
Poster Session 4: Laterality

124. A Dissociation of Laterality for Language Production and Comprehension in a Subcortical Aphasic Patient, Assessed with MEG and fMRI.

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When perisylvian regions are damaged in stroke, their linguistic functions may be taken over by other areas, supporting recovery from aphasia. Our laboratory is studying this plasticity using MEG and fMRI with two tasks, picture naming (production) and sentence picture-matching (comprehension). When appropriate control conditions are subtracted, both tasks elicit robust left-lateralized frontal activation in healthy control subjects. In aphasic patients, both perilesional and contralesional activations are commonly observed, with much variability across individuals. While the adaptive significance of contralesional activation is hotly debated, comprehension and production processes have seldom been assessed within the same individuals. We present here contrasting findings from two patients, demonstrating that comprehension and production activations can jointly relocate to the right hemisphere, or instead become partially dissociated between hemispheres.

Patient 1 (47F) suffered a large cortical stroke destroying almost all of the classical left perisylvian language areas, resulting in severe aphasia that had resolved to mild anomia after two years, with a lasting deficit for comprehension of syntactically complex sentences. Both picture naming and sentence picture-matching tasks resulted in strong activations in the right-hemisphere homologs of the left-hemisphere areas that are activated in healthy controls, suggesting that this patient's recovery is supported by right-hemispheric takeover of language functions.

Patient 2 (48F) suffered a left frontal subcortical stroke, resulting in transcortical motor aphasia, also with a persistent deficit for syntactic comprehension. DTI indicated damage to the extreme capsule and arcuate language pathways, with cortical gray matter generally spared. This patient was assessed four times throughout the first year post-stroke and exhibited marked improvement in language function, although right-sided limb function remained poor due to destruction of the pyramidal tract. fMRI studies of picture naming (four sessions) in this patient consistently revealed normal selective activation of left frontal cortex for naming real pictures, compared with saying "fake" in response to scrambled pictures. Increases in activation across the four sessions were observed in more posterior regions, possibly contributing to recovery, but the left frontal activation was relatively invariable.

The comprehension task yielded quite different results in patient 2, as assessed with fMRI and MEG one time each, approximately one year after stroke. Bilateral activations were observed, but more strongly in the right hemisphere. Detailed analysis of the timecourses of BOLD and MEG activity suggested that working memory for sentence content, as opposed to online comprehension, was particularly lateralized to the right hemisphere in this patient, as opposed to healthy controls in which all stages of the task evoke left-lateralized activity. Further studies in this individual are planned to assess comprehension and production across the levels of single words, sentences, and discourse.

The dissociation in laterality seen in patient 2 suggests that when connections to left frontal cortex are disrupted, some of its functions but not all may be reorganized to the contralateral hemisphere, depending on the specific pattern of spared gray and white matter.

Presented by: **Meltzer, Jed**

125. Automatic Activation of Affective Words in the Cerebral Hemispheres

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Theories of affect and emotion suggest that the affective value of words are evaluated quickly and automatically and may influence subsequent processes. Thus, in a priming paradigm, the valence of a first word or prime affects the processing of a second word or target. This effect has been repeatedly reported for short stimulus onset asynchrony (SOA), a result which supports the idea that the process is fast and occurs without awareness (e.g. Fazio, Sanbonmatsu, Powell, & Kardes, 1986). On the other hand, and despite the fact that past research has been inconsistent with regard to the possible lateralization of the effects of words with affective meaning, a special capacity for the right hemisphere in affective processes has been suggested. While recent divided visual field (DVF) priming studies in the domain of lexico-semantic research has indicated that automatic priming is larger in the left than in the right hemisphere (e.g., Koivisto, 1997), the automatic nature of affective word processing and the role of the left hemisphere in this regard may account for inconsistent results in this area. In the present study, using a DVF priming paradigm, we investigated the time course of affective meaning activation in the left and right hemispheres through within-hemisphere presentation of affective words to the cerebral hemispheres across four different SOAs of 0 ms, 150 ms, 300 ms, and 750 ms.

Twenty-six right-handed students with normal or corrected to normal vision who spoke English as their first language participated in the study. A set of 192 prime-target pairs with the same valence (e.g., “thrill-rescue”, “deceit-agony”) or opposite valence (e.g., “treat-riot”, “victim-fun”) were presented in four blocks, under the four SOAs of 0, 150, 300, and 750 ms, to the right visual field (RVF) and the left visual field (LVF) and reaction times to valence decision for the target words were measured. The design of the experiment was a 2 (visual field: RVF-RVF, LVF-LVF) X 4 (SOA: 0 ms, 150 ms, 300 ms, and 750 ms) repeated measures ANOVA.

Data analysis revealed evidence of priming of affective words in the LVF at an SOA of 0 ms that shifts to the RVF at an SOA of 150 ms. This effect diminishes quickly in a way that priming effects are absent at longer SOAs of 300 ms and 750 ms (Hermans, De Houwer, & Eelen, 2001).

The results seem to suggest that the two hemispheres have different and possibly complementary roles in the automatic processing of affective words.

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Presented by: **Abbassi, Ensie**

126. The Lateralization of Math and Language: Agraphia and Acalculia in a Left-handed Patient with a Right Hemisphere Lesion.

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Summary

Patient FL, left-handed, developed agraphia and acalculia after a deep right parietal lesion. The analysis of error patterns in writing and calculation leads one to conclude that F.L.'s performance results from a disturbance similar to what is found after left rather than right parietal lesions in right-handers. This finding is interesting insofar as it shows that, when language is processed in the right hemisphere, so is calculation. This was demonstrated by Semenza et al. (2006) in a case series study of right hemisphere acalculia. However, Pinel and Dehaene (in press) recently investigated via fMRI whether normal variations in the degree of left hemispheric asymmetry that characterize the brain organization for language are mirrored in the asymmetry of areas involved in number processing. They came to the conclusion that "co-lateralization" of language and math is more complex than expected. Thus it becomes important to document independently which arithmetical function exactly co-lateralizes with which language functions.

Case Report

FL displayed a Gerstmann's syndrome without aphasia, memory disorder, intellectual impairment or visual neglect. Finger agnosia, agraphia, right-left disorientation and dyscalculia were investigated in detail. As previously reported for Gerstmann's syndrome, FL's agraphia seemed to result from a deficit in accessing grapho-motor patterns for handwriting: he produced incomplete and poorly formed letters and letter substitutions. Oral spelling, assembling block letters and immediate copy of letters and words were well preserved. No signs of spatial agraphia were detected. The patient performed well in number transcoding and had good comprehension of Arabic and written verbal numerals. His knowledge of arithmetical facts and rules was intact. Multi-digit calculation for additions, subtractions and multiplications was instead clearly impaired. The errors reflected a systematic failure in factor selections: he always proceeded from the leftmost digit rightwards.

Discussion

FL showed "bug" errors for arithmetical procedures, described so far as resulting from left hemisphere lesions. His agraphia had none of the characteristics that distinguish agraphia after right hemisphere lesions. Moreover FL showed a full Gerstmann syndrome, a sign of left hemisphere lesion in right-handers. These findings seem to indicate that left hemisphere arithmetical procedures shift to the right hemisphere if writing does.

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Presented by: **Chiarelli, Valentina**

127. Hemispheric Roles in Perception and Production of Famous Proper Nouns

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Background

Proper nouns differ from common nouns in being phonologically complex, having low text frequency, and denoting a unique entity. Although lexical processing is associated with left-hemisphere function, clinical observations and experimental studies support a right hemisphere involvement in proper noun recognition. However, controversy remains about the extent of right hemisphere involvement (Schweinberger, Landgrebe, Mohr, & Kaufmann, 2002), and it appears that the left hemisphere supports production of proper nouns (Semenza, 2006).

Purpose of study

The goal of this study was to further investigate hemispheric specialization for proper and common nouns by examining the ability of individuals with left hemisphere damage (LHD) to perceive and verbally reproduce famous names and matched common names compared with the performance of matched normal control (NC) subjects.

Method & Procedures

Ten individuals with LHD due to stroke and 16 age- and education-matched NC subjects completed identification and production tasks of famous proper and common nouns. Two hundred stimuli were utilized for three response conditions: A manual condition, yes/no verbal condition, and verbal production. All tasks were designed as split-visual field experiments, modeled after Ohnesorge & Van Lancker (2001).

Results

Famous proper nouns were recognized more often than common nouns in both visual fields for NC, consistent with previous findings. An ANOVA revealed that NC identified stimuli in the left hemisphere more often than in the right hemisphere [$F(1,15) = 7.089$; $p = .005$]. Whereas significantly decreased performance in identifying common nouns was found in participants with LHD, these subjects correctly identified proper nouns at a level similar to NC. These findings confirmed that proper nouns are processed differently from common nouns, and that the right hemisphere contributes to processing of proper nouns. For the verbal production task, NC exhibited significantly better performance in producing proper nouns and common nouns presented to the right visual field/left hemisphere compared to the left hemisphere/right hemisphere ($p < .05$). Significantly decreased performance in producing both proper and common nouns was found in LHD, indicating a left hemisphere role in production of proper nouns, in agreement with lesion and brain imaging studies.

Conclusion

These results contribute to a better understanding of hemispheric roles in perception and production of famous proper nouns, suggesting that (1) both hemispheres can recognize famous proper nouns, possibly due to a right hemisphere role in personal relevance (Van Lancker, 1991) and (2) production of proper nouns as well as common nouns is associated with the left hemisphere.

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Presented by: **Yang, Seung-yun**

128. A Dual Task Investigation of Hemispheric Semantic Processing Following RH Release from Inhibition in Participants with LH Lesions

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Dual task investigations of language processing in young healthy participants suggest that the semantic processing abilities of the right hemisphere (RH) can be improved under conditions that release it from left hemisphere (LH) inhibition (Querne, Eustache & Faure, 2000). The dual task paradigm is designed to overload a hemisphere's processing resources, in order to reduce interhemispheric suppression. LH lesions are suggested to release the RH from interhemispheric inhibition for language tasks (Landis & Regard, 1988). However, it may be argued that the lesioned LH can exhibit residual control over the RH, or can regain control over recovery. The current investigation aimed to examine RH semantic processing for participants with LH lesions, with and without additional LH processing load, in order to explore the potential for enhanced RH processing following the release from LH suppression.

Method

Participants with unilateral LH lesions (LHD) (n=9) and matched healthy controls (n=14), were asked to simultaneously perform a divided visual field semantic priming task and a verbal memory task. Three verbal memory load conditions were included, zero-word baseline, two-word memory load and six-word memory load. At each memory load condition the semantic priming task employed a stimulus onset asynchrony of 250ms and compared the activation of stimuli related by association only, association and category membership, and category membership only. Data analysis was carried out on reaction time (RT) and accuracy data for real word targets, using linear mixed model analysis. Analysis was carried out on data from each memory condition separately. Planned contrasts were used to explore hemispheric priming patterns.

Results and Discussion

The LHD group revealed differences in RT priming between the baseline and memory load conditions for targets presented to the LVF/RH. In the baseline condition the LHD group revealed LVF/RH priming for the associated category membership and the association only conditions, while RVF/LH priming was observed for all three related conditions. The LHD group's priming of RVF/LH targets did not change between baseline and memory load conditions. However, the LVF/RH priming improved under both memory load conditions, to include all three related conditions. The control group's priming performance did not differ between baseline and memory load conditions, with significant bilateral priming revealed for all of the related conditions. Accuracy data analysis revealed a similar pattern of priming to the RT data. Both groups revealed an overall LH advantage for accuracy at baseline. The addition of memory load served to remove this LH advantage for the LHD group. The current findings indicate that following a LH lesion, the RH's contribution to semantic processing can be enhanced under conditions designed to overload the LH.

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Presented by: **Smith, Erin**

Poster Session 4: Treatment Methods and Impacts

129. A Language Teacher in the Labyrinth of Aphasia: A Kurdish-Persian Case

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As a consequence of the increasing number of bilinguals in the world population, the study of bilingual aphasia has been of significance to researchers of language impairment and a considerable amount of work has been carried out during the past few decades. In addition, in order to supplement the research on bilingual aphasia, it is important to reflect on it in different contexts (Fabbro, 2001; Abutalebi & Green, 2007). Due to the scarcity of aphasia-related studies in Iran, the present study aims: (1) to shed light on impaired language skills; (2) to identify the recovery pattern of languages; and (3) to provide the main variables affecting the recovery pattern of languages in a bilingual Kurdish-Persian aphasic speaker.

The bilingual case was a 40-year-old right-handed individual with Broca's aphasia following a cerebral hemorrhage. An interesting point to note is that the patient used to teach Persian language and literature for about 18 years. To assess the patient's language skills, taking into account pre-morbid language proficiency and history of bilingualism, we administered the standardized and equivalent versions of the Bilingual Aphasia Test (BAT) (Paradis, 1987) in Kurdish (Paradis & Maniyi, 1989) and Persian (Paradis, Paribakht, Nilipour, 1987) were administered, respectively. Then, the performances were described and compared qualitatively and quantitatively in detail.

The overall findings revealed preserved comprehension but reduced non-fluent speech in both languages. The final recovery pattern was non-parallel recovery with L2 (Persian) better recovered and less impaired than L1 (Kurdish). The non-parallel recovery of languages was associated with several variables including type of aphasic syndrome, pre-morbid language proficiency, language-specific features, plus age, context, and manner of language learning. Besides, the experience of teaching L2 was incorporated in this respect.

On the whole, the study revealed that a combination of "Critical Variables" (Paradis, 2001) may explain the deficits and the way to determine the recovery patterns in bilingual aphasic speakers. Additionally, it was concluded that teaching a language as an explicit automatic process (Kainz, 1983; Paradis, 2000) affects the recovery pattern of languages post-stroke, and the consciously learned and taught language is better recovered and less impaired in bilingual aphasic speakers.

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Presented by: **Akbari, Mohsen**

130. Factors Underlying Successful Use of a Computer-assisted Alternative Communication Program by People with Severe Aphasia

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Background

Some individuals with severe non-fluent aphasia do not respond in a functional way to any form of communication therapy but others show improved communication with treatment focused on compensatory alternative communication modalities. This study investigated whether individuals with severely restricted verbal output could significantly improve their functional communication skills by using an alternative communication computer program called C-Speak Aphasia (Nicholas & Elliott, 1998). We explored various factors to determine how they related to individual patients' ability to communicate expressively using C-Speak Aphasia. These factors included semantic processing ability and executive system functions.

Using C-Speak Aphasia, individuals select icons and put them together to create novel messages that are then spoken by the computer's speech synthesizer. Research on the efficacy of C-Speak Aphasia as a means to improve communication has been ongoing for several years. Preliminary results from the first series of single-subject studies indicated that people with severe aphasia but with relatively preserved executive functions of cognitive flexibility and self-monitoring learned to use C-Speak Aphasia better than those who had severe aphasia plus executive system deficits, (Nicholas, Sinotte, Helm-Estabrooks, 2005). Other researchers (e.g. van de Kant-Sonderman and colleagues, 2007) have stressed the importance of intact semantic abilities to use of a different computer alternative communication system known as TouchSpeak. Thus, we were motivated to explore the relative importance of both these domains of cognition (executive functioning and semantic knowledge) for effectively communicating with a computer device with additional subjects trained to use C-Speak Aphasia.

