

Poster Session 1: Neural Bases of Language

11. Task Modulated Neural Activation Patterns in Chronic Stroke Participants with Aphasia

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Introduction

Functional neuroimaging (fMRI) studies on the recovery of language functions in aphasia have showed contradictory results. Some underlined the role of left hemisphere regions in recovery mechanisms (Karbe et al., 1998; Heiss et al., 1997), whereas others have implicated areas of the right hemisphere in compensatory functions (Weiller et al., 1995; Ohyama et al., 1996). This lack of consistency in findings in the neuroimaging literature could be attributed to a number of factors, including lesion site, phase of recovery, difficulty of the task, and performance accuracy used in the investigations. In the proposed study, the relationship between tasks with varying processing demands (lexical decision, semantic judgment, and picture naming) and varying lesion site (anterior, posterior, anteroposterior) was examined in participants with aphasia.

Methods

Three monolingual, right handed, English-speaking participants with aphasia and one normal control were involved in the preliminary phase of the experiment (age range 54-61 years). All participants with aphasia had a single unilateral left hemispheric ischemic stroke in the distribution of the left middle cerebral artery. P1 had a frontal lesion, P2 a temporo-parietal lesion and P3 a fronto-temporal lesion. All participants with aphasia were high level patients at least 2 years post onset. The Aphasia Quotient ranged from 91-97.6 and the Boston Naming test scores ranged from 46-59. Data was acquired on a 3T GE scanner. A gradient-echo EPI with the following parameters were used TE=40ms, TR = 2000ms, FOV = 24x24cm, a 256x256 pixel matrix. 31 axial slices with 3 mm thickness and 0.3 mm gap in A-P direction were acquired. This was followed one high-resolution T1 SPGR images. Functional MRI data were preprocessed and analyzed in FSL (www.fmrib.ox.ac.uk/fsl/).

Results and Discussion

Performance accuracy was greater than 95% for all the three tasks. For all the participants, increased cortical activation was observed as the task processing demand increased. For P1 and P2, activation involved prevalently the perilesional or undamaged regions in the language dominant hemisphere during lexical decision task and semantic judgment task.

For P3 activation was observed in perilesional Broca's area and in the right-sided homologue during semantic judgment task and bilateral occipital activation during lexical decision task.

On the other hand, during picture naming task, all participants showed increased right temporoparietal activation in addition to the left hemisphere activation. Activation maps for participant P03 are presented in Figure 1. The results of this study suggest that the pattern of brain activation is influenced by the task and site of the lesion.

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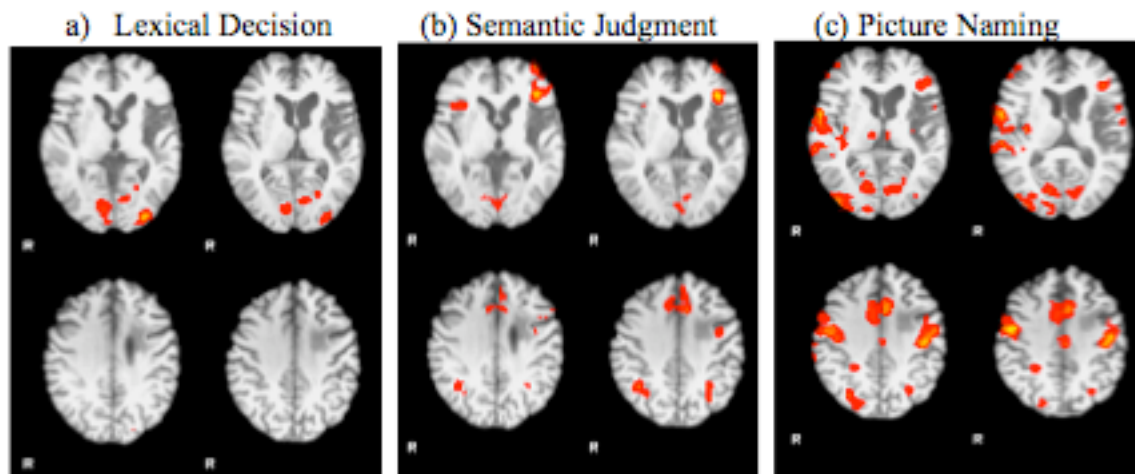


Figure 1: Activation maps for P03 for (a) lexical decision task, (b) semantic judgment task, (c) picture naming task. Statistical maps were thresholded by using clusters determined by $Z > 3.5$ and a (corrected) cluster significance threshold of $P = 0.05$.

