiology, 14, 851-871.

Ziegler, W. (2005). A nonlinear model of word length effects in apraxia of speech. Cognitive Neuropsychology, 22, 603-623.
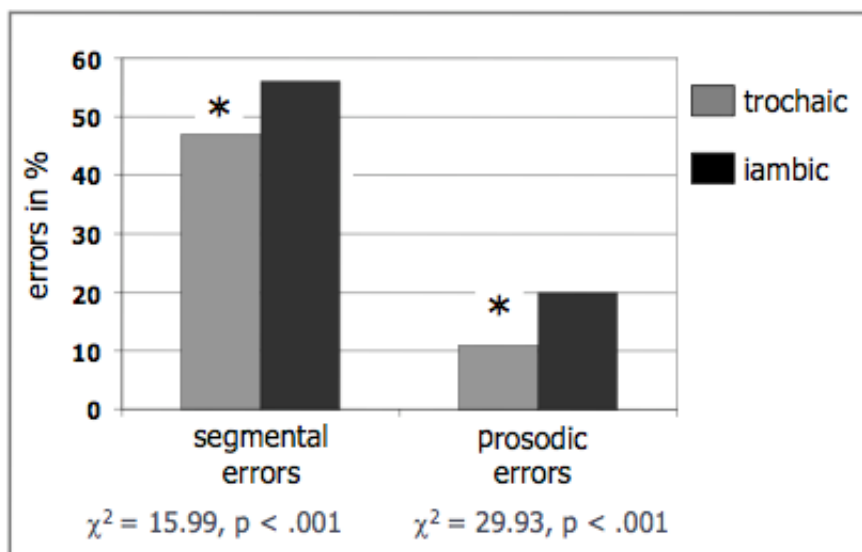
Figure 1: Influence of word stress: Percentage of segmental and prosodic errors

Presented by: **Aichert, Ingrid**

101.   Phrase-Level Reduction in Apraxia of Speech

Staiger A., Rüttenauer, A., Ziegler W.
EKN – Clinical Neuropsychology Research Group, Munich

Background
The occurrence of phrase-level reductions such as segmental deletions and assimilations is a characteristic property of fluent connected speech (Kohler, 2001). The transformations contribute to a reduction of articulatory-motor effort and constitute an important aspect of speech naturalness (Lindblom, 1990). Up to now, these phenomena have not been subject to clinical investigations in patients with apraxia of speech (AOS). Since the disorder is considered a phonetic encoding deficit, this condition might interfere with the mechanisms involved in phrase-level reduction. The present single-case study is an attempt to examine the types and frequencies of reduction phenomena in spontaneously produced connected speech in AOS.

Methods
We investigated phrase-level reduction phenomena in two extensive samples of spontaneous speech (> 1000 syllables each) in a German individual with pure AOS. A first speech probe (T1) was recorded one month, a second (T2) seven months post onset. At T2, the patient showed clearly improved speech-motor skills as expressed by a decreased error rate and an increased speech rate. The results were compared with normative data from two neurologically healthy control speakers of German. The speech data were analysed perceptually and evaluated for categorically perceived segmental deletions, assimilations and geminate reductions. A reliability measure revealed very high inter-rater agreement (Cohen's Kappa, $\kappa = 0.849$).

Main contributions
At T1, 1.6% of the syllables produced by RK exhibited phrase-level changes. With a proportion of 3.5% a significant increase was observed at T2 (Pearson $\chi2 = 9.1$; $p < .01$). By comparison, 14.5% and 14.8% of the syllables produced by the control persons showed phrase-level changes. A qualitative analysis of the connected speech processes revealed different patterns in RK and the control persons: While the controls predominantly produced vowel deletions, the majority of the patient's phrase-level reductions were consonant deletions and geminate reductions. In RK, phrase-level reductions almost exclusively resulted in simplifications of the syllable structure, i.e. reductions of consonant clusters. By contrast, in the healthy controls new clusters emerged substantially more often than existing clusters were reduced.

Discussion
We assume that the remarkably low number and the qualitatively different pattern of phrase-level reductions reflected the patient's speech-motor impairment. However, the exact nature of this relationship is still to be clarified. Against the background of theories dealing with phrase-level reduction phenomena two fundamentally different accounts can be offered: (A) a primary deficit in reorganising canonical forms, directly resulting from the apraxic pathomechanism, (B) a secondary adaptation to impaired speech-motor skills.

References
Kohler, K. J. (2001a). The investigation of connected speech processes. Theory, method, hypotheses and empirical data. In K. J. Kohler (Ed.), AIPUK 35. Sound patterns in German Read and Spontaneous Speech: Symbolic Structures and Gestural Dynamics (pp. 3-33). Kiel: IPDS.
Lindblom, B. (1990). Explaining phonetic variation: A sketch of the H&H theory. In W. J. Hardcastle, & A. Marchal (Eds.), Speech Production and Speech Modelling (pp. 403-439). Dordrecht: Kluwer Academic.

Presented by: **Staiger, Anja**

102. Bilingual Advantage in Lateralized Attention: Evidence from a Dichotic Listening Task

Soveri A.[1], Laine M.[1], Hämäläinen H.[2], Hugdahl K.[3]
[1] *Department of Psychology, Åbo Akademi University, Finland,* [2] *Centre for Cognitive Neuroscience, Department of Psychology, University of Turku, Finland,* [3] *Department of Biological and Medical Psychology, University of Bergen, Norway*

Introduction
It has been suggested that the management of two or more languages in a single brain can have beneficial effects on prefrontally mediated executive functioning. In particular, positive effects of bilingualism have been found for executive tasks requiring inhibition of interfering irrelevant information (Bialystok, Martin & Viswanathan, 2005). We investigated the possible effects of bilingualism on dichotic listening (DL) using the forced-attention paradigm and syllabic stimuli (Hugdahl & Andersson, 1986). Besides the standard non-forced (NF) condition that typically yields right ear advantage indicating left-hemispheric language dominance, the paradigm includes forced-right (FR) and forced-left (FL) attention instructions that call for directed (lateralized) focus of attention to either the right or the left ear stimulus and ignoring information coming to the other ear. The FL condition is particularly demanding, since the instruction is to work against the perceptual asymmetry that creates the right-ear asymmetry effect. If bilinguals have better executive cognitive skills, they should show better performance for the FR and in particular the FL condition than monolinguals.

Methods
Finnish monolinguals and early simultaneous Finnish-Swedish bilinguals from two age groups served as subjects. The younger group (30-50-year-olds) consisted of 18 monolinguals and 17 bilinguals and the older group (60-80-year-olds) of 14 monolinguals and 16 bilinguals. In the DL task, consonant-vowel (CV) syllables (36 syllable pairs per condition) were dichotically presented. While listening to the syllables, participants directed their attention either to the right (the FR condition) or to the left ear stimulus input (the FL condition), according to task instructions. In the non-forced (NF) condition the subjects were asked to listen to the syllables presented and then report which syllable they could hear more clearly, without any explicit instructions about direction of attention.

Results and Discussion
Overall, the bilinguals had more correct responses, although both groups exhibited a similar right-ear advantage in the NF condition (Fig.1). More importantly, the results yielded a significant group (bilinguals, monolinguals) x condition (NF, FL, FR) x ear (left, right) interaction. This stemmed from the bilinguals showing an advantage for the attended ear in the FL and FR conditions. In line with the hypothesis, the bilinguals had an advantage in the FR and FL conditions that allowed them to direct attention and ignore task-irrelevant stimuli. This suggests a bilingual advantage in a language-related cognitive executive task.

References
Bialystok, E., Martin, M.M. & Viswanathan, M. (2005). Bilingualism across the lifespan: The rise and fall of inhibitory control. International Journal of Bilingualism, 9, 103-119.
Hugdahl, K., & Andersson, L. (1986). The "forced-attention paradigm" in dichotic listening to CV-syllables: A comparison between adults and children. Cortex, 22, 417-432.
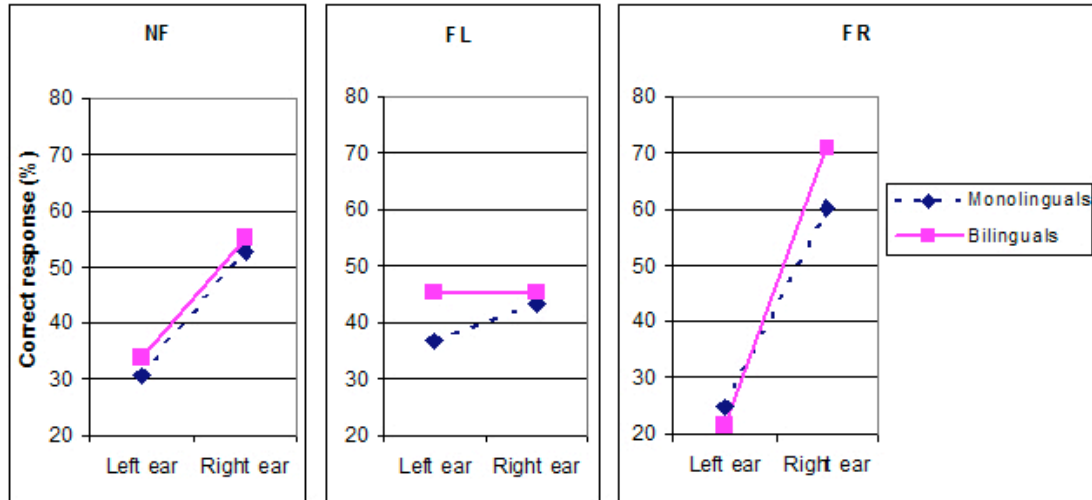
Figure 1. Average percentage of correctly reported syllables per ear in bilinguals and monolinguals (age groups collapsed), in the three attention conditions.