Methods and Procedures

Participants were ten individuals with severe aphasia who received at least six months of training to learn C-Speak Aphasia. Communication skills on untrained communication tasks (answering autobiographical questions, describing pictures, making telephone calls, describing a short video, and two writing tasks) were repeatedly probed to assess carryover of treatment effects. Response to treatment was examined with respect to baseline measures of language (auditory comprehension and semantic abilities), and non-linguistic executive function skills.

Results

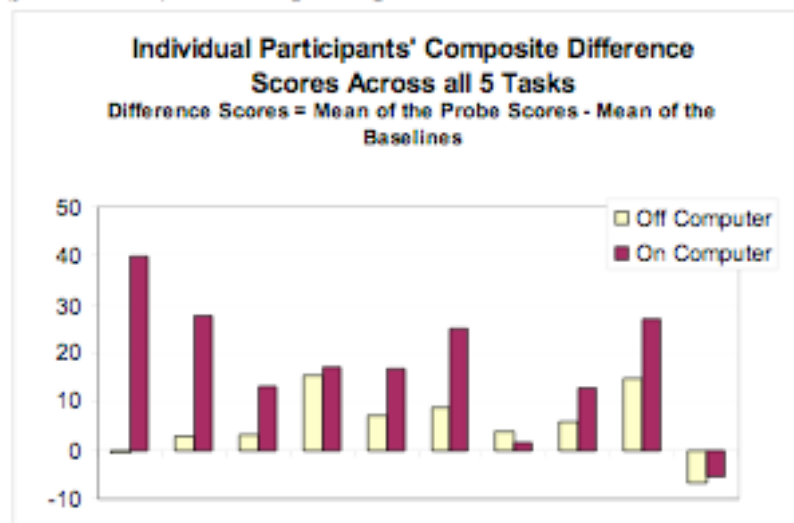
Using C-Speak Aphasia, four participants communicated significantly more information (see Figure 1) on selected probe tasks using the computer than they did without the computer. Further analyses indicated that executive function skills were significantly correlated with treatment response ($r = .81$, $p < .05$) while semantic knowledge and auditory comprehension scores did not correlate with treatment response.

Conclusions: Individuals with the more intact executive function skill of cognitive flexibility responded better to treatment with C-Speak Aphasia than subjects with relatively greater impairment in this domain, suggesting that impairments in nonverbal executive functions may at least partially underlie poor response to treatment to improve functional use of alternative modes of communication.

References

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Figure 1. Communication difference scores (changes from baseline) using *C-Speak Aphasia* (red bars) compared to off-computer scores (yellow bars) for each participant.



Presented by: Nicholas, Marjorie

131. Treatment Induced Language Recovery in Chronic Aphasia: The Role of Non-domain Specific Brain Areas

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Background

Intense speech and language therapy is currently considered the treatment of choice for chronic aphasia and improvement of language functions and concomitant brain plasticity after intensive treatment has recently been demonstrated in several studies (for review Meinzer & Breitenstein, 2008). Still, so far only short-term treatment effects were assessed even though long-term consolidation of novel language information may require different brain areas than the ones participating in initial learning. For example, in healthy subjects brain structures involved in general learning (e.g., the hippocampus, HC), mediate the initial acquisition of lexical or semantic knowledge. Later on, secondary associative cortices may be functionally required (e.g., Breitenstein et al., 2004). Thus, we aimed to differentiate brain regions mediating short-term and long-term language learning success in chronic aphasia by using functional magnetic resonance imaging (fMRI). We also assessed whether the structural integrity of the HC and its surrounding fibers predicts the degree of treatment success.

Methods

During fMRI language functions were evaluated by a picture naming task in 8 patients with chronic aphasia prior to, immediately after and 8 months after an intensive naming treatment based on associative learning principles. In 10 patients we assessed the structural integrity of the HC by a volumetric analysis. Fiber integrity in white matter tracts surrounding the HC was assessed by Diffusion Tensor Imaging (DTI).

Results & Conclusions

Short-term treatment success was predicted by increased activity bilaterally in the hippocampal formation, the right precuneus, and the fusiform gyri. Long-term training success was predicted by activity increases in the right-sided Wernicke's homologue and in perilesional temporal areas. Thus, brain regions involved in memory encoding,

attention, and multimodal integration were predictive of short-term treatment success. Long-term treatment success was mediated by activity increases in classical language regions. The volume of the left compared to the right HC was substantially reduced (9-16%) in 6/10 patients. Fiber integrity in the adjacent white matter in the ipsilesional hemisphere was reduced in all patients (21-50%). The degree of volume and fiber integrity reductions strongly predicted both immediate and long-term training success. No correlations were found for a parallel set of untrained language material, attesting the specificity of our results. The present findings demonstrate that (a) different brain regions may mediate short- and long-term language training outcome and (b) the structural integrity of the task-dominant hippocampus and its surrounding fiber tracts – i.e., non-domain specific brain structures – may be a prerequisite for successful training outcome in chronic aphasia.

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Meinzer, M., & Breitenstein, C. (2008) Functional imaging of treatment-induced recovery in chronic aphasia. *Aphasiology*, 22, 1251-1268.

Presented by: **Meinzer, Marcus**

132. Functional Reorganization after Constraint-Induced Language Therapy in a Case of Wernicke's Aphasia

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Introduction

Recent investigations utilizing functional neuroimaging have shed light on mechanisms underlying recovery in poststroke aphasia. Still, knowledge of the precise relationship between therapy and recovery, and how treatment-induced changes are instantiated in the brain remains elusive. The current longitudinal study examined changes in fMRI BOLD activation in an individual with Wernicke's aphasia who underwent intensive constraint-induced language treatment (CILT; Pulvermuller et al., 2001) followed by extended practice. Patterns of activation correlated with maintained improvements in naming were investigated.

Method

At study onset, ACL, a 55 y.o. right-handed male, was three years post-left MCA stroke resulting in a large temporoparietal lesion. He demonstrated impairments in auditory comprehension (9th percentile); repetition (30th percentile); and confrontation naming (9/60) on the BDAE and BNT. He was trained to name 48 black-and-white line drawings of objects and actions from the International Picture Naming Project (Szekely et al., 2005). Shortly after two weeks of intensive CILT therapy, he began a six-week period of extended practice on half of the trained pictures to promote maintenance.

Functional MRI images were acquired (Siemens 1.5T) at three timepoints (S1:pre-treatment; S2:post-treatment; and S3:6 months post-treatment), while ACL overtly named blocks of trained (CILT), untrained (UNTR), and consistently correct from baseline (CORR) pictures. He was trained to say "pass" if unable to name a picture, and during control trials (viewing nonsense shapes/lines). To record overt speech, sparse acquisition was employed (TR=3.0s; effective TR=7.0s).

Results

There were no statistically significant differences in accuracy in the scanner (2% vs. 4% correct) or BOLD signal between to-be-trained (CILT) and untrained (UNTR) conditions pre-treatment. Post-CILT, naming improved on CILT but not UNTR pictures (46% vs. 8%). Six months post-CILT, accuracy was 33% vs. 6%. Practiced CILT pictures remained 46% accurate compared to trained-but-unpracticed pictures (21%).

Post-CILT, in contrasts examining experimental vs. control tasks, significant activation (cluster FWE-corrected, $p < 0.05$) was focused in L middle frontal cortex (LMFC; BA 8/9), with increased spatial extent and degree of

activation correlated with less successful naming. Six months later, a similar pattern prevailed. Both trained (CILT) and untrained (UNTR) conditions elicited expanded left frontal activation, including LMFC (BA 6;8), LIFC (BA 44;47), and LmedFC (SMA; BA 6). Practiced CILT pictures, named more accurately than unpracticed, activated a bilateral network that approached significance, including right posterior temporal cortex (Fig. 1).

Conclusion

Treatment-related functional reorganization was observed in a longitudinal study of an individual with chronic moderately severe Wernicke’s aphasia following CILT. Improved naming was correlated with patterns of activation resembling consistently correctly named pictures. Increased effort and decreased accuracy were correlated with greater spatial extent and degree of activation including LIFC, a pattern maintained six months post-treatment. This longitudinal case study complements a small, growing literature documenting neuronal reorganization following treatment-induced improvements in, and maintenance of, naming in poststroke aphasia.

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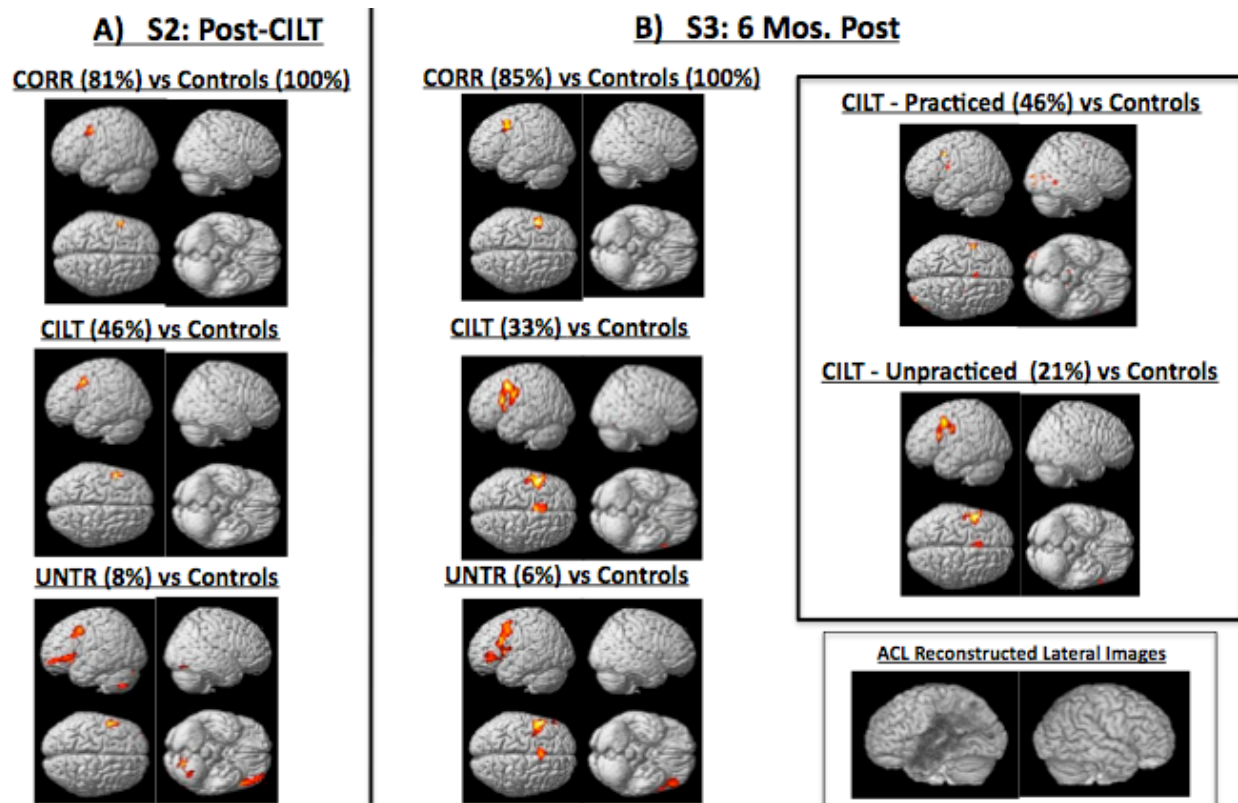


Figure 1. BOLD signal increases observed during naming of consistently correct (CORR), trained (CILT) and untrained (UNTR) pictures vs. the control task (saying “PASS” when viewing shape and line patterns) at two time points: A) post-CILT therapy; and B) six months post-therapy. Note difference between practiced and unpracticed CILT pictures vs. controls (inset). Significant regions of activation (shown here at $p < 0.001$ uncorrected for display purposes) were rendered onto a standard 3D anatomical template; ACL’s reconstructed lateral 3D images shown in lower right corner. Numbers in parentheses indicate accuracy on the task in the scanner.

Presented by: **Kurland, Jacquie**

133. Photography as a Means of Expression: Performance as Related to Aphasia Severity and Nonverbal Cognitive Status

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Introduction

Drawing is used to help people with aphasia (PWA) circumvent verbal communication problems and painting as way for PWA to convey emotions. Reports of photography with PWA are rare although Levin, et al. (2007) demonstrated its effectiveness. In this paper we describe photo workshops conducted with 15 PWA and report findings regarding relationships between the quality of photographs produced by participants and their aphasia severity and nonlinguistic cognitive status.

The Study

Participants (see Table):

- 15 PWA, ages 46 to 82 (M=69 years), 7 months to 13 years post onset (M=5.5 years)
- Aphasia severity (Aphasia Diagnostic Profiles) ranged from 9th to 95th (M=43rd)
- Nonlinguistic cognition scores (Cognitive Linguistic Quick Test : Symbol Cancellation, Symbol Trails, Design Memory, Mazes, and Design Generation) ranged from 4 to 43 (M=26.5 of 49 points)

Two Photography Workshops:

- 10 sessions (average rate = 2 per week)
- Instructor: Photographer/college professor
- Assistants: SLPs and university students
- Equipment: Digital cameras

Weekly Topics:

- “Reading” photographs
- Camera operation/strategies
- Light/tone/color
- Compositional tools/design concepts
- Difficult lighting situations
- Exposure Controls, Depth of Field, Focus

Primary homework assignments:

- Close-ups
- Light/tone/color
- Portraits/self-portraits
- Indoor/outdoor photos

Instructor downloaded participants’ photos from camera memory cards and selected best images for group analysis/discussion.

Photo Image Scoring Procedure:

- Instructor chose three photos from each participant that she judged “weak”, “moderate”, “good” (three in each category)
- Images presented in random, blind order to five college students of photography for rating
- 5-point Likert Scale: Fully Agree (1) to Fully Disagree (5) used to rate seven aspects of photographs
 - Image objects easy to name
 - Critical elements in focus
 - Textures clear
 - Image well composed
 - Image conveys emotions
 - Intent of photographer clear

- Overall, image good
- Summary Rating: Sum of aspect ratings (low scores = better photographs)

Analyses and Results

Student summary ratings scores for photographs were in keeping with the “weak”, “moderate”, “good” judgments of the instructor. Neither aphasia severity nor non-linguistic cognitive scores correlated significantly with summary ratings. Aphasia severity did correlate with photographers’ ability to convey emotions ($r(13) = -.594, p = .02$). A strong correlation ($r(13) = -.629, p = .01$) was found between aphasia severity score and variability in photo image quality (as measured by standard deviations of the nine photo summary ratings.)