Presented by: Sebastian, Rajani

12. Wernicke's Aphasia Caused by Crossed Cerebellar Diaschisis Following Cerebellar Hemorrhage

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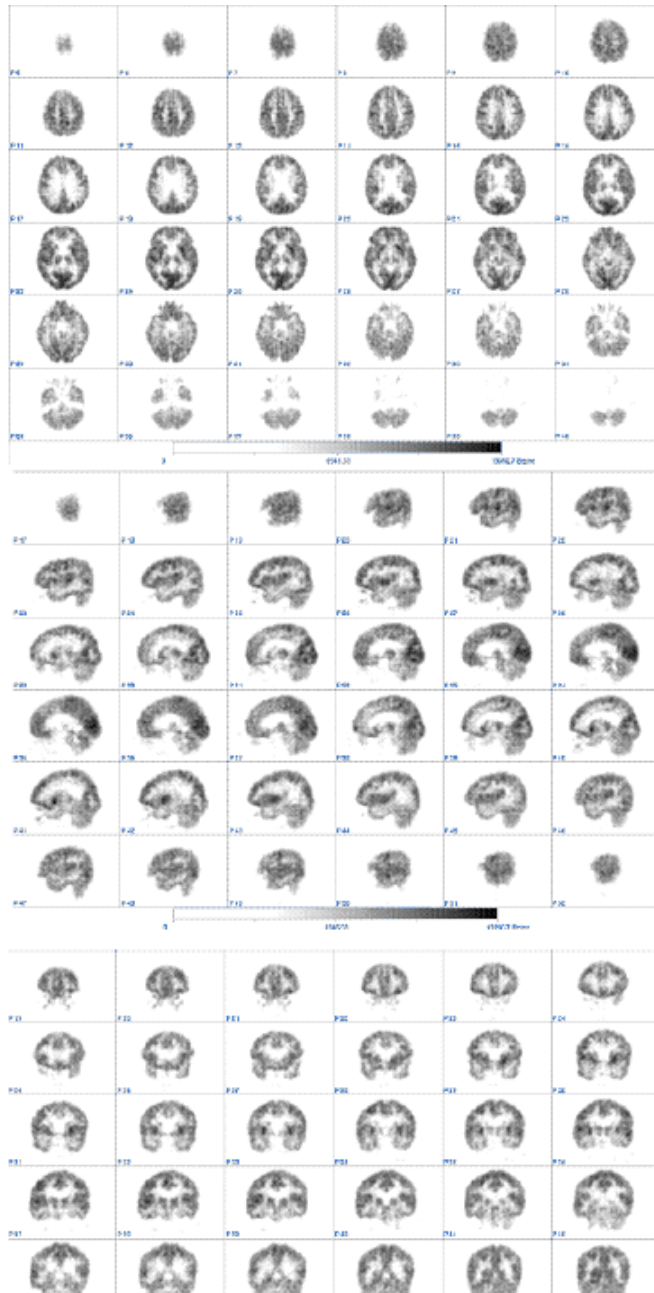
Stroke is the most frequent serious neurological disorder in the world and the third leading cause of death in many countries. Among the diverse cognitive deficits caused by stroke, aphasia is the one of the most devastating. Among aphasia types, Wernicke's aphasia (as described by Wernicke) consists of the loss of comprehension, loss of ability to read and write, and distortion of oral speech. Hearing is intact. Within the Geschwind-Lichtheim model, the disorder is due to cortical lesions: Brodmann's areas 22 and 39 (namely, Wernicke's area).

Diaschisis is a functional impairment at a site in the brain remote from the lesion causing it. Cerebellar diaschisis after cortical insult is detailed in the literature; however, cortical diaschisis after cerebellar insult remains a rarely reported occurrence. In the chronic stage of stroke, contralateral cerebellar blood flow and metabolism are depressed, which is known as crossed cerebellar diaschisis (CCD). We reported a Wernicke's aphasia caused by CCD following cerebellar hemorrhage.

The patient was a 56 years old, right-handed male. He lived in Beijing and was a businessman. He was admitted by the department of Neurology, Beijing Tiantan Hospital on 10th Aug, 2007. His wife's major complaint was deterioration of his language skills for one month, and she recalled that the patient suffered from cerebellar hemorrhage two months ago and was given some treatment at hospital. When he went home after one month, she found that the patient had difficulty with word-finding. Specifically, when the patient needed words to express his needs, he could not accurately say the correct word but could express his needs with gestures. On the other hand, he

had significant impairment in auditory comprehension and he could not perform sentence completion tasks. However, he could perform well in reading comprehension at the sentence level (sentence comprehension, reading instructions and reading the test). His performance in writing names of objects and pictures matching were poor, and could not write down some words during writing and dictation tasks. He was diagnosed as Wernicke's aphasia by using the Western Aphasia Battery. His aphasia severity gradation was level four.