Presented by: **Laine, Matti**

---

103.   The Neural Bases of Phonological Competition: Evidence from Aphasia

*Sweeney C. [1], Blumstein S. [1], Apfelbaum K. [2]*
[1] Department of Cognitive and Linguistic Sciences, Brown University, [2] Department of Psychology, University of Iowa

Statistical properties of words affect how readily a listener or speaker accesses them. For example, high density words similar in sound structure to many other words exhibit slower reaction times in a lexical decision task than low density words with fewer phonological 'neighbors' (Luce & Pisoni, 1998). Behavioral and fMRI experiments with brain-injured and normal subjects have implicated the left parietal region as a neural structure sensitive to phonological competition in word production and recognition (Apfelbaum et al., 2007; Prabhakaran et al., 2006). This ongoing study utilized an eyetracking paradigm to examine the role of frequency and density during the time course of lexical access in three Broca's aphasics with left frontal lesions and four patients with left parietal lesions (two Wernicke's aphasics, two Conduction aphasics). Control subjects included 21 young normals and eight age-matched controls. In each trial, participants viewed four pictures on a touch-sensitive monitor, listened for a word, and touched the corresponding picture while an SMI Eyelink I tracker monitored their eye movements. Trials contained items from different frequency/density categories; for example, a high frequency/high density target (e.g., brain) appeared with a high frequency/low density, low frequency/high density, and low frequency/low density foil (e.g., church, log, and fox). All groups were predicted to show a frequency effect with a higher proportion of looks to high versus low frequency targets. It was hypothesized that control participants and patients with frontal lesions would show a normal density effect while patients with parietal lesions would show no such effect.

All subject groups showed a greater proportion of looks to high than low frequency targets; patient frequency results are displayed in the top row of Fig. 1. Control participants also showed significantly higher proportions of looks toward low rather than high density items, demonstrating the competitive effects of phonological neighbors. As hypothesized, parietal patients failed to show a density effect. In contrast to the hypothesis, Broca's aphasics also demonstrated no density effects, as displayed in the bottom row of Fig. 1. These findings raise the hypothesis that phonological competition modulates access to the conceptual representations of words, supporting the view that frontal structures are recruited in selecting among competing semantic alternatives (Thompson-Schill et al., 1997).

References

Apfelbaum, K., Blumstein, S.E., & Kittredge, A. (2007). The neural systems underlying lexical competition in speech production: Evidence from aphasia. Brain and Language, 103, 10-11.

Luce, P., & Pisoni, D. (1998). Recognizing spoken words: The neighborhood activation model. Ear and Hearing, 19, 1-36.

Prabhakaran, R., Blumstein, S.E., Myers, E.B., Hutchison, E., & Britton, B. (2006). An Event-related fMRI investigation of phonological-lexical competition. Neuropsychologia, 44, 2209-2221.

Thompson-Schill, S.L., D'Esposito, M., Aguirre, G., & Farah, M. (1997). Role of left inferior prefrontal cortex in retrieval of semantic knowledge: A reevaluation. Proceedings of the National Academy of Sciences, U.S.A., 94, 14792-14797.
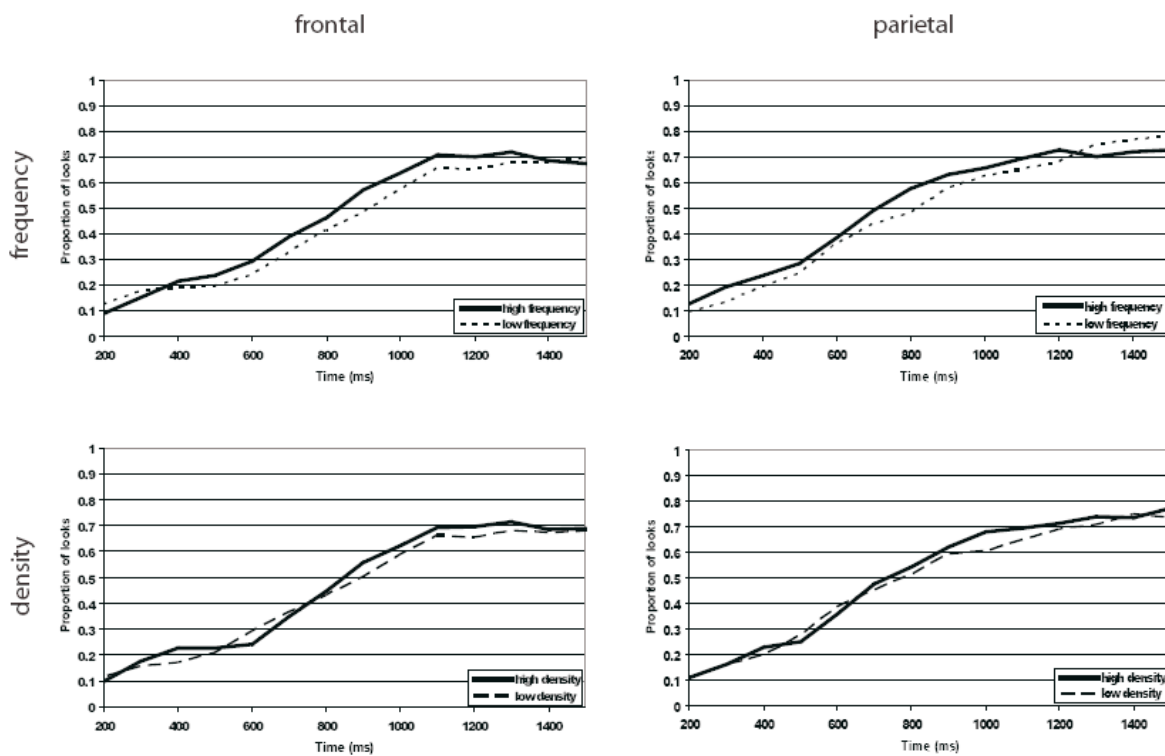
Presented by: **Sweeney, Carol**

---

104.   Lexical and Post-Lexical Deficits in Bilingual Anomia

Munarriz A., Ezeizabarrena M.
University of the Basque Country

Introduction

Traditional cognitive models of spoken word production distinguish among three major stages in the process of word retrieval: semantic stage, lexical stage and phonological stage (Levelt, Roelofs, & Meyer, 1999). Consequently, word retrieval deficits appear in different forms, depending on which stage of word retrieval is

damaged, and three types of anomia are distinguished: semantic anomia, lexical or pure anomia, and phonological anomia (Laine & Martin, 2006).

In this study we report on the oral production of an early, and highly proficient, Basque-Spanish bilingual (AF) with lexical and phonological anomia attributable to aphasia. Her good performance across several tasks suggests target-like linguistic comprehension and perception at lexical and post-lexical levels. However, several target-deviant features of her spontaneous oral production reveal some deficit at lexical and post-lexical phonological levels. The goal of this presentation is to analyse the lexical and post-lexical deficits in order to provide new evidence regarding the levels of representation of phonological information.

Method and Results

Spontaneous production data and data obtained experimentally through a picture naming task, both point in the same direction: the bilingual participant performs better in Spanish, the more frequently used language, than in Basque, although both languages were acquired at an early age. First, lower frequency of filler words in her spontaneous speech, as well as shorter reaction times and lower frequency of lexical errors in the picture naming task reveal more efficient lexical access in Spanish than in Basque. Second, fewer phonological paraphasias are attested in the spontaneous and elicited linguistic production in Spanish, which indicates better performance than in Basque also at the phonological level.

Furthermore, detailed analyses were carried out in order to detect the variables which have an effect on lexical and post-lexical deficits. In both languages lexical deficit appears to be sensitive to lexical frequency (low frequency names correlate with longer RTs and higher rate of lexical errors), but not to neighbourhood density. In contrast to this, phonological deficit is sensitive to phonological factors such as featural information (75% of the substitutions differ in a single phonological feature), typological markedness (tendency for unmarked characteristics to predominate) and syllable constituency (90% of the paraphasias contain target-like metrical properties).

Conclusion

All these results provide new evidence about the separation of lexical and post-lexical phonological information in word retrieval processes (Goldrick & Rapp, 2007). Moreover, the fact that Spanish, the more frequently used language, appears to be less affected as compared to Basque poses new questions about the representation of lexical and phonological systems in the bilingual brain (Paradis, 2004).

References

Goldrick, M., & Rapp, B. (2007). Lexical and post-lexical phonological representations in spoken production. Cognition, 102, 219-260.

Laine, M., & Martin, N. (2006). Anomia: Theoretical and Clinical Aspects. Hove: Psychology Press.

Levelt, W. J. M., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. Behavioral and Brain Sciences, 22, 1-75.

Paradis, M. (2004). A Neurolinguistic Theory of Bilingualism. Amsterdam/Philadelphia: Studies in Bilingualism.

Presented by: **Munarriz, Amaia**

---

105.   On the Role of Rapid Temporal Processing in Pure Word Deafness

Martin R. [1], Slevc L. [1], Hamilton A. [1], Joanisse M. [2]
[1] Rice University, [2] University of Western Ontario

Pure word deafness (PWD) is characterized by severely impaired speech perception despite good hearing ability and preserved functioning in other language domains (e.g., reading, writing and speaking). Despite its rarity, PWD has attracted considerable attention because of its specificity to speech sounds. 'Pure' cases of PWD show dissociations not only between speech perception and other types of linguistic processing but also between perception of speech stimuli and other complex auditory stimuli. The case reported here shows exactly this pattern: severely impaired speech perception despite relatively preserved reading, writing and speaking ability, as well as preserved perception of complex environmental sounds (Bozeat et al., 2000) and musical pitch.

Although PWD typically results from bilateral damage to the posterior superior temporal lobes, or more rarely from damage to the left superior temporal lobe combined with damage to inter-hemispheric connections, this patient has only unilateral left temporal and parietal lobe damage, including superior temporal gyrus, supramarginal gyrus, and angular gyrus. Not only does he have an intact right hemisphere, but he also has preserved white matter tracts connecting the two hemispheres as shown by diffusion tensor imaging. This pattern suggests a crucial role played by the left superior temporal regions in speech perception, perhaps reflecting a specialization for the processing of rapid temporal aspects of the speech signal (cf. Stefanatos, Gershkoff, & Madigan, 2005).