Discussion

Aphasia severity correlated significantly only with ability of photographers to express emotions and variability of the quality of their images. No relation was found between nonlinguistic cognitive scores and performance. All-in-all, photography workshops appear to be a viable activity for PWA.

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Presented by: **Helm-Estabrooks, Nancy**

134. Comprehension, Maintenance, and Generalization after Treatment for Anomia in Semantic Dementia

Jokel R., Anderson N.

Baycrest-KLARU, University of Toronto

Semantic dementia (SD) is the fluent subtype of primary progressive aphasia. The earliest and most devastating feature of SD is a loss of word meaning that is reflected in poor auditory word comprehension and anomia. Recent investigations addressed the effectiveness of interventions for naming deficits focusing largely on post-treatment expressive abilities. This study evaluated the effect of therapy on comprehension of treated words, maintenance and generalization, in addition to improvements in naming.

A technique that has attracted recent interest in language rehabilitation is errorless learning, wherein individuals are prevented from making errors when learning information. We have recently reported on the benefits to naming of combining errorless and effortful (self-generated) processing in SD. Here, we explored the benefits of four treatment methods on improving comprehension in patients with SD, and evaluated maintenance and generalization of post-treatment gains. The four methods used in word re-training were

- (1) Errorless-Experimenter Provided: cues and words are provided by the experimenter in an error-free learning environment;
- (2) Errorless-Subject Generated: participants generate cues and words in an error-free learning environment;
- (3) Errorful-Experimenter Provided: cues and words (both with errors) are provided by the experimenter;
- (4) Errorful-Subject Generated: participants generate cues and are allowed to make naming errors.

Methods

Seven individuals with SD participated. Four balanced lists of 30 words each were randomly assigned to the four different training methods. Learning of picture names occurred during six hourly sessions per list, spread over 2-3 weeks. Naming and comprehension of treated words were tested immediately after the treatment stopped, followed by additional naming probes at 1 and 3 months later. Measures of post-treatment generalization addressed naming, comprehension and state of semantic knowledge.

Results

Naming: The Errorless Self-Generated approach was previously reported as significantly better than all other approaches ($p < .001$, Friedman's ANOVA).

Comprehension: The four methods were equally beneficial in retraining semantic features necessary for a successful recognition of treated words ($p > .5$, Friedman's ANOVA).

Maintenance: Naming gains were maintained at significant levels at 1 month and 3 months post-treatment ($p < .05$ for all methods, McNemar Change Test).

Generalization: Positive changes were observed on measures of naming and comprehension after treatment ($p < .05$, McNemar Change Test), but not on general semantic knowledge.

Conclusion

This study confirmed that improvements in word retrieval are possible in SD, despite a steady language decline. It also demonstrated that working on semantic features while addressing naming skills can improve comprehension of treated words. The combined effects of improved naming and comprehension were associated with post-treatment generalization measures. This study has the potential to identify mechanisms underpinning successful language therapy in SD and to fine tune therapeutic interventions for patients with progressive language disorders.

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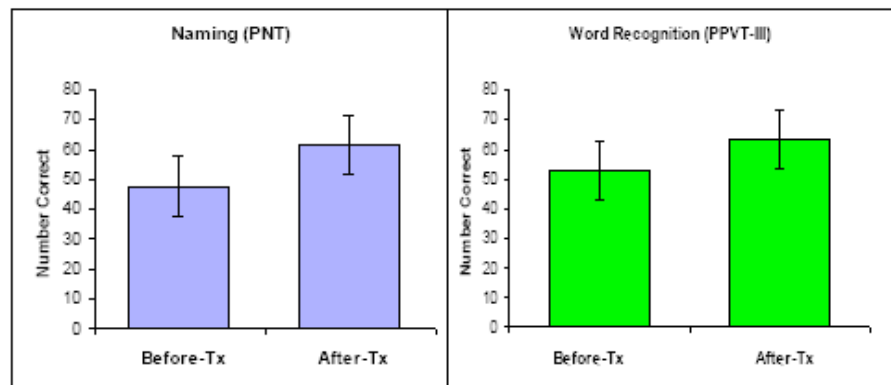


Figure 1 Post-treatment generalization

Presented by: **Jokel, Regina**

135. Issues in the Management of Subjects with Aphasia in India: A Survey

*Tiwari S., Krishnan G.
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Introduction

The prevalence of aphasia in India is estimated to be about 39 million (<http://stanford.wellsphere.com/brain-health-article/statistics-by-country-for-aphasia/242274>). However, there have not been any attempts to explore the issues in the management of subjects with aphasia in India. In this context, an online survey was designed to target the SLPs working with aphasic subjects in India.

Method

A custom-made brief survey was developed (www.kwiksurveys.com) and electronically mailed to a group of 540 SLPs. The e-mail addresses of the participants were retrieved from the Indian Speech and Hearing Association official directory (<http://ishaindia.org.in/directory.html>). The responses were collected for a period of one month.

Results

Among the 540 emails sent, 103 failed to deliver. During the survey period, 56/437 (12.81%) participated in the survey. Forty nine (87.5%) respondents were directly involved in the management of subjects with aphasia. Twenty six (46.42%) had less than five years of experience whereas 33.92% (19) had 5-10 years of experience and 11 (19.64%) had more than 10 years of experience in the management of subjects with aphasia. The majority of them (26/56; 46.42%) worked in institutional settings; 19 (33.92%) worked in hospital settings, 7 (12.5%) in university settings and 8 (14.28%) participants worked privately. Most (71.42%) had a Master's degree; 16.07% had a doctoral degree and 12.5% had Bachelor's degree.

Forty eight (85.71%) SLPs experienced problems in the management of aphasia. Most of them (91.07%) experienced client-related problems such as financial (52.14%), acute stage of the disorder (50%), proximity of the clinics (47.82%), poor motivation (43.47%), poor family support and associated problems (e.g., hemiplegia) (39.13% each). Sixteen (28.57%) participants reported of clinician-related problems; the major issues included the lack of 'time-tested treatment techniques' and all except one reported 'lack of adequate time for extensive training.' Two participants reported that they did not prefer a profession involving the management subjects with aphasia. Among the 56 participants, 43 (76.78%) reported that subjects with aphasia are often discharged from the hospital immediately after the acute medical management, without considering their post-morbid life as the individuals in the society, whereas 13 (23.21%) did not report this. Furthermore, 50 (89.28%) participants felt that the concerned authorities should set up rehabilitation centres for subjects with aphasia whereas six participants did not agree with it. When asked who the concerned authorities were, 31 participants (55.35%) answered it as government, 37 (66%) identified hospitals and 45.65% suggested that it could be non-governmental organizations (NGOs). The participants were given an opportunity to select more than one option, if relevant.

Discussion

The survey revealed several potential issues in the management of subjects with aphasia in India. It is expected to draw more attention to the management as well as to potentially contribute to the policy-making for subjects with aphasia. In addition, the survey is also expected to increase the awareness about the issues in management of subjects with aphasia in India at the international level.

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www.kwiksurveys.com (retrieved on 10th Feb 2009)

Presented by: **Krishnan, Gopee**

136. Functional Impact of CILT in Early Aphasia Rehabilitation: A Case Study

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Introduction

Constraint induced language therapy (CILT) studies have demonstrated positive outcomes on various language tests for chronic aphasia, but have only to some degree investigated the impact on everyday communication (Pulvermüller & Berthier, 2008). Recently, Pulvermüller & Berthier (2008) focused on the communicative relevance of the picture material for meaningful activation of speech, interaction and generalization to every day living. While most outcomes from CILT have dealt with chronic aphasia, we reported a positive outcome using CILT in early aphasia rehabilitation (Kirmess & Maher, 2008). This study aims to further explore the impact on functional communication outcome of CILT in early aphasia for two additional cases.

Methods

A pre-posttest intervention study was carried out with two Norwegians (LL, 78 & MX, 51) with aphasia and AoS following first time left MCA CVA. Treatment (TX) began five (LL) and thirteen (MX) weeks post onset and was delivered approximately 3 hours a day for 10 days. TX involved card games using pictures of items with communicative relevance for daily living and requiring spoken interaction in either 1-to-1 interactions with an SLP or in a small group setting. A standardized language battery (The Norwegian Basic Aphasia Assessment (NGA), TROG-2, VAST, PALPA, CILT baseline measures, Cookie theft, NGA-interview) and the CETI (Lomas et al., 1989) were administered pre and post TX.

Results

Preliminary analysis indicated an average improvement of 15% (LL) and 21% (MX) for all verbal speech production tests but not in auditory comprehension (Table 1). Communicative effectiveness (CETI) was rated by a close family member, yielding changes of the average CETI score of 16 points for LL. Lomas et al. (1989) suggested a 12 point cut-off for a significant change on the CETI, indicating a reliable increase for communication effectiveness for LL. MX's rating was at ceiling pre-TX, which persisted post TX; however, personal comments from MX's significant other indicated a more communicative attitude and larger vocabulary than before the CILT intervention.

Discussion

Results suggest that both subjects improved after CILT TX. Furthermore, improvement may also be seen in functional communication as measured by the CETI. However LL's increased results in reading comprehension and writing could not be solely explained by the CILT treatment, suggesting that influence of natural recovery on the results must be considered. Results of this study support the applicability of CILT to early rehabilitation and its impact on functional communication.

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Table 1 Pre-post test results for CILT intervention in percentage correct answers, Case LL & MX

Assessment	LL		MX	
	Pre test	Post test	Pre test	Post test
Verbal speech production tests in percentage correct				
CILT baseline measure	25	81	63	87
NGA* -repetition	92.5	97.5	65	90
NGA* -naming	88	90	69	100
NGA* -reading aloud	65	65	81	96
PALPA (64 - naming frequency)	57.5	72.5	85	100
VAST (VOST) - sentence construction	75	85	60	95
Implicit/written tests in percentage correct				
TROG -2	60	61	91	96
NGA* -comprehension	83	82	97	100
NGA* -reading comprehension	48	72	100	100
NGA* -writing	10	30	70	80
Commutative effectiveness index in points				
CETI	60	76	100	100

Note: PALPA, VAST, TROG-2 and CETI are standardized Norwegian editions of the original tests.

* NGA = Norwegian Basic Aphasia Assessment

Presented by: **Kirmess, Melanie**

137. Adaptive Interaction: Communicating with People with Very Advanced Dementia Using Imitation

*Ellis M., Astell A.
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Adaptive Interaction is a new approach to interacting with people who have very advanced dementia and can no longer speak. Adaptive Interaction is based on Intensive Interaction (II), an approach using imitation to communicate with people born with severe and profound intellectual disabilities. We present data on the use of imitation with five people with very advanced dementia which illustrate the promise of Adaptive Interaction for promoting and supporting communication between people with advanced dementia and those who care for them.

Introduction

Intensive Interaction (II; Hewett, 1996; Nind, 1999) is a communication technique focusing on non-verbal and subvocal exchanges with little or no involvement of speech. Caregivers attend to and imitate their partner's nonverbal behaviour and join in with their rhythms, sounds and vocalisations. By responding in ways that are familiar to the person with severe communication difficulties, it is possible to "learn their language" and build relationships without speech (Caldwell, 2005).

Adaptive Interaction is an attempt to learn the language of people with very advanced dementia who experience communication barriers from progressive loss of speech coupled with severe cognitive problems. Investigation with a single individual with advanced dementia suggested that imitation has promise as a communication technique in dementia (Ellis & Astell, 2005). The present study extends the exploration of the communicative function of imitation to a group of nonverbal people with very advanced dementia.

Method

Using a small 'n' multiple baseline design, five people with very advanced dementia participated in a total of six sessions each with a communication partner (i.e. total study sessions = 30). This included a minimum of 2 AI sessions per person giving a total of 15 baseline and 15 AI sessions across the 5 participants. Instances of communicative imitation by the people with dementia and the communication partner were recorded.

Results and Discussion

Comparison across all participants with dementia between the baseline and AI sessions revealed significant increases in communicative imitation by the people with dementia in the AI sessions (Table 1. p

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Table 1. Mean (SD) amount of imitation of communicative bids by people with dementia and communication partner

	Baseline	Adaptive Interaction
People with dementia	0.1(0.3)	1.7 (2.3)
Communication partner	1.9 (3.1)	24 (8.9)

Presented by: **Ellis, Maggie**

138. Effects of Intensive Aphasia Therapy on the N400: Evidence from Chronic Aphasics

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We investigated the effects of a 4-week intensive aphasia therapy program (InteRACT) on patterns of brain activation measured with event-related brain potentials (ERPs) in nonfluent, chronic aphasics. Our goal was to characterize the effects of intensive therapy on the N400, an ERP effect associated with lexical processing. Evidence suggests that intensive therapy can lead to significant improvements in language ability even in chronic aphasics. Since patients undergo a clearly defined and consistent therapeutic regimen, and clinically significant gains may be realized over a relatively short timespan, this presents an ideal opportunity for investigating the neural bases of recovery from aphasia.

We recorded brain activity using ERP while aphasics (n = 5) performed a picture-name matching task, both before and after 4 weeks of intensive (approx. 25 hours/week) therapy. As well, neurologically intact, age matched controls (n = 11) and aphasics (n = 4) in standard-of-care (non-intensive, 1-2 hours/week) speech-language therapy participated, tested twice with a 4 week interval in between. On each trial in this task, a picture of a common object was presented followed 1 sec later by a spoken label that either matched or did not match the object displayed. Participants indicated whether the picture and label were a match or not via button press.

ERP results showed that in neurologically intact controls, an N400 was elicited for picture-label mismatch trials relative to match trials. The amplitude, timing, and distribution of the N400 was highly stable across the two testing

sessions 4 weeks apart. In contrast, the N400 was highly variable between aphasic participants, with generally delayed latency and reduced amplitude. The N400 was quite stable across testing sessions for individual aphasics in standard-of-care therapy. In contrast, aphasics in the intensive therapy program who showed clinically significant gains on standardized tests, also showed changes in the N400. Specifically, the latency of the N400 was reduced (suggesting faster processing), and the amplitude was, in most patients, increased.

Presented by: **Newman, Aaron**

139. Investigating Speech as a Source of Biomarkers for Changes in Cognition, Executive Function and Mood

*Pénard N., Counihan S., D'Arcy S., Rapcan V., Reilly R., Robertson I.
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Depression, dementia, and mild cognitive impairments are the most common pathologies that may prevent the elderly from remaining independent. These diseases gradually impair executive function in the elderly, making it hard to detect without thorough testing. Complete neuropsychological assessments are cumbersome, expensive and time consuming. It would be greatly beneficial to find non-invasive and automated ways to constantly monitor memory, mood and executive function without face-to-face testing. Speech is a potential candidate for providing biological markers for changing cognitive functions.