To test this account, this patient's ability to discriminate between stimuli differing in rapid temporal vs. spectral dimensions was assessed with synthesized stimuli (modeled on Joanisse & Gati, 2003). Temporal discrimination ability was assessed with both synthesized consonants (speech condition) and closely matched sinewave sweeps (non-speech condition), with fast (20 ms), normal (40 ms), or slowed (60 ms) formant transitions. Spectral discrimination ability was assessed with synthesized vowels (speech condition) and sinewaves matched to the vowel formant pitch differences (non-speech condition). As predicted, the patient showed worse processing of rapid temporal than spectral stimuli in both speech and non-speech stimuli, especially for the fastest transitions. However, he also showed considerably worse processing of speech than non-speech stimuli. These data partially support theories of a rapid temporal processing deficit in PWD, but also suggest a specialized role for left-hemisphere processing of non-temporal aspects of speech complexity.

References
Bozeat, S., Lamdon Ralph, M.A., Patterson, K., Garrard, P., & Hodges, J.R. (2000). Non-verbal semantic impairment in semantic dementia. Neuropsychologia, 38, 1207-1215.
Joanisse, M.F. & Gati, J.S. (2003). Overlapping neural regions for processing rapid temporal cues in speech and nonspeech signals. NeuroImage, 19, 64-79.
Stefanatos, G.A., Gershkoff, A., & Madigan, S. (2005). On pure word deafness, temporal processing, and the left hemisphere. Journal of the International Neuropsychological Society, 11, 456-470.

Presented by: **Slevc, L. Robert**

---

106.   Acoustic and Linguistic Influences on Auditory Extinction

Wolmetz M., Rapp B.
Johns Hopkins University, Department of Cognitive Science

Extinction occurs when the presence of one stimulus results in the perceptual loss of another stimulus presented closely in time. The phenomenon has been shown within several sensory modalities, but extinction of verbal information is well reported amongst brain-damaged individuals (Sparks, et al. 1970). While normal listeners typically show a right ear advantage for linguistic stimuli, brain-damaged individuals sometimes exhibit contralesional ear extinction in dichotic listening. Here, we report two experiments to examine whether degree of extinction is sensitive to acoustic and linguistic structure of input, as well as acoustic similarity between inputs from the two ears.

Experiment 1 included two brain-damaged individuals with receptive language deficits. DMN and JCE had left superior temporal infarcts extending from Heschl's Gyrus to the temporo-parietal junction in DMN's case, and further into the parietal lobe in JCE's case. FMRI indicated abnormal or absent auditory input to the left hemispheres.

In this experiment, DMN and JCE were instructed to direct attention to their right ears and report the number word heard in that ear by selecting from five numbers displayed. On each trial, a target digit was presented to the attended right ear and a distractor stimulus to the to-be-ignored left ear. Distractors included female-voiced linguistic stimuli (monosyllabic words, digits, letters) and nonlinguistic stimuli of varying acoustic complexity (noise, tones, sinewave

tones with noise, spectral ripples with syllabic envelopes). Target digits were spoken by a female speaker in one administration and a male speaker in another. Results (Table 1) indicated that linguistic distractors produced increased extinction relative to nonlinguistic distractors. This effect was compounded by acoustic similarity (as manipulated by speaker gender) between the target and the distracter.

Experiment 2 was designed to test whether the linguistic effect on extinction in Experiment 1 was due to linguistic influence or the greater acoustic complexity of the linguistic distractors. This experiment used sine wave speech (SWS) tokens (sine wave approximations of the first three formants from eight words). On first listen, these sound like nonlinguistic chirps, but with familiarization, they sound like the words they were generated from. The procedure was: (1) measure degree of extinction generated by SWS tokens, (2) familiarize participants with these tokens until they were easily recognized as words, and (3) measure degree of extinction with familiarized and nonfamiliarized SWS. The prediction is that if the effect is linguistic rather than acoustic, there will be greater extinction for familiarized vs. non-familiarized SWS distracters. A similar task as in Experiment 1 was used and (to date) JCE participated in the experiment. The results indicated that, while the words from which the SWS were constructed produced extinction, SWS did not, regardless of familiarization.

Taken together, the two experiments suggest that auditory extinction of language was most driven by acoustic complexity and similarity, rather than linguistic factors. These results will be further discussed with respect to mechanisms of extinction, and types of damage responsible for extinction in language-impaired individuals.

R. Sparks, H. Goodglass, B. Nickel, in Cortex. (1970), vol. 6, pp. 249-60.

	female target		male target	
	JCE	DMN	JCE	DMN
linguistic distracter	55.0%	68.3%	93.3%	88.3%
nonlinguistic distracter	98.8%	90.0%	97.5%	98.8%

Table 1. Percent correct for right ear target identification from Experiment 1. In all manipulations, the target voice was female. It should be noted that control participants, as well as DMN and JCE when attending to their left ears, were almost exclusively at ceiling performance across all tasks reported here.

Presented by: **Wolmetz, Michael**

---

107. Neuro-Cognitive Processing of Pitch and Speech Rate Cues to Emotion: Evidence from Brain-Damaged Patients

Dara C., Pell M.
School of Communication Sciences & Disorders, McGill University

There has been a long standing debate on the cerebral mechanisms involved in the processing of emotional information from the vocal cues or speech prosody. As summarized by Schirmer & Kotz (2006), decoding emotional prosody involves a multistep process that requires bilateral contributions (Schirmer & Kotz, 2006). Therefore, to extend our understanding about the role of the two hemispheres in processing emotion information from prosody, this study examined the effects of right and left hemisphere damage at the stage of acoustic processing to infer emotional meaning from prosody. The current study employed a discrimination task to analyze the ability of the left hemisphere damaged (LHD) and the right hemisphere damaged (RHD) patients to infer differences in the emotional meaning from the two utterances that have been manipulated using the two most critical acoustic cues for emotion perception - pitch and speech rate. The two cues were systematically manipulated in such a manner that the participants had to attend to the changes in the acoustic cues to arrive at the emotion judgments.

Nine LHD, eight RHD and 10 age-matched healthy control (HC) participants were administered discrimination task

using pseudo-utterances spoken in three emotion contexts – happy, fear and sad. Participants were presented a pair of utterance in three cue contexts: pitch, speech rate and no change conditions. For pitch and speech rate condition, the two utterances in a pair differed by the corresponding acoustic cue only, therefore, to perceive the distinction between the two utterances it was required to detect the difference in the acoustic properties of the two utterances. For example, in pitch condition, the pitch of one of the utterances in the pair was manipulated such that either it was higher or lower than the other. Both the utterances were same in the no change condition. The discrimination task entailed the participants to listen to two utterances that would differ only in acoustic manifestation of the utterance and the listener had to specify which utterance was a better exemplar of a pre-defined emotion category. In addition, participants were required to do an emotion categorization task for emotional prosody, emotional verbal scenarios and facial expressions.

For the discrimination task, there was a highly significant interaction of acoustic cue by participant group. Both RHD and LHD participants were not able to take advantage of the manipulated pitch and speech rate cues relatively in a similar manner as the HC participants, who performed better in pitch as compared to the speech rate condition. Moreover, the RHD group performed worse than the HC group in the no change condition. Interestingly, in other categorization tasks, both patient groups performed well except in recognizing emotions from prosodic cues relative to the HC group. Thus, these findings implicate that vocal emotion processing extends beyond the right hemisphere and both the hemispheres seem to contribute in decoding emotion information from pitch and speech rate cues.

References
Schirmer, A., & Kotz, S. A. (2006). Beyond the right hemisphere: Brain mechanisms mediating vocal emotional processing. Trends in Cognitive Sciences, 10(1), 24-30

Presented by: **Dara, Chinar**

Poster Session 3: Lexical Access

108.   Neural Correlates of Improved Picture Naming in Aphasia

Abel S. [1], Dressel K. [1], Saur D. [2], Weiller C. [2], Huber W. [1]
[1] Neurolinguistics at the Department of Neurology, Medical Faculty, RWTH Aachen, [2] Department of Neurology, University Medical Center Freiburg

Introduction
Recent brain imaging results indicate that contributions of both hemispheres to recovery of aphasic word processing deficits are complementary (Zahn et al., 2006). The left hemisphere appears to be more essential in patients with better/faster recovery, the right hemisphere in patients with slow/limited recovery. Lesion site and extension appear to be important factors restricting the degree of recovery. More research is required to further illuminate which patient and treatment variables determine outcomes and associated brain reorganization patterns (e.g., Crosson et al., 2007). Here we present our first results on the neural correlates of improved naming after cueing-therapy in a single case with functional magnetic resonance imaging (fMRI).

Methods
BB (female, 49 years old) presented with a chronic transcortical-sensory aphasia after rupture of an MCA aneurysm resulting in an extensive infarct. She was administered two pre-tests (T1, T2) requiring overt naming of 132 pictures, in order to select items with low baseline performance which were attributed to carefully balanced sets representing untrained items (CONTROL; N=30) and trained items (TRAINED; N=2x30). In the subsequent 4-week therapy, BB's attempts to name pictures were assisted by oral cues with increasing semantic or phonological target information. A post-test (T3) was performed the week after training. T2 and T3 were performed inside the scanner

(3T). fMRI data were analysed with SPM5. We present the following contrasts:
(1) All>Rest_T2;
(2) (TRAINED > CONTROL at T2) > (TRAINED > CONTROL at T3);
(3) (TRAINED > CONTROL at T3) > (TRAINED > CONTROL at T2).
All contrasts were thresholded at uncorrected p<.001 (≥ five voxels).

Results and Conclusion
Before therapy (T2), BB only produced 20 of the 90 eventually selected items correctly, yielding perilesional and contralateral brain activations for naming in general (see Fig. 1A). After therapy, there were significant improvements for TRAINED (McNemar Test, one-tailed, p<.05) but not for CONTROL items (p>.05). Regarding activations specific to training-induced changes, activation maxima before treatment included bilateral cerebellum, left SMA, precentral, superior temporal, middle occipital, and fusiform gyrus (Fig. 1B). After treatment, right inferior parietal (BA 40), right middle temporal, and left postcentral gyrus were involved (Fig. 1C).
To conclude, items difficult for BB elicited brain areas related to planning and execution of word production and visual(-semantic) regions. After effective training, these items yielded right hemisphere areas related to lexical processing. Therefore, training-induced improvements in case of BB strongly relied on right hemisphere compensation.
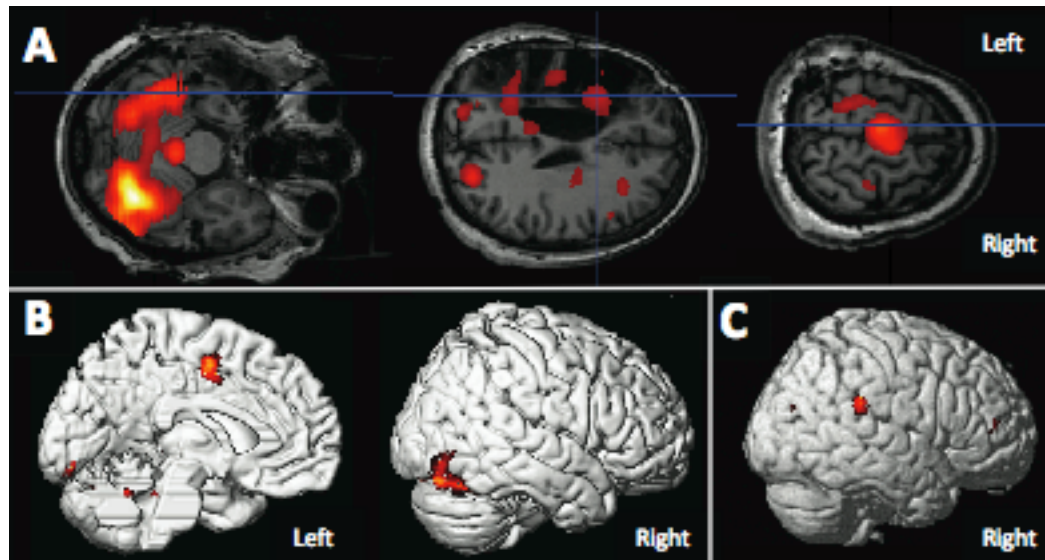

Fig. 1: Increased activations for naming in general (A; contrast 1) rendered onto BB's brain, and specific to TRAINED items before treatment (B; contrast 2) versus after treatment (C; contrast 3) rendered onto a standard brain (all uncorr., p<.001)

References
Crosson, B., McGregor, K., Gopinath, K. S., et al. (2007). Functional MRI of language in aphasia: a review of the literature and the methodological challenges. Psychological Review, 17, 157-177.
Zahn, R., Schwarz, M., & Huber, W. (2006). Functional activation studies of word processing in the recovery from aphasia. Journal of Physiology, 99, 370-385.

Presented by: **Abel, Stefanie**

109. Contrasting Word Retrieval Treatments for Semantic Anomia

Raymer A., Graham K. Azevedo Z., McHose B.
Old Dominion University

Errorless naming treatment for aphasia (ENT, Fillingham et al., 2005) encourages verbal production of target words through maximal support provided in a repetition/oral reading format. Gestural (GES) facilitation of naming pairs verbal and gestural modalities to enhance verbal production (Raymer et al., 2006). Neither treatment has been carefully evaluated for effects in semantic anomia where treatment response tends to be more limited than in phonologic anomia. The purpose of this study was to compare the effects of modified versions of ENT and GES for semantic anomia.

Participants
We investigated two right handed women with aphasia subsequent to left hemisphere stroke (P802: 67 yrs, 16 mos post stroke; P804: 78 years, 6 months post stroke). In standardized and experimental testing both had Broca's aphasia, severe limb apraxia, and pronounced comprehension and naming impairments indicative of semantic anomia.

Treatment Design and Methods
In a single-participant crossover design, we probed picture naming and gesture production for three matched sets of 24 nouns used for ENT, GES, and untrained pictures. Following baseline sessions, participants were randomly assigned to receive ENT followed by GES over 20 treatment sessions. Results were graphed and effect sizes (d) were calculated if possible. An effect size >5.8 was considered large (Beeson & Robey, 2006). Standardized tests and a communication rating scale were repeated after each training phase.

Results
Improvements in picture naming for both participants were greater during ENT than GES (Table 1). Much of the effect of Phase 1 ENT declined during Phase 2 GES, however. Both participants demonstrated large increases in gesture use following GES; P802 generalized gesture production to untrained pictures as well.

Standardized testing at the completion of training indicated improvement beyond the standard error of measurement on the Western Aphasia Battery for P802 (+13.5) and P804 (+5.7), largely due to increases in auditory comprehension and naming. Increases were also noted for P802 on a communication scale (Lomas et al., 1989).

Discussion
In these individuals with severe semantic anomia, contrasting patterns of improvement were evident in the two word retrieval treatments. ENT led to improvements in picture naming while GES led to large gains in gesture production. GES nonetheless led to notable improvements in communication abilities in standardized testing and on a communication rating scale.

References
Beeson, P.M., & Robey, R.R. (2006). Evaluating single-subject treatment research: Lessons learned from the aphasia literature. Neuropsychology Review, 16, 161-169.
Fillingham, J.K., Sage, K., & Lambon Ralph, M.A. (2005). Treatment of anomia using errorless versus errorful learning: Are frontal executive skills and feedback important? International Journal of Language & Communication Disorders, 40, 505-523.
Lomas, J., Pickard, L., Bester, S., Elbard, H., Finlayson, A., & Zoghaib, C. (1989). The communicative effectiveness index: Development and psychometric evaluation of a functional communication measure for adult aphasia. Journal of Speech and Hearing Disorders, 54, 113-124.
Raymer, A.M., Singletary, F., Rodriguez, A., Ciampitti, M., Heilman, K.M., & Rothi, L.J.G. (2006). Gesture training effects for noun and verb retrieval in aphasia. Journal of the International Neuropsychological Society, 12, 867-882.

Table 1: Mean % correct, standard deviations, and effect sizes (d) across treatment phases (*estimated; bold = large effect sizes).

	P802		P804	
Baseline	Mean	S.D.	Mean	S.D.
ENT Set - Naming	8.4	5.9	27.5	9.6
GES Set - Naming	2.1	2.4	25.8	13.0
Control Set - Naming	0	0	25.0	15.6
ENT Set - Gesture	0		0	
GES Set - Gesture	1.1	2.1	0	
Control Set - Gesture	0		0	
Errorless Training Phase 1	Mean	d	Mean	d
ENT Set - Naming (trained)	50.0	7.19	62.5	3.65
GES Set - Naming (untrained)	10.5	3.57	35.4	.74
Control Set - Naming (untrained)	0	0	20.9	-.26
ENT Set - Gesture (trained)	0		0	
GES Set - Gesture (untrained)	0	-.52	0	
Control Set - Gesture (untrained)	0		0	
Gesture Training Phase 2	Mean	d	Mean	d
ENT Set - Naming (maintenance)	31.3	-3.19	41.7	-3.53
GES Set - Naming (trained)	12.5	.23	25.0	-.50
Control Set - Naming (untrained)	0		29.2	1.41
ENT Set - Gesture (untrained)	52.1	24.81*	72.9	34.7*
GES Set - Gesture (trained)	100	47.62	0	0
Control Set - Gesture (untrained)	70.9	33.76*	0	0

Presented by: **Raymer, Anastasia**

---

110. Double Dissociation of Word and Number Processing in Auditory and Written Modalities: A Case Study

Han Z. [1], Shao A. [1], Zhang Y. [2], Bi Y. [1]
[1] State Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, [2] Department of Neurology, Tiantan Hospital, China

Past research has identified various cognitive/neural aspects where number and word might be processed differently, such as conceptual processing (Butterworth et al., 2001; Cappelletti et al., 2008) and oral production (Marangolo et al., 2005).

Here we report an individual who shows reverse patterns of dissociations between number and word processing in two modalities (auditory recognition and written production). ZY suffered from large left-hemispheres lesion due to a car accident. A series of experiments was carried out to assess his word and number processing functions across the three modalities: auditory recognition, visual recognition, and written production (see Figure 1 for details about the tasks). Oral production assessment was not included due to his severe impairment. We carefully matched the simple words and number stimuli on a range of psychological variables including frequency, length, and visual complexity (e.g., stroke numbers). The same tests were given to five age- and education-level matched healthy controls.

The results were summarized in Figure 1. We evaluated whether ZY's performances were significantly impaired in

comparison to controls and whether there were significant dissociation between words and numbers (Crawford & Garthwaite, 2005.) In visual recognition, he was comparable with controls, and no word-number dissociation was observed. In auditory recognition, his performance in all word tests was comparable with controls, and in all number tests he was significantly worse than controls. The dissociation between numbers and words were significant. In written production, he was perfect in writing Arabic numbers and number words when no auditory input is involved (in writing-to-cues) whereas his word writing ability was significantly worse than controls. The dissociation between words and number writing was significant.

To sum up, ZY shows double dissociation between word and number processing in two modalities: he is better at words than numbers in auditory recognition and better at numbers than words in written production. This case profile adds further evidence to the functional/neural segregated number and word processing systems. In combination with his lesion characteristics, it might be speculated that the functional lateralization of information being processed (numbers vs. words) interacts with the processing modality.