In a longitudinal study, we assessed 30 elderly participants first in a clinic setting, and then in 7 consecutive home-based phone interviews at one-month intervals. For each of these interviews, we recorded the participants' performance in a Word List recall task (Immediate and Delayed), a category fluency task (alternatively: animals, vegetables and fruits) and a Mood test (short version of the PANAS). The participants also read a short narrative passage and performed a verbal description task requiring executive function. During this last task, the participants had to describe pictures without using a set of keywords. These keywords were important elements in the pictures that were difficult not to use in a verbal description. These two tasks were digitally recorded on a computer. Using automated algorithms, we extracted a set of physical features of speech for these two recordings (e.g., number of pauses, mean pause durations, etc.).

Using correlational and multivariate techniques, we investigated whether the speech parameters predicted the score results from the neuropsychological tests. We also compared variability indices within and between participants for the different assessments.

The results are discussed as possible ways of using these speech parameters to estimate the state of memory, executive function and mood of the elderly living at home. Accurate predictions of cognitive and mood states could lead to the design of devices and procedures allowing for a painless and timely diagnostic of abnormal aging.

Presented by: **Pénard, Nils**

Poster Session 4: Syntactic Representations and Processes-2

140. Syntactic and Memory-Based Effects in Aphasic Agreement

*Slevc L., Banneyer K., Martin R.
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Speakers sometimes erroneously produce plural agreement for a singular subject when another noun in the sentence is grammatically plural (e.g., "The box near the windows were open"). The little work investigating these attraction effects in agrammatic aphasic patients has yielded mixed results: some evidence suggests only syntactic factors influence agreement errors (Hartsuiker, Kolk, & Huinck, 1999) while other work shows influences of both syntactic and semantic factors (e.g., Vigliocco & Zilli, 1999). Because the left inferior frontal damage implicated in Broca's aphasia is also implicated in semantic short-term memory (STM) deficits (Martin & Romani, 1994), these previous data may confound STM deficits and agrammatism. Thus, the present study elicited agreement errors in three patients with severe semantic STM deficits and varying degrees of agrammatism to investigate the role of syntactic and semantic factors in agreement production.

Patients and controls repeated sentence preambles and continued with a verb (is/are) and a visually-presented adjective. Critical preambles contained singular matrix nouns and manipulated the grammatical number and semantic plausibility (compare (1) and (2) below) of intervening nouns.

- (1) The box near the window(s)... (OPEN)
- (2) The box near the table(s)... (OPEN)

Because patients with semantic STM deficits accurately detect noun-verb number agreement errors even across intervening material (Martin & He, 2004; Martin & Romani, 1994), we predicted these patients to show relatively normal effects of grammatical attraction. However, as these patients have deficits in semantic STM, they were predicted to show stronger than normal effects of semantic plausibility (either because of rapid decay of the controlling noun or excessive interference between possible controllers).

Contrary to our prediction, all three patients showed substantially greater syntactic attraction effects than did controls; however, the size of this effect was not correlated with the degree of agrammatism. Two of three patients also showed greater semantic plausibility effects than controls. These findings suggest that producing an agreeing verb involves a search in STM for an appropriate controlling noun, which may be confused with other elements in memory that have similar properties, especially when the interfering noun is semantically consistent with to-be-produced material (cf. Badecker & Kumiak, 2007). Current work is testing a further prediction of this account: that these patients will be impaired at detecting agreement errors in sentences including potential controllers with mismatching features.

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

141. Neural Correlates of Storage and Computational Costs in Sentence Comprehension

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Introduction

Processing syntactic structure involves both memory and computational operations. In the present study, we examined the neural basis of memory and computational costs in parsing and sentence interpretation using fMRI. We explored memory costs by adapting stimuli from Chen (2004) that have shown behavioral effects of Gibson's (1998, 2000) "storage" costs, which vary the number of thematic roles predicted by a verb without introducing additional differences in the type of predicted element or the word order of the sentence. We explored computational costs by varying the number of thematic roles that have to be assigned when a verb is encountered. This study differs from previous studies in that it focuses on two aspects of verb arguments: the expectations set up by the number of arguments of a verb, and the costs incurred because of the need to satisfy each of the arguments of a verb.

Stimulus Materials

Storage Costs

Obligatory Transitive: Mary published a book which had impressed some critics and a young child

Optional Ditransitive: Mary read a book which had impressed some critics to a young child.

Obligatory Ditransitive: Mary gave a book which had impressed some critics to a young child.

In the storage cost sentences, the obligatorily transitive and optionally ditransitive sentences require the prediction of one noun phrase to complete the sentence grammatically, while the obligatorily ditransitive sentences require the prediction of two noun phrases.

Computational Costs

Transitive: The conductor realized that the train was ready to board.

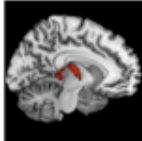
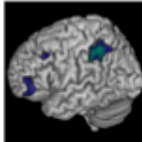
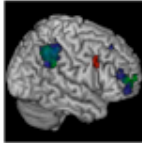
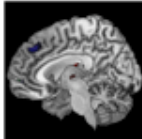
Intransitive: The conductor realized that the train was ready to leave.

In the computational cost sentences, the transitive sentences require two thematic roles to be integrated at the verb, while the intransitive sentences only require one thematic role to be integrated.

Experimental Methods

12 right-handed native speakers of English read plausible and implausible sentences in a rapid-presentation event-related (RPER) fMRI paradigm and made plausibility judgments of these sentences. Only responses to plausible sentences were considered when constructing the contrasts and statistical activation maps for the fMRI experiment to eliminate potential responses arising from the detection of implausible or impossible scenarios. Structural and BOLD-sensitive functional MRI images were obtained with a 3T Siemens Trio scanner (Siemens Medical Solutions USA Inc., Malvern, PA, USA). All preprocessing and statistical analysis of the fMRI data was performed using the SPM5 software package.

Results

	RegionBA	p cluster	cluster size (in voxels)	
Computation: transitive – intransitive				
1. L Thalamus (Pulvinar)		0.032	71	
2. L Thalamus (Medial Dorsal Nucleus)		0.001	198	
3. R Middle Frontal/Precentral Gyrus	9, 6	0.018	89	
Storage: obligatorily ditransitive – optionally ditransitive				
1. R Inferior Parietal Lobule/Supramarginal Gyrus	40	<0.001	901	
2. L Inferior Parietal Lobule	40	<0.001	623	
3. L Middle Frontal Gyrus	10	<0.001	221	
4. R Anterior Cingulate, Middle/Superior Frontal Gyrus	10	0.003	99	
5. R Middle Frontal/Superior Frontal Gyrus	10, 9	0.004	88	
6. L Middle Frontal Gyrus	8	0.006	77	
7. R Cingulate/Medial Frontal Gyrus	32, 8	0.001	120	
Storage: obligatorily ditransitive – obligatorily transitive				
1. L Inferior Parietal Lobule	40	<0.001	304	
2. R Inferior Parietal Lobule	40	<0.001	465	
3. R Middle Frontal Gyrus	10	0.014	65	
4. R Middle Frontal/Superior Frontal Gyrus	10	0.012	68	

Conclusions

Neural correlates of computational and storage costs are individually demonstrable and spatially distinct.

Neural correlates of the two separate storage cost contrasts overlap in four common regions, indicating that similar processes are taking place in these two related contrasts.

Results are consistent with behavioral results using similar stimuli, which indicate that transitive sentences have higher processing costs than intransitive sentences, and obligatorily ditransitive sentences have higher processing costs than optionally ditransitive and obligatorily transitive sentences, with no cost difference between optionally ditransitive and obligatorily transitive sentences.

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Acknowledgments

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Presented by: **Caplan, David**

142. Treating Written Verb and Written Sentence Production in an Individual with Aphasia: A Clinical Study

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Background

Written language is an important communication modality for some people with aphasia. Although there has been some important work in this area, e.g. Mitchum, Haendiges and Berndt (1993), the efficacy of treatments for written verbs and sentences is less well explored in comparison to treatments for spoken verb and sentence production deficits. We document the efficacy of a treatment to improve written production of verbs and sentences in an individual with aphasia. Specifically, (a.) to improve the production of written subject-verb sentences (involving intransitive verbs) and (b.) to improve the production of written subject-verb-object sentences (involving transitive verbs). This treatment enabled us to compare acquisition of intransitive and transitive verbs in the written modality.

Method

The participant, LW, was a 63 year old right-handed female aphasic speaker, following an infarct at the age of 56 (left middle cerebral artery). She had a marked language comprehension deficit, moderate apraxia of speech, relatively good spelling abilities and no hemiplegia. A multiple-baseline single-subject experimental design was adopted. Two pre-treatment baseline measures were taken before the beginning of treatment (a week apart) and these were followed by ten weekly treatment sessions, each lasting about an hour. One maintenance measurement was taken three weeks after the end of treatment. The stimuli involved 12 intransitive verbs and consequently subject-verb (SV) active sentences and 15 transitive verbs permitting subject-verb-object (SVO) active non-reversible sentences. A control task, letter spelling to dictation was used to evaluate the specificity of the intervention. The treatment was undertaken in the context of UK clinical practice and was guided by a psycholinguistic model of spoken sentence production (Bock & Levelt, 1994).

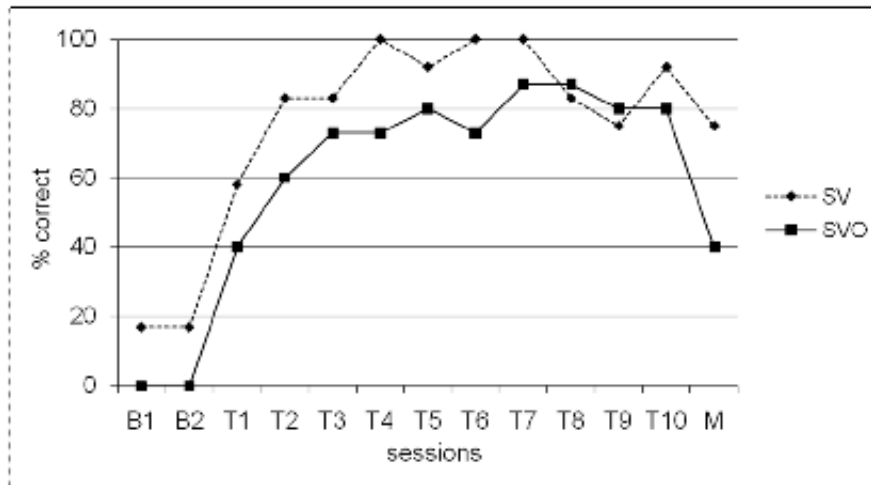
Results and Discussion

Statistical improvements were noted for the trained sets of sentences. LW's performance during treatment is shown in figure 1. At baselines (B1, B2), stability of performance was demonstrated. During treatment (T1 - T10) performance began to improve. At post-treatment (M) there was evidence of a decline for sentences with transitive verbs whereas performance on sentences with intransitive verbs was maintained. This trend is concordant with Thompson's (2003) argument structure complexity hypothesis, positing that the greater the number of arguments associated with a verb the poorer the performance. Other clinically significant quantitative and qualitative improvements were also noted in LW's ability to retrieve other verbs and construct written sentences although treatment did not generalise to letter spelling to dictation, spoken sentence comprehension nor written discourse production.

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Figure 1 Transitive and intransitive sentences



Presented by: **Salis, Christos**

143. Neuroplasticity and Recovery from Aphasia: Treatment-Induced Recovery of Verbs and Sentence Production

*Riley E., Den Ouden D., Lukic S., Thompson C.
Northwestern University*

Introduction

Many agrammatic aphasic speakers show greater difficulty producing verbs compared to nouns, with the greatest difficulty associated with argument structure density (Thompson et al., 1997). Verb production deficits are also associated with sentence production deficits, and improved verb retrieval has been linked to improved sentence production (Schneider & Thompson, 2003). The Complexity Account of Treatment Efficacy (CATE; Thompson et al., 2003) suggests that treatment proceeding from more to less complex verbs might result in the greatest treatment effects. Further, recent studies examining the neural correlates of recovery from aphasia suggest that such training will influence the neural substrates of verb production.

The purpose of the current study was to examine generalization effects of training verbs with complex argument structure on retrieval and use of verbs with less complex argument structure, while examining the neural mechanisms of recovery. It was hypothesized that training three-argument verbs would result in generalization to less complex verb types for both verb naming and sentence production, and that behavioral changes would be associated with observable shifts in brain activation patterns from pre- to post-treatment.

Methods

Using a single-subject multiple baseline design across participants and behaviors, six agrammatic aphasic speakers were trained using three-argument verbs and generalization was examined to transitive and intransitive verbs. Training occurred in simple active sentence contexts and involved verb naming and thematic role activities using pictures and written sentence constituent cards. Verb naming and argument production accuracy were measured with daily sentence production probes administered before each training session. Performance was evaluated based on the proportion of (a) sentences produced with the correct verb (regardless of argument structure), and (b) sentences with correct verbs also produced with correct argument structure. Before and after training, each participant named intransitive and transitive verbs from action videos in an event-related functional MRI (fMRI) task.

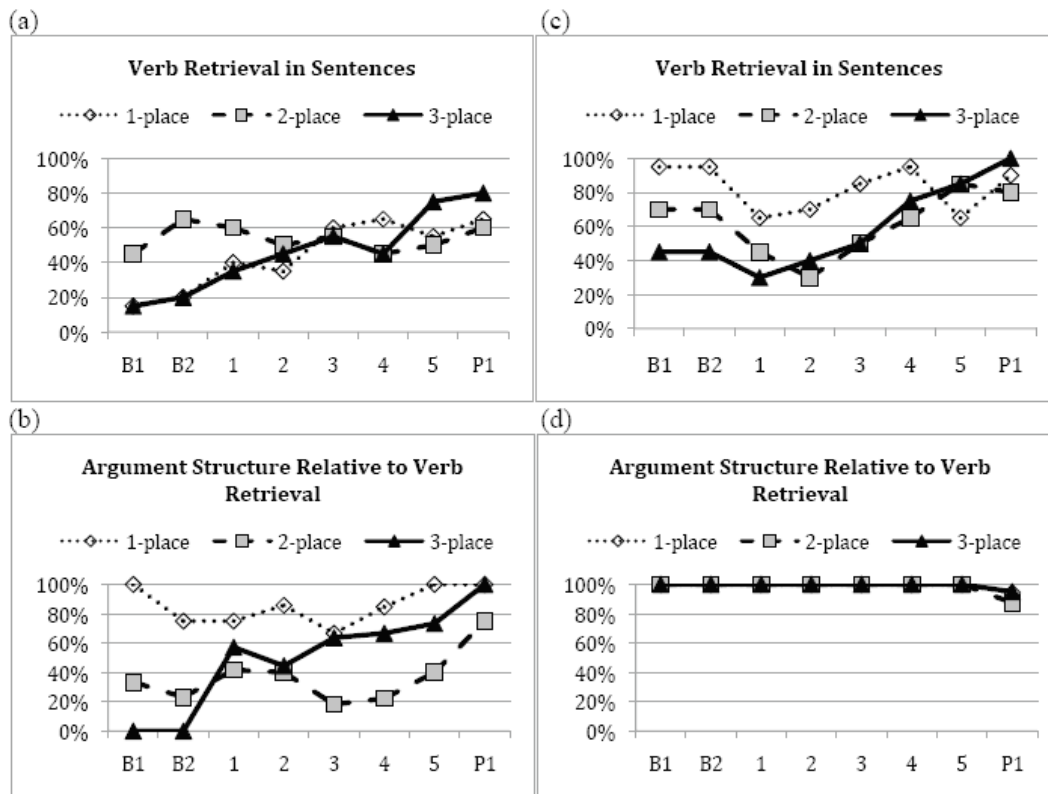
Results & Discussion

All but one participant showed improved ability to name three-argument verbs; however, none showed generalization to transitive or intransitive verb naming. With regard to the effects of verb naming on improved sentence production (i.e., argument structure access), two patterns emerged. Two participants demonstrated improved verb retrieval with concomitant improvements in argument production for verbs correctly produced (Figure 1a, b). In contrast, four participants demonstrated improved verb retrieval while argument production remained high (Figure 1c, d). All participants showed pre- to post-treatment changes in fMRI activation patterns with differences across participants related to several factors including site and extent of lesion. These findings will be discussed in relation to their theoretical implications.