References
Butterworth, B., Cappelletti, M., & Kopelman, M. (2001). Category specificity in reading and writing: the case of number words. Nature Neuroscience, 4, 784-786.
Cappelletti, M., Jansari, A., Butterworth, B., & Kopelman, M.D. (2008). A case of selective impairment of encyclopedic numerical knowledge or 'when December 25th is no longer Christmas day, but '20 + 5' is still 25'. Cortex, 44, 325–336.
Crawford, J. R., & Garthwaite, P. H. (2005). Testing for suspected impairments and dissociationsin single-case studies in neuropsychology: evaluation of alternatives using Monte Carlo simulations and revised tests for dissociations. Neuropsychology, 19, 318-331.
Marangolo, P., Piras, F. & Fias, W. (2005). 'I can write seven but I can't say it': A case of domain-specific phonological output deficit for numbers. Neuropsychologia, 43, 1177–1188.
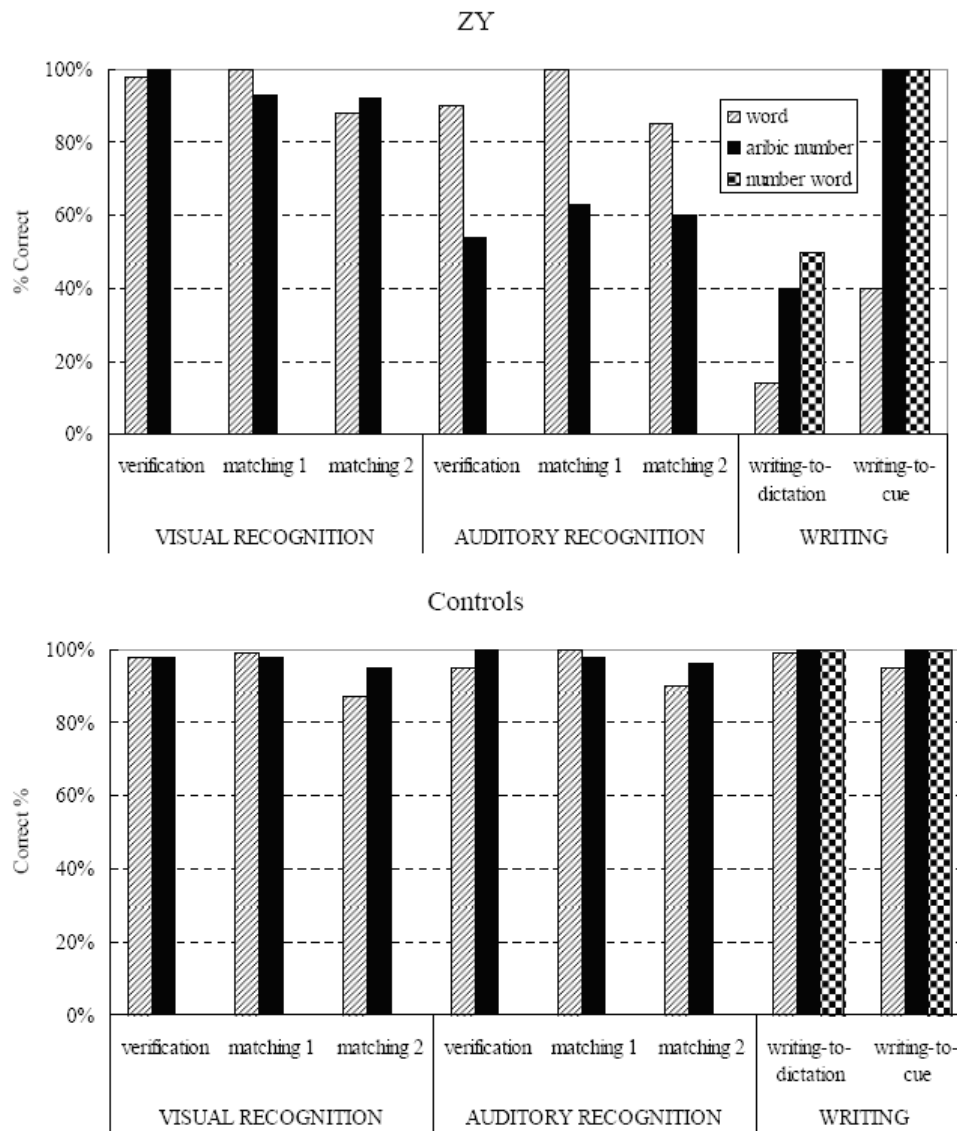
Figure 1. Performances of ZY and controls on various word and number processing tasks. Visual/Auditory comprehension: 1) Verification: verify whether the visual word or Arabic number matches the object picture or the value of a cash picture (with the number clipped out); 2) Matching 1 & 2: judge which of the two bottom items that is more closely associated with the top item, in meaning (word), or in value (number). Writing: 1) writing to dictation: write down the word or number (Arabic or number words) upon dictation; 2) writing-to-cues: for words, the subject hears a compound word ("tea-pot") and is given the first written character ("tea") followed by a blank, he needs to write in the blank the second character ("pot"); for numbers, a written number (Arabic or number word) is presented and the subject writes down the following number in the other format (number word or Arabic).

Presented by: **Bi, Yanchao**

111. Re-Assessment of Semantic Control Deficits in Stroke Patients using Blocked-Cyclic Naming and Comprehension Tasks

Bi Y. [1], Feng T. [1], Wei T. [1], Lin N. [1], Tatiana S. [2], Martin R. [2]
[1] State Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, [2] Rice University

A recent theory of conceptual representation (e.g., Jefferies et al. 2007) proposes two cognitive and neurological origins for semantic impairments following brain damage: the disruption of a semantic knowledge "hub" in the anterior temporal lobes (semantic dementia) and an inability to select appropriate semantic information from multiple sources, described as a deficit in a semantic control network distributed across multiple brain regions (stroke aphasia).

Support for this proposal comes from blocked-cyclic naming and comprehension tasks. In blocked-cyclic naming (Schnur et al., 2006), subjects repeatedly name blocks of semantically related or unrelated pictures. In the comprehension variant, the task is to repeatedly match a word to one of several pictures. Jefferies et al. (2007) observed that stroke patients with semantic deficits showed "refractory effects" in both tasks in either errors or response times (e.g., decreasing performance across repetitions and/or an increasing effect of semantic relatedness with repetition). The authors concluded that such effects are indicators of poor semantic control. However, patient performance was not compared to controls and controls demonstrate some effects in response times (e.g. Schnur et al., 2006; Biegler et al., 2008). Therefore it is unclear whether the stroke cases behave differently from controls, and thus if the same mechanism underlies the semantic impairments in production and comprehension.

In the present study, we assessed performance of four stroke patients with distributed lesion patterns and various levels of semantic performance and one semantic dementia patient on the naming and comprehension tasks relative to that of matched controls (N=6). To avoid the influence of picture naming in the comprehension task, we opted for an associative matching variant (see Biegler et al, 2008), where the task was to choose one out of several pictures that was most closely associated with the target word. Regarding the "refractory" effects in naming, all patients showed a significantly larger increase in semantic blocking across cycles compared to controls. In associative matching, none of the patients showed a significantly different cycle-by-blocking interaction effect from controls. Across both tasks the effect of cycle was mixed.

The lack of difference between our stroke patients and controls in the comprehension task challenge the assumptions that semantic impairments in stroke patients are a consequence of an impaired semantic control function and cyclic naming and comprehension paradigms are sensitive tasks for assessing semantic control. Either the patterns of results from these tests do not reveal semantic control deficits, or semantic impairments in stroke patients are not necessarily due to a disruption of semantic control.

References
Biegler K. A., Crowther J. E., Martin R, C. (2008). Consequences of an inhibition deficit for word production and comprehension: Evidence from the semantic blocking paradigm. Cognitive Neuropsychology, 25, 493–527
Jefferies, E., Baker, S. S., Doran, M., Lambon Ralph, M. A. (2007). Refractory effects in stroke aphasia: a consequence of poor semantic control. Neuropsychologia, 45, 1065–79.
Schnur, T. T., Schwartz, M. F., Brecher, A., Hodgson, C. (2006). Semantic interference during blocked-cyclic naming: evidence from aphasia. Journal of Memory and Language, 54, 199–227.

Presented by: **Bi, Yanchao**

112.   Phonological Impairment as a Decay-Based Impairment: New Evidence from a Single Case Study

Martinez Perez T. [1]*, Majerus S.* [2]*, Van der Kaa M.* [3]*, Boniver C.* [2]*, Poncelet M.* [2]
[1] *Belgian National Fund for Scientific Research (FNRS), Department of Cognitive Sciences, University of Liège, Belgium,* [2] *Department of Cognitive Sciences, University of Liège, Belgium,* [3] *Neuropsychological Rehabilitation Unit, University Hospital of Liège, Belgium*

Introduction
Computational models of language processing such as the Martin and Saffran (1992) model assume two properties underlying language processing: decay rate of activated representations and strength of activation spread between phonological, lexical and semantic levels of representation. Despite the theoretical and epistemological advantages of these models, as opposed to box-and-arrow type models, empirical evidence for these models is currently based on a very limited number of case studies (e.g., patient NC, Martin & Saffran, 1992; patient CO, Majerus et al., 2001). We present here a new single case study providing further support for the existence of decay rate impairments as an underlying cause of language impairment. Following Martin and Saffran (1992), an abnormally increased decay rate of activated representations should lead, in receptive single word processing tasks, to a reduced impact of phonological variables, as opposed to semantic variables; earlier activated phonological representations will suffer to a greater extent from the severe decay rate, relative to later activated semantic representations.