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Figure 1. a, b: Example of one participant's improved verb production (in sentences contexts) and simultaneously improved argument structure production (in sentences). c, d: Example of one participant's improved verb production (in sentence contexts) with maintenance of intact argument structure production for the verbs retrieved.



144. Neural Basis of On-Line Processing of Words and Sentences in Aphasia Revealed by Voxel-Based Lesion-Symptom Mapping

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¹ Neuropsychology and Neurorehabilitation Service, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland, ² Language and Speech Processing Laboratory, University of Neuchâtel, Switzerland

Introduction

Language comprehension is believed to rely on the integration of hierarchically organized linguistic levels ranging from phonetic to pragmatic aspects. While growing neuroimaging literature suggests that partially segregated specialized brain networks underlie the encoding of the different levels of spoken language, the critical role of specific regions remains to be demonstrated. The lack of neuropsychological evidence for the fine anatomic-functional organization of language processing comes notably from the limited specificity of the off-line comprehension tests traditionally used in the clinical evaluation of aphasia. On-line comprehension paradigms resolve this issue by allowing to recruit selectively language processing levels of interest, therefore providing a promising tool for the fundamental and clinical investigation of aphasia. Using a voxel-based lesion-symptom mapping, we investigated the neural underpinnings of on-line language comprehension in a large group of aphasic patients. In addition, our study addresses the relevance of on-line assessment in the characterization of aphasia in brain-damaged populations.

Methods

Forty right-handed French-speaking patients with a first unilateral left-hemispheric lesion underwent an on-line comprehension assessment composed of six subtests. The first test evaluates low-level phonetic processing using a syllable discrimination task within a meaningless syllable sequence. On the lexical level, two word recognition tasks were used, one assessing access to word form and the other to word meaning. On the morpho-syntactic and semantic-pragmatic (sentence) levels we used a word monitoring task assessing the access of syntactic and semantic properties.

A voxel-based lesion-symptom mapping was performed on a subset of 30 patients with available structural CT or MRI to explore the relationship between a on-line test performance and the brain damage sites.

Results

The anatomo-clinical correlations revealed clear associations between lesion locations and most of the tests of our on-line comprehension battery. Lesions to Broca's area were associated with impairment in the phonetic test; sylvian damage with impaired word form recognition; and posterior cortico-subcortical damage with impaired word meaning recognition.

The on-line battery revealed no specific performance pattern associated with classical aphasia syndromes determined with off-line testing. This suggests that any linguistic levels can be impaired in different aphasia syndromes.

Conclusions

Anatomo-clinical correlations of on-line speech processing demonstrated the critical role played by specific networks in phonetic, lexical-semantic and semantic-pragmatic analysis of speech. Thus, our results support strongly evidence for segregated specialized brain networks that underlie the encoding of the different levels of spoken language.

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Presented by: **Schneider, Laurence**

145. Structurally Primed Passive Sentence Production in Agrammatic Aphasia: An Eyetracking Study

Cho S., Thompson C.
Northwestern University

Introduction

Difficulty producing passive sentences is common in individuals with agrammatic aphasia. Some studies have attributed this difficulty to structural impairments (e.g., Schwartz et al., 1994; Thompson & Shapiro, 2007), and others have attributed it to morphological impairments (e.g., Caplan & Hanna, 1989). However, the source of this deficit remains unclear due to methodological issues present in previous off-line studies. Given that passive morphology is essential for identification of passive structures, it is challenging to examine impairments in passive structures when passive morphology is impaired. To overcome this problem, this study used structural priming to elicit active and passive structures, and eye movements were tracked during production attempts to determine the source of passive production difficulty.

Methods

Participants. Nine individuals with agrammatic aphasia (age: 38-66, time post-onset: 2-17 years, WAB AQ: 71.2-82.4) participated in the study. All but one were right handed, well-educated, and demonstrated good visual and hearing acuity.

Stimuli and Procedures. 40 prime sentences (20 passives, 20 actives) were paired with pictures of target transitive events, which elicited target sentences. All sentences were semantically reversible and included two animate nouns and a transitive verb. On experimental trials, participants listened to and viewed a prime sentence, and repeated it aloud. Next a picture appeared, and participants were expected to describe it using the primed sentence structure. Participants' speech and eye movements were recorded.

Results and Discussion

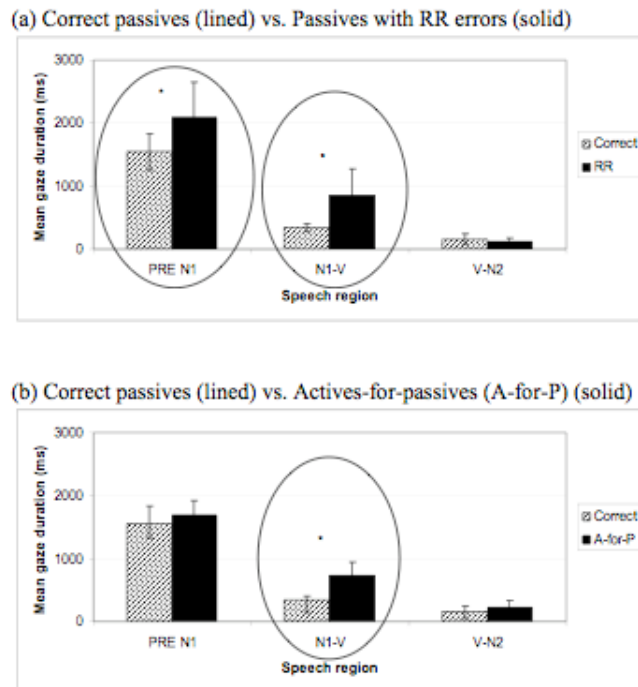
Production accuracy data showed that passives were produced with relatively preserved morphology, but with substantial role reversal (RR) errors (42.2%). In addition, a high proportion of actives were produced for passives (37.61%). Onset latency of passives with RR was significantly longer than that of actives-for-passives (6907 ms vs. 4219 ms) ($p < .01$), which was significantly shorter than that of correct passives (5773 ms) ($p < .05$).

The eye movement data revealed greater processing costs for passives with RR than for correct passives, and RR responses were qualitatively different from actives-for-passives (Figure 1). Before speech (the PRE N1 region), participants gazed significantly longer at the object to be produced as N1 when producing RR as compared to correct passives ($p < .05$), indicating difficulty assigning the Theme to the subject position. However, when producing actives-for-passives as compared to correct passives, this difference was seen during speech (the N1-V region) ($p < .05$), but not before speech, indicating unprepared sentence production prior to speech onset. These on-line data (speech onset latencies and eye movements) provide evidence of real-time difficulties constructing passive sentence structure when morphology is relatively intact. The theoretical and clinical relevance of these data will be discussed.

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Figure 1. Mean gaze duration to N1 by speech region in correct and incorrect passives



Presented by: **Cho, Soojin**

146. The Effects of Distance on Reading Sentence Processing in Persons with Aphasia and Normal Individuals.

Sung J., McNeil M., Dickey M.
University of Pittsburgh

Introduction

Working memory (WM) has been used to account for sentence comprehension deficits in aphasia. However, the precise nature of WM and its effects on sentence comprehension remain underspecified in both normal and clinical populations. Gibson (1998, 2000) has argued that distance or locality is a critical factor consuming WM, and Grodner and Gibson (2005) investigated how distance affects the accuracy and speed of processing sentences with subject-verb (SV) and filler-gap (FG) dependencies in younger adults. The current study attempted 1) to investigate distance effects by replicating Grodner and Gibson's (2005) study and 2) to examine the effects of dependencies on sentence processing when distance is held constant between SV- and FG-dependency in persons with aphasia (PWA) and age-matched normal individuals (NI) using a self-paced reading task.

Methods

Twenty PWA (age: mean=60, SD=14) and 30 NI (age: mean=66, SD=12) participated in the study. The NI passed hearing, vision, memory, and language screens, and reported no history of communication, neurological, or psychiatric disorder. The PWA were defined by their performance on the Porch Index of Communicative Ability (Porch, 2001), the Revised Token Test (McNeil & Prescott, 1978), and the Assessment Battery of Communication in Dementia (Bayles & Tomoeda, 1993).

All participants read 240 sentences including 120 filler sentences presented using a word-by-word, self-paced reading method. The experimental sentences were constructed by manipulating distance, using three modifier

conditions (No modifier, Prepositional Phrase(PP), Relative-Clause(RC)), and two linguistic dependencies (SV vs. FG). Reading times (RT) for the embedded verbs and errors in yes/no questions served as dependent measures. A three-way ANOVA with group, modifier and dependency as factors examined distance effects. A two-way ANOVA with dependency and group as factors examined dependency effects when the distance was held constant between the two linguistic dependencies.

Results

A three-way ANOVA for the error data revealed significant main effects (all $p < .05$) and dependency (FG>SV). RT analyses revealed a significant main effect of dependency ($p < .05$) and group (PWA>NI). In the RT analysis, there was a significant main effect ($p < .05$)

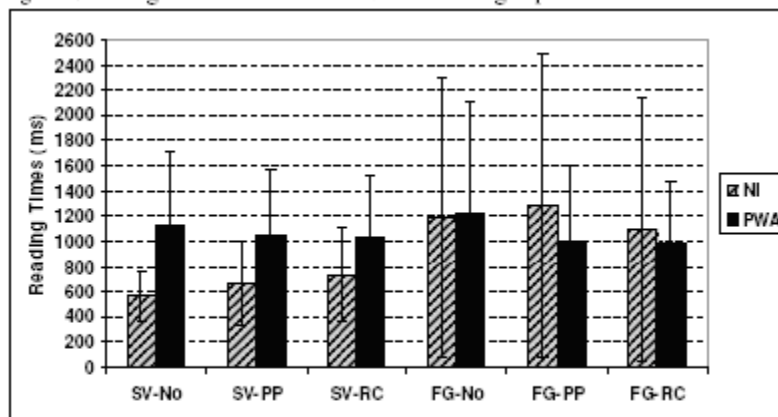
Discussion

Although NI showed systematic distance effects in errors and RTs, the effects of distance were not evident in PWA. Furthermore, both groups showed more errors and longer RTs in FG than SV dependencies when the distance was controlled. These results indicate that greater computational loads were imposed by FG sentences than SV sentences when distance was held constant, for both PWA and NI.

Selected References

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Figure 1. Reading times on the embedded verbs for both groups



Presented by: **Sung, Jee Eun**

147. The Role of the Left Inferior Frontal Gyrus in Sentence Composition: Connecting fMRI and Lesion-Based Evidence

Piñango M., Finn E., Lacadie C., Constable T.
Yale University

Introduction

We report on the neuroanatomical underpinnings of intermediate gaps (IGs), connectors triggered at the complementizer that whose function is to keep active an argument across clauses until it receives its semantic role (e.g., Gibson & Warren, 2004). In the sample sentence below, the argument "the captain" receives a semantic role

from the subordinate verb “frighten”. To maintain the dependency that brings the argument to its predicate, an IG is created as the sentence unfolds yielding the interpretation:

The captain [who-“captain” the sailor predicted yesterday [that (IG-“captain”) the weather would frighten--“captain”]]...

Hence, IGs represent a clear marker of sentence-level (morphosyntax-semantics) composition. Consequently, knowing its cortical localization would shed light on the brain implementation of a fundamental organizing process involved in sentence structure.

Previous research shows LIFG activation associated with argument movement (e.g., Grodzinsky & Santi 2008) working memory (e.g., Cooke et al., 2001, Fiebach et al., 2005), and semantic-role assignment (e.g., Piñango, 2004, Bornkessel et al., 2005). Crucially, IGs dissociate working memory from movement and semantic-role assignment and uniquely reveal real-time composition as they are triggered exclusively by sentence-composition demands (i.e., are not part of the lexicon). Hence LIFG recruitment by IGs would suggest that LIFG supports the real-time integration of syntactic and semantic structure involved in movement and semantic-role assignment; thus unifying previously disparate findings regarding LIFG function.

Methods

15 subjects were tested in a 1.5T magnet on four conditions (60 sentences/condition), pseudorandomly presented across 10 runs:

A. IG (^) & Argument_Gap(*):

The captain, who the sailor predicted yesterday ^that the weather would frighten *, turned back towards port.

B. Argument_Gap(*):

The captain, who the sailor’s prediction yesterday about the weather had frightened *, ...

C. Argument_Gap violation:

The captain, who the sailor’s prediction yesterday about the weather had frightened the crew, ...

D. No-gap:

The captain believed the sailor’s prediction yesterday that the weather would frighten the crew and ...

Results

Initial results show unilateral LIFG and LpSTS activation at the complementizer (IGs) consistent with working memory activity to keep the argument active (Figure 1) and LIFG activation at the embedded verb (AGs) indicating semantic-role assignment (Figure 3).

Results also show sentence-level bilateral temporoccipital activation consistent with non-linguistic working memory/attention demands of multiclausal processing (Figure 2).

Discussion

Results support LIFG involvement in initial parallel syntactico-semantic real-time composition guided by argument-structure demands. We discuss these results within a model of brain-language relations that brings together representation and processing-based views of the LIFG and LpSTS.