Methods
We tested these predictions in MF, an aphasic patient with a left hemisphere ischemic lesion and subtle speech comprehension impairments. MF was administered nonword and word repetition tasks, auditory lexical decision tasks with target words being preceded either by phonologically or semantically related primes, and a synonym judgment task for high and low imageability word pairs. If a decay impairment is leading to a reduced effect of phonological variables, then a semantic priming but not a phonological priming effect should be observed in lexical decision tasks. Furthermore, single word repetition and synonym judgment performance should be affected by semantic variables. Finally, speech perception abilities were assessed via a minimal pair discrimination tasks with half of the pairs being temporally slowed; in the case of a decay rate impairment, slowed stimuli should lead to even greater impairment than natural stimuli.

Results
In lexical decision, MF showed a severely reduced phonological priming effect while the semantic priming effect was in the normal range (see Table 1). In the synonym judgment task, MF also showed a normal advantage for judging high imageability word pairs. Word repetition performance for high imageability words was perfect, but a mild impairment was observed for low imageability word repetition. The most severe impairment was observed for nonword repetition. Minimal pair discrimination performance was most impaired for the temporally slowed speech stimuli.

Table 1.

	MF	Control ranger (N=15)
Auditory lexical decision		
Size of phonological priming effect	23 ms *	104 ms - 283 ms
Size of semantic priming effect	88 ms	79 ms - 124 ms
Judgement of synonyms		
Size of imageability effect	374 ms	301 ms - 425 ms
Single word repetition		
High imageability (accuracy)	98%	98,8 % - 100 %
Low imageability (accuracy)	94%	98,8 % - 100 %
Single nonword repetition		
Accuracy	62%	92,3 % - 97,6 %
Minimal pair discrimination		
Consonant oppositions	99 %	96,9 % - 100 %
Vowel oppositions	91,8 %	91,3 % - 100 %
Minimal pair discrimination (Accelerated speech rates)		
Consonant oppositions	64,3 % *	79,7 % - 92,8 %
Vowel oppositions	78,6 % *	82,9 % - 91,1 %

* : indicates performance significantly different from controls according to the modified t-test by Crawford & Garthwaite, 2005

]

Conclusion
MF illustrates the conceptual parcimony of computational accounts of language processing, a single decay rate impairment accounting for a conjunction of language processing deficits, where box-and-arrow models such as the logogen model would need to posit the simultaneous existence of multiple deficits at the level of speech perception, phonological processing and lexical-semantic access.

References
Majerus, S., Lekeu, F., Van der Linden, M., & Salmon, E. (2001). Deep dysphasia: Futher evidence on the relationship between phonological short-term memory and language processing impairments. Cognitive Neuropsychology, 18, 385-410.
Martin, N., & Saffran, E.M. (1992). A computational account of deep dysphasia: Evidence from a single case study. Brain and Language, 43, 240-274.

Presented by: **Martinez Perez, Trecy**

---

113.   Longitudinal Naming Performance in a Bilingual Patient with Primary Progressive Aphasia

Friedman R. [1], Carney A. [1], Snider S. [1], Eckmann C. [2], Ullrich L. [1], Lott S. [1]
[1] Georgetown University, [2] Språk- og informasjonstjenester

Introduction
How language is represented in the brains of bilinguals remains an open question. Research related to this question typically employs neuroscience techniques (fMRI, ERP) with neurologically-intact bilinguals or behavioral studies involving bilingual patients with aphasia. Reports of bilingual patients with Primary Progressive Aphasia (PPA), a degenerative language disorder, are rare (e.g. Filley et al. 2006), yet may offer a unique learning opportunity through longitudinal analysis. Here we examine the progressive decline of naming in the two languages spoken by a

bilingual patient with PPA, and the effects of treatment in one language on naming performance in the other language.

Case Report
AND, a 61-year-old woman, was diagnosed in April, 2006 with PPA. A PET scan with CT fusion showed asymmetric decrease in metabolic activity of the left parietotemporal cortex. AND was born in Norway where she lived until the age of 21. Her first language was Norwegian. Her second langue, English, was learned in grade school. She completed college in Norway and obtained a graduate degree after moving permanently to the US in the 1960s. She worked as an elementary school teacher until 2000, then as an office manager for a medical practice. Although English has been her primary language for the past 40 years, she has continued speaking Norwegian regularly. AND has multiple weekly phone conversations, in Norwegian, with her sisters, and spends one month every year in Norway speaking only Norwegian. Thus she is an ideal person in whom to study the decline of naming in two languages, both of which she uses constantly and in both of which she is highly skilled.

Method
Two picture exemplars of each of one hundred fifty-six objects were presented for naming. All pictures had high name agreement from 56 English-speaking control subjects. The Norwegian word for each of these objects was provided by author CBE, an American who is a professional Norwegian/English translator in Norway.
AND named each picture in English and Norwegian on separate days. Two matched subsets of the pictures named correctly in both languages (Baseline) were chosen: one for training in English only and the other as an untrained control. Training consisted of naming and transcribing the name of each picture. Training continued at home and in the clinic for 12 months.

Results and Conclusion
One year later, naming accuracy in both languages was at 72% for the untrained items, but at 92% in both languages for the trained items. Of the six untrained items missed in each language, one was missed in both languages; five items were missed in English but not Norwegian, and five were missed in Norwegian but not English. These results, and the 18-month results (to be obtained in October) will be discussed in terms of current notions of the representation of language(s) in the bilingual brain.

Filley, C.M., Ramsberger, G., Menn, L., Wu, J., Reid, B.Y., & Reid, A.L. (2006). Primary progressive aphasia in a bilingual woman. Neurocase, 12, 296-299.

	Trained (in English)		Untrained	
	Baseline	One year post	Baseline	One year post
ENGLISH	25	23	22	16
NORWEGIAN	25	23	22	16
	Number of items named correctly			

Presented by: **Friedman, Rhonda**

---

114. ERP Correlates of New Word Learning in Two Aphasic Patients

Camen C. [1]*, Morand S.* [2]*, Laganaro M.* [3]
[1] *University Hospital & University of Geneva, Switzerland,* [2] *Department of Psychology, University of Glasgow, UK,* [3] *University of Neuchâtel, Switzerland*

Introduction
Although the majority of the words in the adult speaker's lexicon have been learned many years earlier, even an adult still acquires new lexical entries during everyday life. Most neuroimaging studies analyzing new word learning

with healthy subjects (McCandliss et al., 1997; Raboyeau et al., 2004; Grönholm et al., 2005) indicate that newly learned words activate a cortical network similar to the one implied in producing words that have been in our lexicon for a while. The question we seek to analyze here is whether the processes underlying word production are the same for real words and for newly-learned words in patients with left hemisphere lesion who recovered from severe anomia.

Method
Two well-recovered chronic aphasic subjects (P1 and P2) and a control group of 10 healthy subjects undertook the new-word-learning task. Pseudo-words were associated to abstract drawings, which minimizes the semantic processes and maximizes learning a new phonological form. High density EEG was recorded during picture naming at the beginning of the learning phase and after successful learning as well as during real (familiar) picture naming. Epochs from 0 to 600ms relative to picture onset were averaged for each subject.

Results
At the last session the patients reached respectively 63% and 79% of correct production of the newly learned pseudo-words.
The ERPs were subjected to waveform and to topographic analyses. The first (unsuccessful) and the last (successful) recording sessions were compared and the successful pseudo-word production was compared to real picture naming. Results revealed differences in amplitudes and topographic maps (see Figure 1) between the first and the last recording in both patients starting at about 300 ms after picture onset.
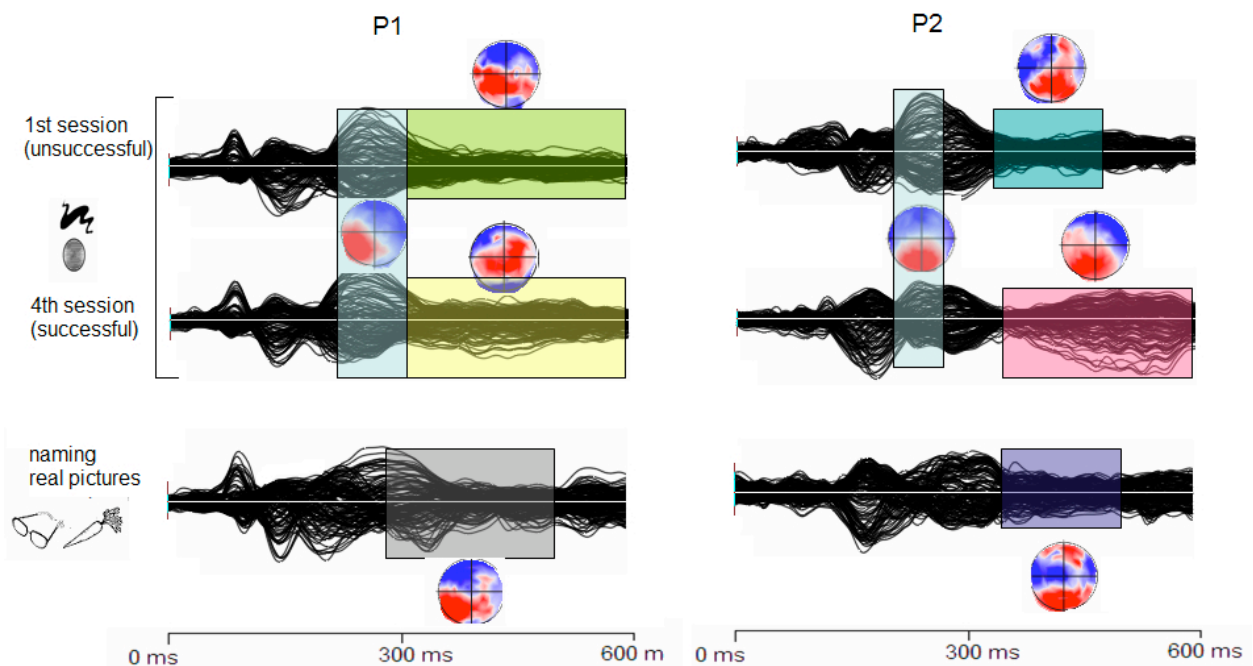

Figure 1. Grand average ERPs (128 electrodes) and topographic maps diverging between the 3 recording data.

In comparison with real word naming, a different topographic map appeared in approximately the same time-window in both patients, as well as an earlier difference (from about 230 to 300 ms) with the two pseudo-word recording sessions.

Discussion
A map substitution in the successful new-word production relative to the pre-learning recording session was also observed in the control group. However, differently from the patients, in the comparison with real word production the control group displayed the same topographic map as in the successful new-word production data. By contrast, a different topography was observed in the 350-600 ms time-windows in the two patients, suggesting that different processes underlie the production of newly learned pseudo-words and of (real) words after stroke.

References

Grönholm, P., Rinne, J. O., Vorobyev, V., & Laine, M. (2005). Naming of newly learned objects: A PET activation study. Cognitive Brain Research, 25, 359–371.

McCandliss, B.D., Posner, M.I. & Givon, T. (1997). Brain plasticity in learning visual words. Cognitive Psychology, 33, 88–110.

Raboyeau, G., Marie, N., Balduyck, S., Gros, H., Démonet, J.-F. & Cardebat, D. (2004). Lexical learning of the English language: a PET study in healthy French subjects. NeuroImage, 22, 1808– 1818.

Presented by: **Laganaro, Marina**

---

115.   Lexical Competition Effects in Nonfluent Aphasia: Converging Evidence from Three Different Tasks.

Wilshire C. [1], Bareham C. [1], Scott R. [2]
[1] Victoria University of Wellington, New Zealand, [2] Monash University, Victoria, Australia

In some individuals with nonfluent aphasia, word production may be powerfully influenced by contextual factors. For example, when a series of pictures is repeatedly presented, their naming accuracy may drop dramatically across repetitions, particularly when the pictures are semantically related (e.g., Schnur et al., 2006). Such effects suggest an abnormal susceptibility to lexical competition. However, other, task-specific factors may also play a role. In this study, we tested two Broca's aphasics (JHM and BY) on three very different word production tasks, all designed to induce competition during lexical selection.

Method
Participants were patients JHM and BY, and a group of older controls. JHM and BY both exhibited a similar profile, characterised by: a) fragmented and effortful spontaneous speech; b) mildly impaired picture naming; and c) normal to borderline performance on lexical-semantic comprehension tasks.
There were three picture naming tasks. In the paced cyclic naming task, (Cyclic task), sets of six pictures were presented repeatedly; each set was cycled through four times in varying order (e.g., cat, dog, sheep, pig, goat, horse, sheep, dog...). Picture sets were either semantically blocked or unrelated. In the picture-word interference task (PWI task) pictures were accompanied by an auditory distractor word, which was semantically related, phonologically related or unrelated to the picture name. Distractors were presented at four different onsets -200 ms (distractor before picture), 0 ms, +200 ms or +400 ms. In the picture pair naming task (Pairs task), two pictures had to be named using a single phrase (e.g. "nose and mouth"). Pairs were semantically related, phonologically related or unrelated.

Results
Results are summarised in Table 1. In the Cyclic task, patients' naming accuracy was significantly and disproportionately affected by semantic blocking, particularly on later cycles through the picture set. A similar detrimental effect was observed in naming latencies.

Task/Measure	Patient JHM	Patient BY	Controls
Cyclic Task:			
Effect of semantic blocking on naming accuracy[a]			
Cycle 1	2.86	3.0	-2.6
Cycles 2-4	12.43	8.83	1.42
Effect of semantic blocking on naming latency[b]			
Cycle 1	2.59	-11.95	-0.43
Cycles 2-4	16.50	13.44	3.77
PWI Task:			
Semantic relatedness effect[b]			
Early Presentation onsets (-200 to 0ms)	-12.39	-15.77	-8.03
Late presentation onsets (+200 to +400 ms)	-13.18	-8.82	-1.98
Phonological relatedness effect[b]			
Early Presentation onsets (-200 to 0ms)	-13.12	-21.81	1.01
Late presentation onsets (+200 to +400 ms)	-12.83	10.65	-0.60
Pairs task:			
Semantic Relatedness effect[b]	19.49	17.15	-0.55
Phonological Relatedness effect[b]	-2.87	1.21	0.69

Note a. Percentage decrease in naming scores
Note b. Percentage increase in naming latencies

Table 1

Performance on JHM, BY and controls on the experimental tasks. For each task, percentage change scores are reported for the semantically and/or phonological related conditions relative to unrelated conditions (a positive score indicates interference, negative indicates facilitation).

In the PWI task, patients' naming accuracy remained high throughout, but naming latencies were abnormally affected by the presence of semantically related distractors across all presentation onsets. Phonological distractors also had an inhibitory effect at early presentation onsets, an effect that was never observed in controls. At later onsets, JHM still showed phonological interference, but BY showed significant facilitation.

In the Pairs task, both patients again performed accurately, but their naming latencies revealed significant negative semantic similarity effects. These effects were not observed in controls. There was no significant phonological relatedness effect.

Discussion
Across three very different tasks, manipulations of semantic relatedness had abnormally detrimental effects on JHM's and BY's naming performance. In some tasks, phonological manipulations acted in a similar way. These results suggest strongly that such individuals may have a specific difficulty resolving lexical competition. We are currently extending our patient cohort in order to identify the specific patient characteristics associated with this pattern.

References
Schnur, T. T., Schwartz, M. F., Brecher, A., Hodgson, C. (2006). Semantic interference during blocked-cyclic naming: evidence from aphasia. Journal of Memory and Language, 54, 199–227.

Presented by: **Wilshire, Carolyn**

---

116. The Functional Locus of Word-finding Difficulties in Alzheimer's Disease: Insights from the Picture-word Interference Task.

Keall L. [1], Wilshire C. [2], Savage G. [3], Lowndes G. [1]
[1] Monash University, Victoria, Australia, [2] Victoria University of Wellington, New Zealand, [3] Macquarie University, New South Wales, Australia

Introduction
Many patients with Alzheimer's disease (ADs) exhibit word-finding difficulties, as evidenced by their poor performance on picture naming tasks. The functional origin of these difficulties remains a topic of debate (see e.g., Astell & Harley, 1998). One task that may shed light on this issue is the auditory picture-word interference task (PWIT), which involves naming a picture while ignoring an auditory distractor word. The distractors may be unrelated, semantically related (e.g., banjo-'guitar') or phonologically related (e.g., banjo-'bandit'). In healthy participants, semantically related distractors typically slow naming times (relative to unrelated ones), particularly when presented just before the picture. This effect has been said to reflect competition occurring at the lexical selection stage (Bloem, van den Boogaard & La Heij, 2004). Conversely, phonologically related distractors typically reduce naming times, particularly when presented just after the picture, suggesting they operate at a later stage of processing. Crucially, these effects may be used as time-specific "markers" of different word production processes, which can be compared across normal and AD populations.

Methods
Participants were: a) eleven healthy controls; and b) four participants with mild to moderate AD all of whom scored outside normal limits on the Boston Naming Test, but were at least 80% accurate on the pictures used in our task. Our PWIT contained 50 pictures with low-frequency names. They were accompanied by three different distractor types (phonological, semantic and unrelated), presented at four stimulus onset asynchronies (SOAs): 200 ms before the picture (-200ms), simultaneously (0ms), or 200 ms or 400 ms after the picture.

Results
Figure 1 shows the percentage change in naming latencies as a function of distractor type. Results for controls replicated previous studies, with a semantic interference effect peaking at -200ms and a significant phonological facilitation effect at all SOAs except -200ms. The AD group showed a reliable semantic interference effect overall (p < .01), which did not interact with SOA. There was a trend towards phonological facilitation – particularly at +400ms - but this failed to reach significance. Combined analysis of AD and control data revealed a significant interaction between distractor type (semantic vs. unrelated) and participant group (ADs vs. controls), p < .01. The trend towards reduced and delayed phonological facilitation in ADs was not statistically reliable.

Discussion
In this task, our group of AD participants were found to be abnormally sensitive to interference from semantic distractors. Under the hypothesis that semantic interference in this task reflects competition at the lexical selection stage, this finding is consistent with a lexical selection impairment. In the future, comparison between ADs and patients with more central semantic deficits (e.g., Semantic Dementia) may shed further light on this issue.

References
Bloem, I., Van den Boogard, S., & La Heij, W. (2004). Semantic facilitation and semantic interference in language production: Further evidence for the conceptual selection model of lexical access. Journal of Memory and Language,

51, 307-323.

Astell, A. J., & Harley, T. A. (1998). Naming problems in dementia: Semantic or lexical? Aphasiology, 12, 357-374.
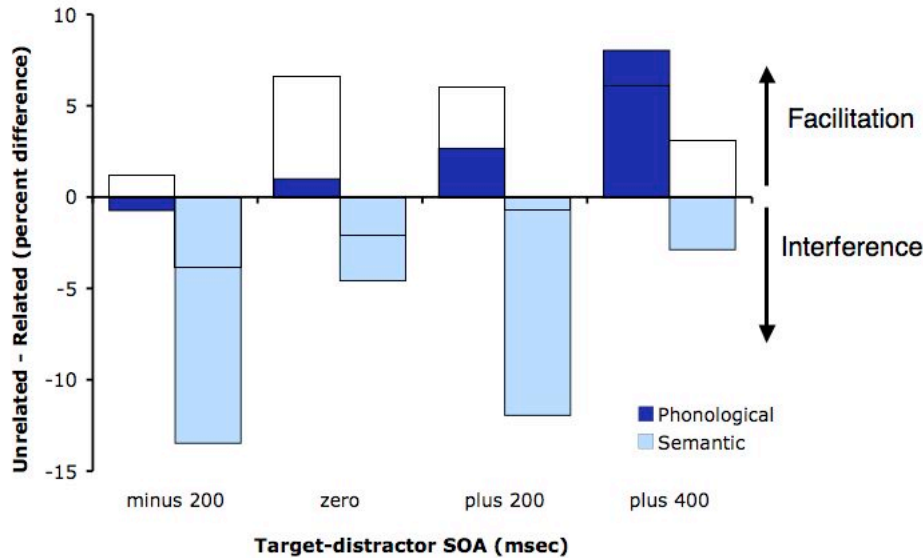
Figure 1

Percentage change in naming latency for semantic and phonological distractor conditions, relative to the unrelated distractor condition. Filled bars denote AD patients' data; unfilled bars show controls' data.