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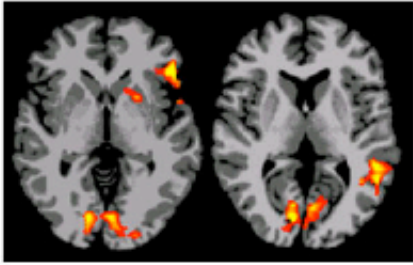


Figure 1. (A - D) $p < .01$, corrected

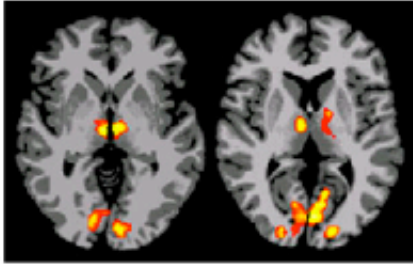


Figure 2. (B - D) $p < .01$, corrected

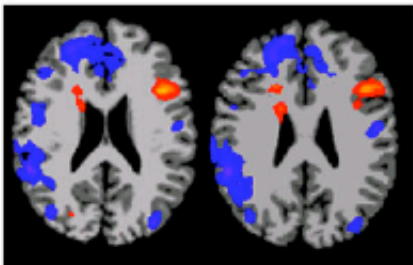


Figure 3. (B - C) $p < .05$, corrected

Figure 1. Activation in the left IFG and left pSTS during the processing of the intermediate gap, condition (A - D).

Figure 2. Bilateral temporoparietal activation associated with multiclausal processing. Note that whereas this is present in (A - D) and (B - D), only (A - D) reveals left IFG activation, showing its sensitivity to intermediate gaps.

Figure 3. Activation associated with processing of argument gaps (B - C) which replicates previous results (see Santi & Grodzinsky 2008 for a summary).

Presented by: Piñango, Maria

Poster Session 4: Conceptual and Semantic Processing

148. Abstract and Concrete Noun Processing in Healthy Older Adults using fMRI

*Sandberg C., Kiran S.
Boston University Sargent College*

Introduction

The difference in processing abstract and concrete words with a specific advantage for concrete words is called a 'concreteness effect' and has been shown to exist in normal and language-disordered populations (Paivio, 1991). Recent neuroimaging studies suggest the possibility of dissociable neural correlates for abstract and concrete word processing (see Binder, 2007, for a review). Binder, Westbury, McKiernan, Possing, and Medler (2005) found bilateral activation for concrete nouns and left-lateralized activation for abstract nouns in healthy young adults. To date, abstract and concrete word processing in normal, healthy older adults has not been addressed, although cognitive processes have been shown to change as a function of age (Cabeza, 2001) and persons with aphasia are usually older adults. The present study explores the processing of abstract and concrete nouns in healthy older adults in order to establish a baseline against which to compare the processing of abstract and concrete nouns in persons with aphasia.

Methods

Ten (five male, five female) monolingual, right-handed, English speaking adults aged 50-63 with no history of neurological disease participated in the experiment. All participants completed at least a high school education and did not display any cognitive or semantic deficits. Each participant completed a lexical-decision task and a word-judgment task presented in an event-related fMRI paradigm. The lexical-decision task was replicated from Binder et al. (2005) and consisted of 50 abstract, 50 concrete, and 100 pseudowords. The word-judgment task consisted of 50 abstract and 50 concrete nouns and 50 same and 50 different symbol strings. Each participant was asked to decide whether the noun was abstract or concrete and whether the symbols in each symbol string were the same or different.

Results and Discussion

In the lexical-decision task, concrete nouns produced greater overall activation and more bilateral activation than abstract nouns, which produced more right-hemispheric activation. This is contrary to the Binder et al. (2005) study, which resulted in greater left-hemispheric activation for abstract nouns but is consistent with bilateral activation observed in older adults (Cabeza, 2001). In the word-judgment task, abstract nouns produced greater overall activation and more bilateral activation than concrete nouns, which produced more left-hemispheric activation. The differences seen between tasks may be due to the nature of the control condition for each task and/or the degree of difficulty of each task. It is important to note that with the limited number of participants in this study, these findings are tentative.

References

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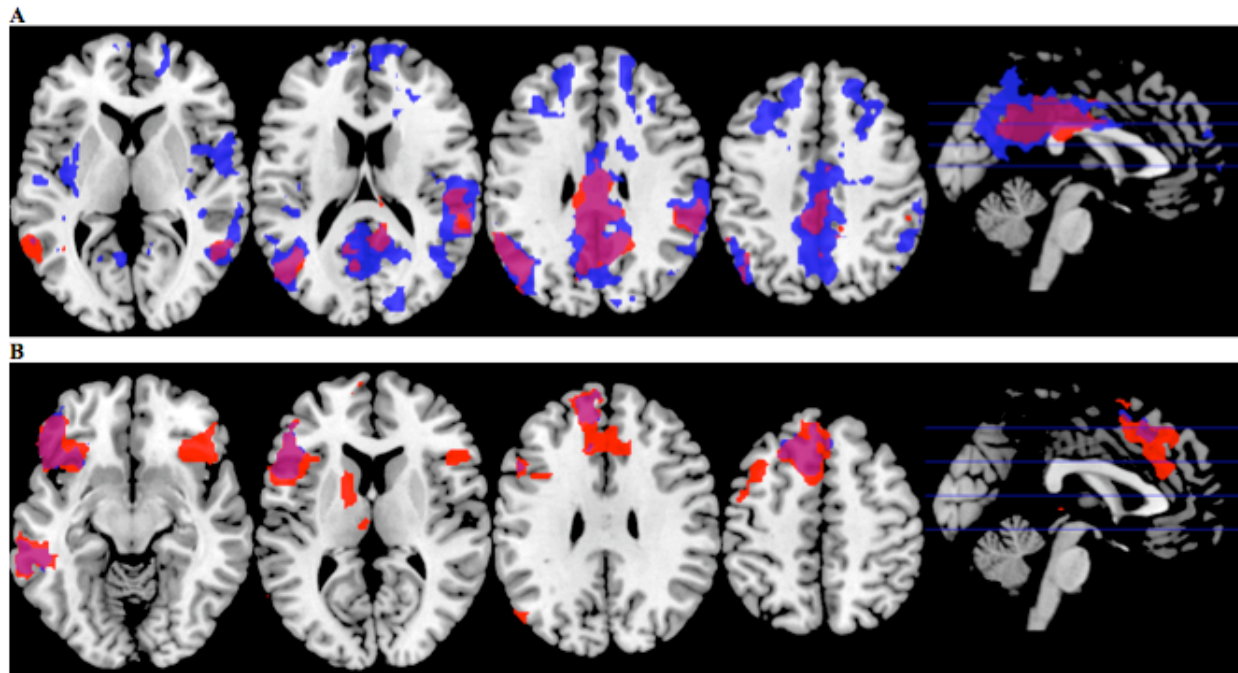


Figure 1: Activation maps of abstract and concrete noun processing for the lexical-decision task (A) and the word-judgment task (B). Red = activation for abstract nouns over control condition, blue = activation for concrete nouns over control condition, purple = overlapping activation.

Presented by: Sandberg, Chaleece

149. Syntactic Structural Recursion or ‘Theory of Mind’ Type Embeddings in Aphasia

Bánrétí Z.¹, Zsitvai M.²

¹ Research Institute for Linguistics of the Hungarian Academy of Sciences, Budapest, Hungary, ² Technical University, Budapest, Hungary

The research has been supported by the National Scientific Research Fund (OTKA), project: NK72461.

It is a debated issue whether recursivity is a syntactic phenomenon or the source of recursion is semantics (Evans & Levinson, 2009). The issue: how aphasic impairment impinges on syntactic and/or semantic recursivity.

Tests have been conducted with four Hungarian aphasic subjects. Photographs representing situations were presented to subjects and questions were asked about them. The types of questions:

Type 1: What is X doing?

Type 2: What does X hate/want to do?

Type 3: What can be the most entertaining/urgent thing for X to do?

Type 4: What can X say/think ?

Type 1 questions did not restrict the structure of the answer. Type 2 and Type 3 questions allowed for recursive and non-recursive answers alike. In Hungarian, Type 4 questions could only be answered by using an embedded clause,

introduced recursively. We used 208 photographs for each test.

Results

Answers given by the 4 aphasic subjects have been classified in terms of whether they were structurally linked to the questions and were or were not grammatical.

The number of grammatical answers decreased from Type 1 to Type 2 and Type 3. Broca's aphasic subjects avoided giving recursive answers as a rule. See Table 1.

With respect to Type 4 questions (What does X say/ think ?), requiring a recursively embedded clause as an answer, the performance of three of the subjects turned out to be better than with Type 1 questions (What is X doing?); for one subject, it was almost as good. This result contradicts the expectation that building recursive structures should be more difficult than building non-recursive ones.

Wernicke's aphasics produced some conjunction-initial clauses and some clauses involving the subjunctive (the mood directly indicating subordination).

Broca's aphasics did not give any answers containing subordinating conjunction (a structural recursion). However, they produced statements that assumed the point of view of one of the characters seen in the photograph, rather than being purely descriptive. They answered as if they were in the "mental state" of the characters. These answers are referred to as "discourse statements." In them, the verb was inflected in the first, rather than the third, person singular, their meanings differed sharply from descriptive statements. 81.8% of Broca's aphasics' answers to Type 4 questions were discourse statements. For example:

The picture: A girl is showing her scar to a boy.

Question: Vajon mire gondol a fiú?

'What may the boy be thinking of?'

Patient's answer: Mindjárt rosszul leszek!

'I'm going to be sick.'

Possible recursive construction:

(Ő) arra gondol, hogy mindjárt rosszul lesz.

'He thinks he is going to be sick.'

Conclusion

These answers contain semantic-pragmatic operations with 'theory of mind' type embeddings instead of syntactic structural recursion. Semantic recursivity may remain selectively unimpaired in Broca's aphasia.

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Presented by: **Bánréti, Zoltán**

150. Probing Semantic Memory with a Computerized Sorting Task

Kar J.¹, Den Hollander J.², Clark D.³

¹ University of Alabama at Birmingham, ² University of Alabama at Birmingham Department of Medicine, ³ Birmingham VA Medical Center & University of Alabama at Birmingham Department of Neurology

Background

Verbal fluency measures (including category and letter tasks) are among the most compact and widely used neuropsychological tests, and allow comparison of semantically cued lexical access to orthographically cued lexical access. However, the utility of these tasks is compromised by the need for subjects to verbalize, such that patients with aphasia, especially deficits of fluency, might decline to floor on both tasks. We explored the use of a computerized sorting task for quantifying semantic deficits in patients with semantic dementia, with the expectation

that elicitation of cued responses could reduce floor effects.

Methods

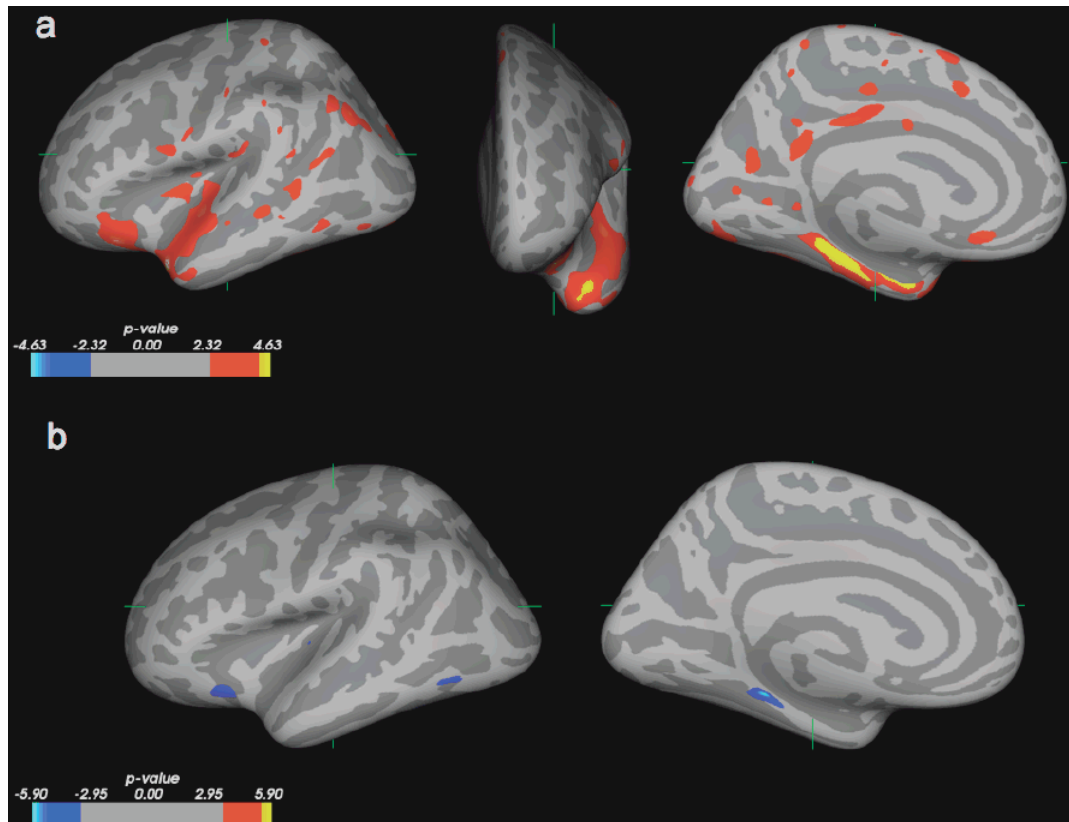
Thirty right-handed, English-speaking subjects were recruited, including 29 healthy controls (age 50.44 ± 20.01) and 3 semantic dementia (SD) patients (age 60.0 ± 5.29). The sorting paradigm consisted of three subtests, two of which required subjects to make a timed decision on black and white pictures, and one of which assessed raw reaction time to single letters. The first of the picture-decision tasks consisted of a series of pictures of animals, with subjects pressing the space bar for each bird and ignoring pictures of other animals. The second picture-decision task required subjects to press the space bar for each tool that was related to food or eating, but to ignore other tools. Subjects were given three seconds for each decision. Reaction times and errors were quantified. All subjects underwent neuropsychological tests and an MRI scan. The neuropsychological test battery included semantic fluency for seven categories (animals, fruits/vegetables, water creatures, tools, vehicles, boats, and verbs) and phonemic fluency for three letters (F, A, and S). These were combined to generate a single scaled fluency score that was proportional to both total score and the ratio of semantic fluency to phonemic fluency. FreeSurfer was used to generate a cortical surface map from each subject's MRI scan. These maps were correlated with error rates on the tools task and with total semantic fluency scores.

Results

Error rates were analyzed with a 2 (group) X 2 (task) ANOVA. There was a main effect of diagnosis, with SD patients making significantly more errors overall ($F(1,58) = 13.67, p < 0.001$). There was a main effect of category, with the tools task eliciting more errors ($F(1,58) = 11.31, p < 0.01$). In addition, there was a significant diagnosis by task interaction, with SD patients making relatively more errors on the tools task ($F(1,58) = 6.49, p < 0.05$). Reaction times were analyzed with an analogous 2X2 ANOVA, which showed only a main effect of category, with the tools task requiring more processing time ($F(1,58) = 26.4, p < 0.001$). Sorting errors correlated strongly with total semantic fluency ($r = -0.73, p < 0.001$) and semantic fluency correlated with gray matter in the left temporal lobe (a). Sorting errors correlated most significantly with gray matter in the left mesial inferior temporal lobe (b). Although one SD subject was at floor with verbal fluency for tools, he answered 41/50 correctly on the tools sorting task.

Discussion

Computerized sorting tasks may provide information comparable to verbal fluency measures, with several advantages, including (1) the opportunity to evaluate semantic memory with verbal and nonverbal cues, (2) evaluation of reaction times, (3) reduction of floor effects, and (4) results independent of articulation.



Presented by: Clark, David

151. Lexical vs. Compositional Semantics: Syntax and Quantifier Scope in Aging and Semantic Dementia

Clark D.¹, Kar J.²

¹ Birmingham VA Medical Center and University of Alabama at Birmingham, ² University of Alabama at Birmingham

Objective

To compare syntactic comprehension and interpretation of quantifier scope ambiguities in patients with semantic dementia and controls using a self-paced reading test with picture verification.

Background

Major syntactic theories employ a movement computation (Move- α) for the generation and interpretation of sentences. According to these theories, movement is involved in the interpretation of complex syntactic constructions and also leads to the ambiguous interpretations of doubly quantified (DQ) sentences. Previous studies have produced conflicting findings, with some suggesting a preference for “surface scope” (preference for the earlier quantifier to take wide scope) and others suggesting interactions between lexical and grammatical factors. We hypothesized that measures of syntactic processing would correlate with processing costs induced by quantifier scope ambiguity.

Methods

Twenty-eight cognitively normal subjects (age 51.0 ± 22.53) and three semantic dementia patients (age 60.0 ± 5.29)

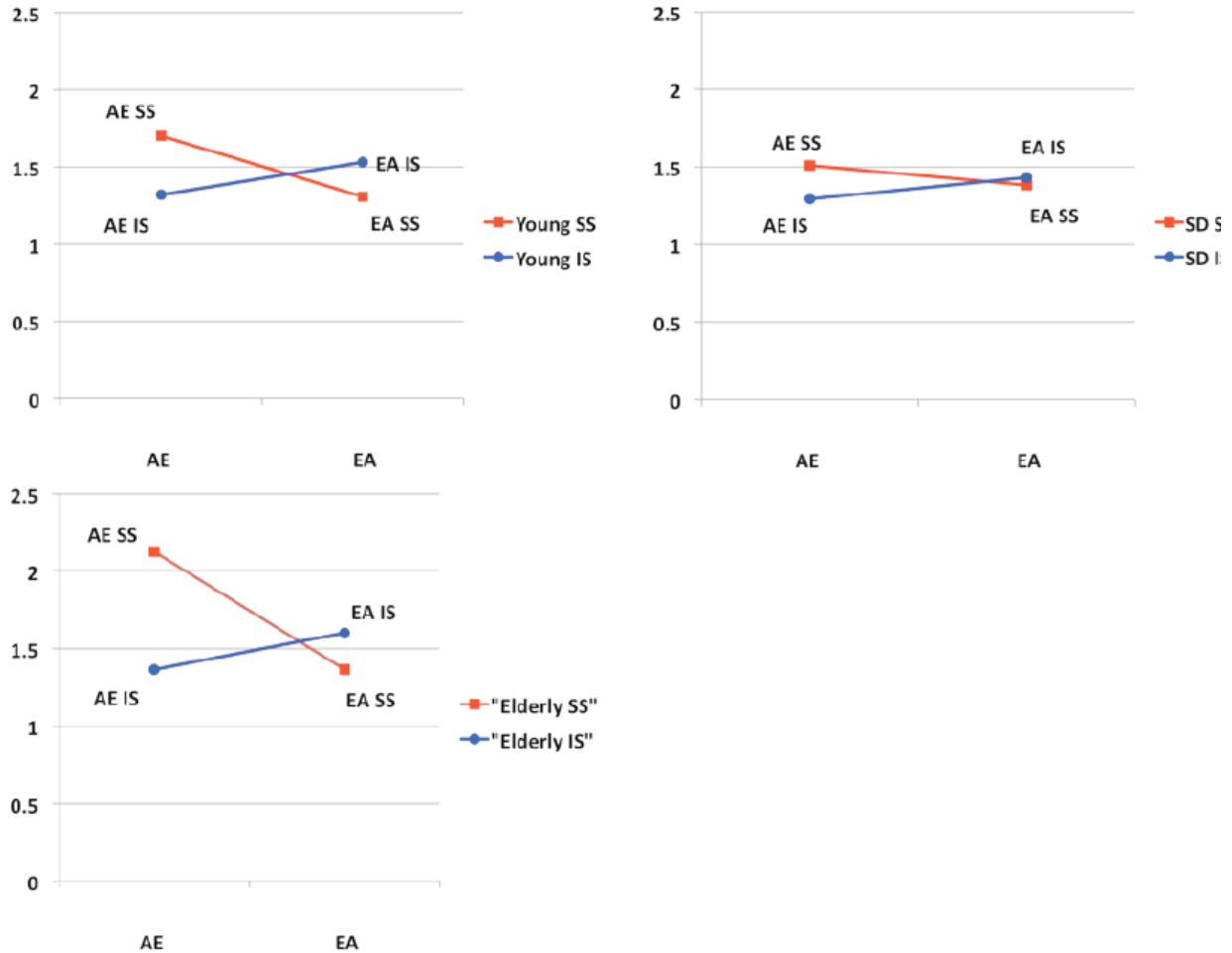
participated in a self-paced reading protocol with picture verification. Stimuli consisted of 242 sentences, divided into two subtests of equal length. Each sentence was followed by a picture that was either consistent (“positive” – 132 items) or inconsistent (“negative” – 110 items) with the preceding sentence. Positive items included 40 from the SOAP test of syntax comprehension, 40 DQ and 40 singly quantified sentences. Singly quantified sentences were paired with the same pictures as the DQ sentences, to provide a measure of visual processing time in the absence of scope ambiguity. DQ positive sentence-picture pairs were divided into four groups according to quantifier order of the sentence (“A...every” and “Every...a” – hereafter AE and EA) and the quantifier scope interpretation necessitated by the picture (inverse or surface scope- hereafter IS and SS). Negative items used sentences and pictures that were comparable to the positive items, always with one inconsistency. Hierarchical linear modeling (HLM) was used to fit a model explaining variance in picture verification times following DQ sentences while controlling for individual differences in reaction time.

Results

HLM revealed that the strongest predictor of picture verification time after DQ sentences was the interaction between scope and quantifier order, with AE-SS sentence-picture pairs taking 548 ms longer than other pairings. The interaction between age and scope was significant, with older subjects requiring more time to verify pictures requiring the SS interpretation. Scaled verbal fluency scores were negatively associated with picture verification times. Patients with semantic dementia generally performed poorly on syntactic comprehension (t-test, $p < 0.01$), but showed smaller delays in the processing of AE-SS sentences than elderly subjects (t-test, $p < 0.05$).

Discussion

Cognitively normal subjects are biased toward the interpretation of the quantifier ‘every’ as having wide scope regardless of quantifier order. Assignment of narrow scope to ‘every’ in AE sentences incurs a processing cost and normal aging is associated with slowing of this processing. Contrary to expectations, some semantic dementia patients do exhibit difficulty interpreting non-canonical sentences. Despite this difficulty, however, both interpretations of DQ sentences appear to be readily available to semantic dementia patients. The tendency to assign wide scope to ‘every’ might represent a learned lexical bias that is attenuated by degraded lexical semantics in semantic dementia. These findings do not support explicit movement computations during the interpretation of ambiguous doubly quantified sentences.



Presented by: **Clark, David**

152. Nicotinic Modulation of Strategy-Based Semantic Priming in PD

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Introduction

Many of the cognitive sequelae of Parkinson's disease (PD) are unresponsive to dopaminergic therapies, indicating dopaminergic system changes alone may not fully account for the cognitive deficits of PD. There is evidence to suggest that cholinergic, particularly nicotinic, mechanisms may play a contributing role. Recently, acute transdermal nicotine was found to selectively affect attentional lexical-semantic processing in healthy young adults (Holmes, Chenery, & Copland, 2008). In PD, attentional lexical-semantic processing is thought to be compromised (e.g., Arnott, Chenery, Murdoch, & Silburn, 2001). The aim of the current study was to investigate the effects of nicotine in medicated persons with PD on a cognitively demanding strategy-based priming paradigm. It was hypothesized that aberrant attentional priming effects would be demonstrated in PD under placebo but that nicotine would ameliorate attentional lexical-semantic processing in PD leading to normalized priming effects.

Subjects and Procedures

Twelve patients with idiopathic PD and 17 matched controls were recruited. The strategy-based priming task stimuli and procedures have been published in detail (Holmes et al., 2008). In brief, subjects were instructed to expect target words to come from specified semantic categories based on the primes, while unexpected targets were also presented. Priming conditions included two conditions that concurred with trained expectations (expected-related and expected-unrelated), two which did not (unexpected-related and unexpected-unrelated), and neutral conditions. Stimuli were presented at a 1250ms stimulus onset asynchrony. Speeded lexical-decisions (yes/no) were made on targets. Nicotine patches (7mg/24hr) and placebos were administered in a double-blind, crossover fashion.

Analyses

Linear mixed model analyses were performed on correct target-response reaction times (RTs).

Results

Analyses revealed a significant group \times drug \times expectancy interaction, $F(1, 1064) = 4.18, p = .041$. As depicted in Figure 1, controls evidenced significant expectancy effects (i.e., significant differences in RTs for expected compared to unexpected conditions) under both drug states ($ps < .001$). In contrast, an expectancy effect was not evidenced in PD under placebo ($p = .147$) but did appear under nicotine ($p < .001$) at a level comparable to that for controls.

Conclusions

The absence of an expectancy effect under placebo for PD is in line with previous findings but further specifies that difficulties in attentionally engaging the lexical-semantic network in PD are present even when semantic strategies are made explicit. The expectancy effect for PD under nicotine is consistent with the notion that nicotine can improve attentional and effortful processing (Rusted, Graupner, Tennant, & Warburton, 1998), at least in populations performing at suboptimal levels, normalizing attentional lexical-semantic processing in PD.

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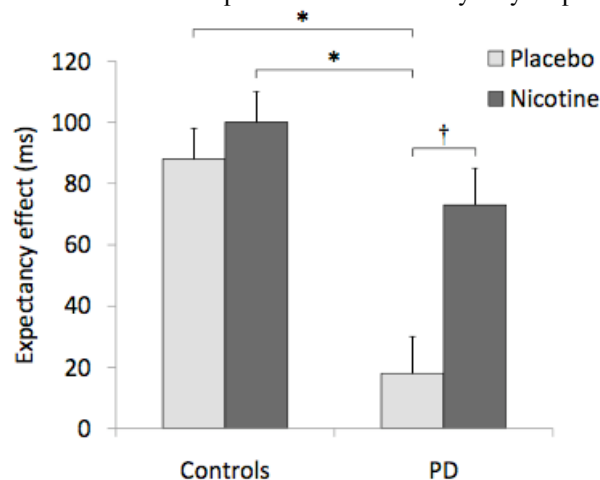


Figure 1. Expectancy effects for controls and PD as a function of drug state
PD = Parkinson's disease; ms = milliseconds; * $p < .001$, † $p < .01$

Presented by: **Holmes, Anna D**

153. Processing the same action-related stimuli in verbal and nonverbal tasks: evidence for dissociable modality-dependent representations in aphasics

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While aphasia is often associated with apraxia, double dissociations between verbal and nonverbal disorders leave unsolved the question of whether action and action-related language share neural representations. Saygin et al. (2004) proposed that there are different degrees at which linguistic and nonlinguistic domains share representations, depending on how much linguistic and nonlinguistic tasks have in common in terms of perceptual and conceptual properties and developmental stages of acquisition.

Here, we tested (i) whether language impairments were always associated with impaired action performance, when linguistic and nonlinguistic functions were tested with the same action-related stimuli; (ii) whether action-verbs and tool-nouns related to the same motor program, share neural representations. We assessed the ability of 12 left-damaged aphasics and 12 healthy participants in action performance (imitation and tool-use), naming and word comprehension (name-to-picture matching tasks). These tasks are comparable for age of acquisition as motor control develops synchronously with word production (Siegel, 1981). Participants were asked to imitate and name 15 pantomimes of tool-use; to use and name the corresponding 15 tools visually presented; to match their spoken names (action-verbs and tool-nouns) to pantomimes and tools, respectively. Stimuli were matched for name agreement, name latency, age-of-acquisition and length. A 3 task (praxis, naming, comprehension) x 2 trigger (tool-use and tools) x 2 group (patients and controls) ANOVA revealed that patients were more impaired at naming actions and tools than on the other tasks. However, action naming correlated with both imitation and verb comprehension, and tool naming correlated with both tool-use and noun comprehension. Thus, we reproduced the above-mentioned group-level correlations across linguistic and nonlinguistic performance. However, the single-case analyses revealed double dissociations in pantomimes processing, between imitation and action naming, and between imitation and verb comprehension. For tool processing, although all patients were better at using than naming tools, a double dissociation was found between tool-use and noun comprehension, suggesting that word representations can be spared, even when word production is impaired. Considering the performance with verbs and nouns, at group-level, action naming correlated with tool naming and action-verb comprehension correlated with tool-noun comprehension. Again, the single-case analysis revealed double dissociations between the ability to name actions versus tools and the comprehension of action-verbs versus tool-nouns. We also observed a differential effect of age-of-acquisition (more accurate performance for early-acquired words) for nouns and verbs, suggesting distinct neural representations for the two word-categories (Boulenger et al. 2007).

Even when items are conceptually identical and tasks are matched for perceptual features and developmental stages of acquisition, representations of tool-actions and tools dissociate from lexical-semantic representations of action-verbs and tool-nouns, respectively. Action-verb representations are independent of the ability to perform the corresponding motor programs. Tools-noun representations dissociate from the ability to produce the associated action. We also provide evidence that action-verbs and tool-nouns are associated with distinct neural substrates.

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Presented by: **Papeo, Liuba**

154. Mapping Language and Action in the Brain: Evidence from Aphasia and Apraxia

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Sensorimotor theories of language have recently implied that motor representations are necessary for processing language (e.g. Gallese & Lakoff, 2005). Studying patients suffering from aphasia or apraxia offers a unique opportunity to test the predictions derived from these theories. To date only a few studies (e.g. Papagno et al. 1993; Kertesz et al. 1984; De Renzi et al. 1980) have been published that served this aim, for they demonstrated that aphasia and apraxia can double dissociate. However, these studies did not report an exhaustive analysis of the lesions that gave rise to aphasia and apraxia.