Presented by: **Wilshire, Carolyn**

---

117.   Impaired Number Word Production: A Bilingual Chinese-English Case Study

Bencini G.[1], Eng N.[1], Semenza C.[2]
[1]Hunter College, City University of New York, [2] University of Padova, Department of Neuroscience

We report the performance of a bilingual Chinese-English speaker (RC) who makes selective errors on number words in both languages only when the task involved processing the number word phonologically, either in the input modality or in the output modality. RC sustained a mid-cerebral artery occlusion resulting in non-fluent aphasia. Several experimental tasks were used to tap RC's ability to access numbers in both languages under different contexts. The purpose of these tasks was to examine the patterns of number word production problems in this patient and to functionally locate the deficit within current models of language production.

Summary of Experimental Tasks
The results of all experimental tasks are summarized in the Table below.

RC's Performance on Number word Tasks and Numerical Tasks

Reading Aloud	Accuracy
Arabic Numbers Aloud (English)	70%
Number words alphabetic (English)	85%
Chinese Numbers	60%

Matching Printed Numbers	
Arabic numbers to Chinese numbers in print	100%
Matching Arabic numbers to English number words	100%
Matching spoken English numbers to English number words	75%
Matching spoken Chinese numbers to Chinese numbers	65%

Automatic Naming	
Counting to 20 English	100%
Counting to 20 Chinese	100%
Days of the week English	100%
Days of the week Chinese	100%
Writing Numbers to Dictation (English)	50%
Writing Numbers to Dictation (Chinese)	75%

Numerical Tasks	
Single digit addition (written)	100%
Single digit subtraction (written)	100%
Single digit multiplication (written)	80%
Single digit division (written)	70%

Numerical Tasks: RC's knowledge of numerical concepts and arithmetic is intact in both languages, as evidenced by her performance on simple arithmetic (addition and subtraction) where she made no errors. RC, however, was less proficient in more cognitively taxing operations (division and multiplication).

Number Word Processing Tasks: RC was administered tasks requiring her to produce number words in both written and spoken modalities, in response to stimuli presented in written and spoken format. RC was 100% accurate in matching Arabic numbers to numbers in the Suzhou Chinese format. This contrasts with RC's performance on tasks that required producing number words. As can be seen in the Table, RC's performance on number production tasks ranged from 60% - 70% accuracy, depending on the script and the language. RC's errors in both languages were lexical errors, where number words were replaced by number words with the correct syntax (e.g., 5 --> "two", 11 --> fourteen). This indicates an intact syntactic frame for number words ("Number Lemma"). RC was also impaired in matching a spoken number word presented in either English or Chinese to its written representation (65% - 75% accuracy). Additional tasks (not reported in the Table) such as reading the clock (both analog and digital) revealed severely impaired performance, with qualitatively similar error patterns in both languages.

Discussion

To locate RC's deficit functionally, we adopt a model of language production (e.g., Levelt, Roelofs, & Meyer 1999, i.a.) that distinguishes between the selection of an abstract grammatical representation of a word (Lemma) and its phonological form (Lexeme). RC's error patterns (preservation of number word syntax) and her ability to correctly match numerals in Arabic and Chinese formats is evidence that the Lemma representation is intact in both languages. Her naming deficit occurs at the level of phonological encoding of the lexically selected number word. This study adds to the body of studies that indicate that number word production may differ qualitatively from the production of other words in the mental lexicon, and may be selectively impaired or preserved (e.g., Cohen, Verstichel, & Dehaene, 1997). Because this bilingual patient was able to match written numbers across different scripts (Arabic, Chinese) this study adds new data that may help elucidate the relationship between abstract representations for number words (number Lemmas) and their phonological encoding (number Lexemes).

References
Cohen, L., Verstichel, P., Dehaene, S. (1997). Neologistic jargon sparing numbers: A category-specific

phonological impairment. Cognitive Neuropsychology, 14, 1029-1061.
Levelt, W., Roelofs, A. Meyer, A. (1999). A theory of lexical access in speech production. Behavioral and Brain Sciences, 22, 1-75.

Presented by: **Bencini, Giulia**

---

118.   Aged-Related Changes in Neurofunctional Networks for Verbal Fluency as a Function of Production Time

Marsolais Y. [1], Perlbarg V. [2], Benali H. [2], Joanette Y. [1]
[1] Centre de recherche, Institut universitaire de gériatrie de Montréal, Québec, Canada/ Département de psychologie, Université de Montréal, Québec, Canada, [2] UMR-S 678, INSERM/UPMC, Faculté de médecine Pitié-Salpêtrière, Paris, France /5LINeM INSERM/UPMC/Université de Montréal

Introduction
Optimal cognitive functioning in older adults has often been linked with changes in patterns of brain activations (Cabeza, 2002). However, most of those studies have relied on the sole identification of isolated activated brain regions (general linear model), which may not be integrated in a neurofunctional network. Furthermore, few studies have investigated the neurofunctional changes underlying expressive language abilities such as verbal fluency, which tends to get harder over time within a given criteria (Crowe, 1998). The goal of this study was to use functional Magnetic Resonance Imaging (fMRI) and a functional connectivity approach called NEDICA (Network Detection Using Independent Component Analysis) (Perlbarg et al., 2008) in order to assess the effect of aging and time of production on the neurofunctional networks associated with a verbal fluency task.

Methods
12 younger (aged 20 to 31) and 12 older (aged 60 to 73) healthy, highly-educated, right-handed French speaking adults performed a verbal fluency task in a 3T fMRI scanner. They were asked to say as many words as possible given 4 orthographic and 4 semantic criteria, within a limited amount of time (90 s/criteria). The reference task consisted of repeating months of the years. The fMRI acquisitions were made within a mixed design consisting of a single functional run (1600 s, TR = 2) and were blocked a posteriori according to production time and criteria (0-40 s, 50-90 s).

Results
At the behavioral level, only the main effect of time was significant; both groups produced more words between 0 to 40 s than 50 to 90 s. At the neurofunctional level, age and time-related differences were found with regards to some of the functional networks identified. For instance, fewer functional networks were identified in older adults and some of them showed spatial age and time-related differences.

Conclusion
Although both age groups performed similarly at the behavioral level, age and time-related differences were found at the neurofunctional level. Such results contribute to the characterization of the impact of aging and time of production on a verbal fluency task and the underlying neurofunctional networks involved.

References
Cabeza, R. (2002). Hemispheric Asymmetry Reduction in Older Adults: The HAROLD Model. Psychology and Aging, vol. 17, no. 1, 85-100.
Crowe, S. F. (1998). Decrease in performance on the verbal fluency test as a function of time: Evaluation in a young healthy sample. Journal of Clinical and Experimental Neuropsychology, 20(3), 391-401.
Perlbarg, V., Marrelec, G., Doyon, J., Pelegrini-Issac, M., Lehericy, S., & Benali, H. (2008). NEDICA: Detection of group functional networks in FMRI using spatial independent component analysis. Paper presented at the Biomedical Imaging: From Nano to Macro, 2008. ISBI 2008. 5th IEEE International Symposium on.

Figure 1. Temporal evolution of a neurofunctional network associated with a verbal fluency task in young adults using the NEDICA approach (n = 12)
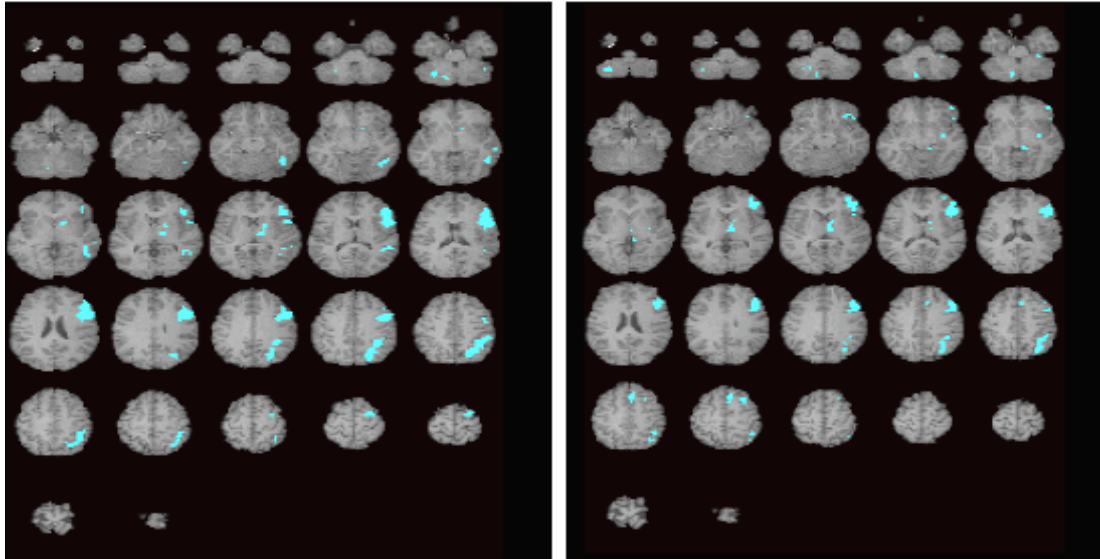
Note: Both figures show 28 axial slices of the brain in a radiological convention (left = right)

Presented by: **Marsolais, Yannick**