Here we present data from 61 left-brain damaged patients who performed clinical tests assessing linguistic (using the Aachen Aphasia Test, Luzzatti et al. 1996) and praxic (imitation and tool use) abilities. Behavioral analysis at group level showed a significant positive correlation between scores on linguistic and imitation tests and between scores on imitation and tool use tests; no reliable correlation was found between scores on linguistic tasks and tool use task. Single-case analyses showed that apraxic and aphasic deficits dissociated: six patients were selectively impaired at language processing, whereas five patients were selectively impaired at imitating and one patient at tool use. The lesion analysis showed aphasia was associated with regions involving insular cortex and putamen, and ideomotor apraxia with temporal white matter areas and thalamus. The patient who showed a selective impairment in tool use had a lesion restricted to the putamen. In order to establish the brain areas most affected in each deficit (controlling for the other two), a lesion analysis at group level was performed using Voxel-based Lesion Symptom Mapping technique (VLSM). Significant results were found for aphasia and ideomotor apraxia: patients' performance on linguistic tests was associated with damage of the superior temporal regions (MNI coordinates $x = -55$, $y = -11$, $z = -1$) extending to the insular cortex ($x = -41$, $y = 4$, $z = -5$); patients' performance on the imitation test was associated with damage of the inferior parietal cortex, including the angular gyrus ($x = -37$, $y = -53$, $z = 50$) and the surrounding white matter ($x = -28$, $y = -47$, $z = 41$) (see Figure). These results replicate previous neuropsychological observations by showing that linguistic and motor abilities are independent and extend our knowledge of their neural correlates.

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Presented by: **Rumiati, Raffaella Ida**

155. Do Abstract and Concrete Concepts Have Different Representational Frameworks? Further Evidence from Another Case of Refractory Semantic Access Disorder

*Hamilton A., Schnur T., Martin R.
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Introduction

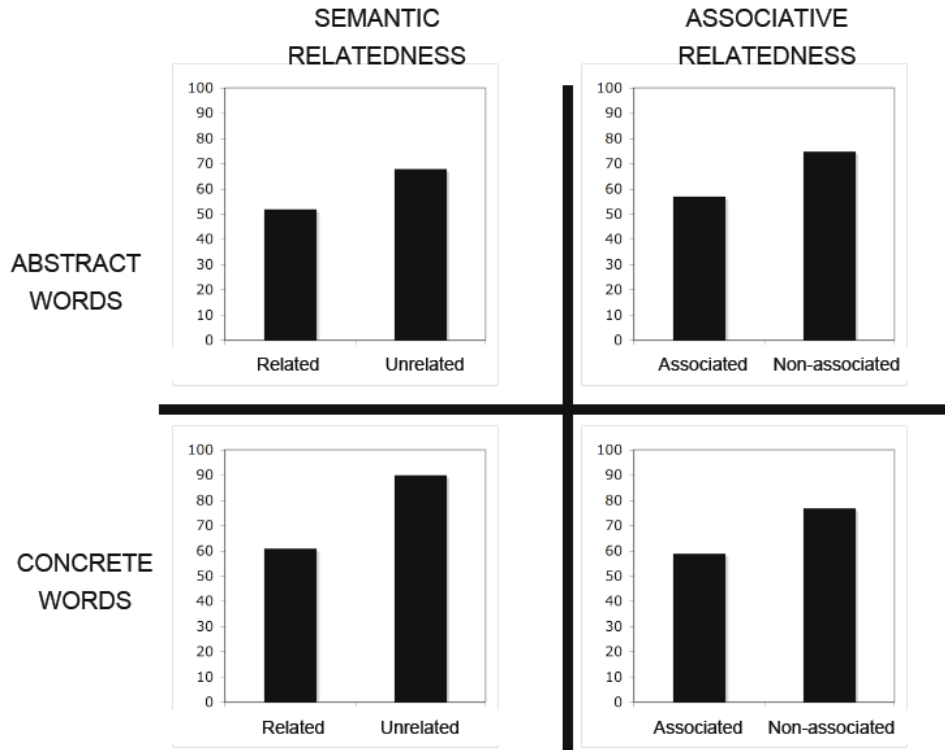
Patients with “refractory semantic access disorders” are characterized by three unique behavioral effects on comprehension tasks employing spoken-word / written-word matching. These patients show an increase in errors as a function of repetition, and with a faster rate of presentation. Moreover, they are extraordinarily sensitive to effects of semantic relatedness. For example, using a spoken-word / written-word matching task, these patients are much worse when words are presented among an array of semantically related items compared to an array of unrelated items. These exaggerated effects of semantic relatedness are thought to result from abnormal activity among semantic representations that share semantic space. The presence and size of these semantic relatedness effects have been used to make novel inferences about the organization of semantic knowledge. For example, Crutch and Warrington (2005) have used data from such patients to propose that concrete and abstract concepts have fundamentally different principles of organization, with concrete concepts being organized categorically (i.e., animals, tools, fruits, etc.) and abstract words being organized associatively (i.e., non-synonymous words bound by real world or sentential contexts). These conclusions were originally based on data from patient AZ, who showed exaggerated relatedness effects for categorically related concrete words and associatively related abstract words, but not associatively related concrete words or categorically related abstract words. However, a subsequent patient with a refractory semantic access pattern of deficits, patient UM-103, showed a very different pattern of performance. Specifically, patient UM-103 showed relatedness effects for both concrete and abstract words, regardless of whether they were presented in categorically related or associatively related arrays (Hamilton & Coslett, 2008).

Case Report

In this study, I present data from another patient who demonstrates all of the features of a refractory semantic access disorder. He is sensitive to repetition, is worse with rapid presentation of items, and is extremely sensitive to effects of semantic relatedness. However, when tested with abstract and concrete materials reported by Crutch & Warrington (2005), patient FC’s pattern of performance closely matched patient UM-103. Specifically, he showed statistically significant relatedness effects for both concrete and abstract words regardless of whether they were presented with categorically or associatively related distractors (Figure 1). These data represent another failure to replicate the double dissociation reported by Crutch & Warrington (2005) and further challenge the replicability of the original data supporting structurally different representational frameworks for abstract and concrete concepts. The findings instead suggest a similar organizational framework for concrete and abstract words.

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Presented by: **Hamilton, A. Cris**

156. Shared Feature and Associative Semantic Errors in Aphasic Word Production

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Semantic errors are one of the most common types of error produced in aphasic word production. Coltheart (1980) made the distinction between shared feature errors which share semantic characteristics with the target (e.g. ‘animal’ or ‘dog’ for ‘cat’) and associative errors which do not (e.g. desk -> school). However, the nature and cause of these different subtypes of semantic error has received relatively little attention in the literature since then. Recently, Jeffries and Lambon Ralph (2006) demonstrated that most individuals with semantic dementia produced only shared feature errors whereas most people with aphasia following stroke, produced both shared feature and associative errors. While Jeffries and Lambon Ralph interpret the associative errors (e.g. squirrel -> nuts’; lorry -> ‘diesel’) as “strong but irrelevant associations”, and conclude “it is difficult to account for these errors in terms of a loss of knowledge” (p2143), Nickels (1997) argued that the fact that most individuals produce both error types makes it more likely that the errors have the same source of impairment. We therefore aimed to investigate this issue further. Picture naming responses were collected from 3 case series of people with word retrieval/production impairments, on 3 different sets of pictures.

The percentage of semantic errors produced was similar across the three groups (19%, 16%, 14%; including multiword responses). Table 1 shows the percentages of each type of semantic error produced. The proportion of coordinate errors is relatively stable across each group, however, there is more variation in the proportion of associative errors produced.

We then investigated the correlations between the production of shared feature (coordinate, superordinate and subordinate) and associative response types in groups B & C. Two consistent factors emerged in the by-subjects analysis: a higher proportion of the errors of those individuals with more accurate naming were semantic errors, and there was a tendency for more associative errors to be produced the more semantic errors there were, suggesting a link with severity of impairment.

When examining the patterns across items, once again the correlations showed some consistent factors: First, items tended to produce more of one kind of error than the other (there was a significant negative correlation between number of shared feature errors and number of associative errors). This suggests that perhaps some property of an item influences whether or not it is more likely to lead to a shared feature or an associative error.

Second, there was no correlation between proportion of semantic errors and proportion of either shared feature or associative errors, suggesting that the error types are not distinguished in terms of difficulty of a particular item. Then, we investigate the effects of psycholinguistic variables (age of acquisition, imageability, rated word familiarity and number of syllables) on the production of shared feature and associative errors, under the hypothesis that if different variables affect each error type, then this is suggestive of different levels of impairment. For shared feature errors, Group A showed a significant effect of imageability; groups B & C showed no significant effects. For associative errors, all three groups showed significant effects of age of acquisition.

Further analyses will be reported from analysis of the factors affecting semantic errors for individual participants and the implications of these results for theoretical accounts of the origin of semantic errors discussed.

Table 1: Percentage of each type of semantic error produced as a proportion of total semantic errors.

% of semantic errors	Group A	Group B	Group C
shared feature: coordinate	25	22	23
shared feature: superordinate	8	4	10
shared feature: subordinate	3	2	3
associative	25	18	33
semantic description: specific/close	10	9	15
semantic description: general/distant	18	3	7
semantic description of a semantically related item	2	2	2
semantic then phonological (single word)	8	15	3
information from episodic memory	1	1	0
semantic other	2	5	3

Presented by: Nickels, Lyndsey

157. Neural Correlates of Semantic Feature Analysis in Chronic Aphasia: Brain Plasticity Mechanisms Induced by Therapy Influenced by Pre-existing Networks.

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Anomia is one of the most common and persistent impairment in aphasia. Semantic feature analysis (SFA) (Boyle and Coehlo, 1995) intends to elicit the word production by activating the semantic networks and was proven to be effective in chronic aphasia (Marcotte et al., 2006; Boyle, 2004). However, it remains to be proven within a larger group of patients. Moreover, a preliminary study showed the impact of SFA on brain plasticity (Marcotte et al.,

2006), but it also needs to be studied with multiple-case studies. Thus, the present event-related fMRI study examined the impact of SFA on the neural substrate and its efficiency in 10 patients.

All participants suffered from a left CVA, from 4 to 25 years prior to the study. They were all right-handers and presented a moderate to severe aphasia. All participants received an intensive SFA therapy, in which 20 objects and verbs were trained. Before and after therapy, they performed an overt naming task in the fMRI. At the behavioural level, a statistical analysis was performed to evaluate the efficacy of the therapy and to measure the generalization effect. For the neuroimaging data, each participant has been analyzed as a single-case. Contrasts have been made with trained words and words correctly named prior to therapy in order to compare the neural networks sustaining correct naming before and after therapy.

A variance analysis showed a significant improvement ($p < 0.01$) with the trained objects and verbs for all 10 participants. With these language improvements, a generalization was observed on few items, but was not significant. The areas that were activated after therapy were related to lexical selection like the MTG in both hemisphere. Activations observed after therapy were more related to the nature of the task and to the semantic nature of the therapy. Moreover, for all participants, we observed a contraction of the network after therapy. All participants benefited from SFA to improve their naming abilities. Even in the chronic phase, older persons presenting an aphasia have a potential to improve their naming abilities. Moreover, these improvements were associated to brain plasticity mechanisms which are related to the nature of the therapy. However, cerebral plasticity appeared to operate differently for each participant according to the pre-existing network of naming. A contraction of the network with both trained objects and verbs was observed and may mean that consolidation means less need for recruitment. Thus, multiple case-studies are important in order to better understand the differences in brain plasticity in chronic aphasia patients.

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Presented by: **Marcotte, Karine**

158. Profound Jargon Aphasia with Preserved Semantic and Gestural Processing: A Case Study.

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Introduction

Jargon aphasia has been described as fluent, easily articulated, prosodic, connected speech that is mostly unintelligible and characterized by semantic, literal and neologistic paraphasias. Varying abilities to self-monitor and self-correct word errors have been reported (Marshall, 2006). Several models of lexical processing have attributed the prevalence of nonword errors to weakened connections between semantic, lexical, and phonological levels of processing (Dell, Schwartz, Martin, Saffran, & Gagnon, 2003). This case study describes the clinical profile of an individual with jargon aphasia, characterized by a profound phonological/orthographic output deficit but relatively preserved semantics and gestures. He will be discussed in relation to the themes of Marshall's (2006) review of jargon aphasia including: nonword errors, self-monitoring, writing, and syntax. His profile suggests the possibility of a complete disconnection between the lexical-semantic and phonological/orthographic levels of interaction.

Case Report

SX, a 73 year old, left-handed male experienced a left CVA in 2006 without residual aphasia, and another left CVA in 2007, resulting in severe jargon aphasia. Assessment was initiated at least 1 year after his most recent CVA.

Phonological/Orthographic System. Spontaneous speech was characterized as fluent jargon with less than 10% of utterances consisting of content words. In connected speech, function words were often evident but surrounded by islands of jargon, so that intelligibility was less than 25%. Naming and repetition accuracy, even for high imageability/ high frequency words, was less than 10%. Despite frequent findings in the literature that paraphasias in jargon aphasia are target-related (Marshall, 2006), his neologistic errors preserved phonological similarity or syllable length less than 25% of the time. Similar errors were present orthographically, even with automatic tasks such as signing his name, writing serial numbers, and copying simple words. Self-monitoring and self-correction behaviors were virtually non-existent for both orthographic and phonological paraphasias.

Rhyming judgments were profoundly impaired with both auditory (43%) and orthographic presentations. Phoneme discrimination and auditory lexical decision were moderately impaired (78%).

Semantic System. In contrast to the severe-profound deficits noted in phonology and orthography, lexical and semantic processing was remarkably preserved. Tasks involving lexical comprehension, ability to follow multi-step commands, synonymy judgments, sentence comprehension, and word reading comprehension were completed with over 80% accuracy.

Gestural System. Another contrast to the severe deficits in the connection between semantics and phonological/orthographic output systems was the preserved connection between semantics and action output lexicon, demonstrated by his outstanding ability to use finely-tuned, complex meaningful gestures.

Treatment. Therapeutic attempts to use his strong semantic or gestural systems to facilitate improved phonological or orthographic output have been unsuccessful.

Discussion

It is hypothesized that because of the severity of the deficit at the orthographic/phonological level, the spread of activation from this level is too weak to support lexical-semantic processing. Therefore, treatment outcomes may be maximized by exploiting the nonverbal semantic system for communication.

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TABLE 1
 Examples of SX's Errors in Naming and Repetition Tasks
 Proportion of Shared Phonemes between Target and Response, Correct # of Syllables Retained

Task	Target	Response	Proportion shared phonemes	# syllables retained
<u>Naming</u>	gun	/ɛmtʃu/	0	no
	hammer	/pɔlsiage/	0	no
	scotchtape	/kewar/	.29	yes
<u>Repetition</u>	bed	/sɪlɪstɪhəkɪnɑrtk/	0	no
	window	/strli/	.20	yes
	The telephone is ringing.	/ɛs ɑnɪʃɪ əfəl/ are	.06	yes
	He is not coming back.	/ɛstərɪn nɛsɑnd/	.27	no

Presented by: **Kohen, Francine**