Why did cerebellar hemorrhage produce his aphasia? Using positron emission tomography (PET), we found decreased perfusion of the bilateral frontal and temporal lobes, consistent with regional loss of neural activity. As shown in Figure 1, the result of PET showed that bilateral frontal and temporal lobes, especially the right frontal and temporal lobes were in a state of glucose hypometabolism. We gave him language training twice a day, and we observed his language ability improved quickly. We proposed that the patient's aphasia resulted from both anterograde disconnection of the corticopontocerebellar tracts and retrograde deafferentation of dentatothalamocortical projections. This patient provides a case of CCD elicited by cerebellar hemorrhage.



Presented by: Zhang, Yumei

13. Optic Aphasia or Wernicke's Aphasia with Diplopia: A Customized Approach for Assessment

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Introduction

Aphasia refers to a family of clinically diverse disorders that affect the ability to communicate orally and/or written language following brain damage. Aphasiologists claim that there are as many clinical forms of aphasia as there are aphasic patients which suggest that every client is different from every other depending on various factors such as site, severity of injury and the uniqueness of the individual. The fact that they vary so dramatically from one another has made assessment challenging for Speech Language Pathologists. Therefore, it is always preferable to implement a customized approach during assessment of an atypical aphasic in order to determine the amount of function that is intact for language comprehension and to arrive at a diagnosis with greater reliability.

Aim

The present study focuses on how a customized approach can be utilized in assessing atypical aphasias to arrive at a reliable diagnosis.

Method

An eighty year old, right handed, adult male with a complaint of loss of language following a stroke was examined two weeks post onset. The individual complained of an additional problem in perceiving two images of single object simultaneously. MRI findings revealed an acute parieto-temporal lesion due to an infarct in the posterior cerebral and middle cerebral artery watershed areas.

Results

Based on his performance on the WAB the individual was classified between global and Broca's with an aphasia quotient of 20.50. However, these scores provided an ambiguous diagnosis as they did not correlate with the clinical symptoms nor the neuroanatomical site of lesion. So, a similar test, the BDAE, was customised on the basis of the client's intact abilities. His performance showed two important aspects. Scores of fluency were better compared to comprehension tasks, and poor scores in comprehension, repetition and naming with the presence of paraphasia were noted (typical symptoms of Wernicke's aphasia). His audiological status was also normal. The visual deficit of diplopia resolved in the later stages. In general, the scores of the BDAE, the neuroanatomical site of lesion, and the clinical symptoms exhibited by the case helped us diagnose him as a case of Wernicke's aphasia with diplopia rather than optic aphasia.

Conclusion

Outcome of the study emphasizes how a reliable diagnosis can be attained by using a customized approach using battery of tests for atypical aphasics. As this study emphasizes, the WAB or BDAE alone is not sufficient for uncovering all aspects of client's disorder. Therefore it is vital for clinicians to be logical in selection of a spectrum of test batteries and modalities of subtests for a particular aphasic. A multiple baseline assessment will further enhance the quality of test outcomes. Flexibility in the evaluator's approach in selection of test subtask will definitely enhance the reliability and validity of assessment.

Presented by: **Kumar, Vijay**

14. Repetitive Transcranial Magnetic Stimulation (rTMS) and Sham Modulation of Language Function in Aphasia

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Introduction

The present research investigated the effects of low frequency Repetitive Transcranial Magnetic Stimulation (rTMS) applied to the Right perisylvian language homologue of L CVA patients on behavioural and neurophysiological measures of semantic naming.

Procedures

Based on procedures outline by Naeser et al., (2005), two patients with non-fluent aphasia were treated using low frequency (1Hz) Repetitive Transcranial Magnetic Stimulation (rTMS) for 20 minutes per day, for 10 days at 90% of resting motor threshold. Stimulation targeted Right Pars Triangularis using the Stealthstation TREON neuronavigational system to monitor coil position. Patient A, (moderate severity) received real rTMS while Patient B, (moderate severity) received blind condition Sham rTMS.

Baseline and 1 week post stimulation language outcome measures included subtests from the Boston Diagnostic Aphasia Examination (BDAE), the Boston Naming Test (BNT) and verbal naming responses from 144 black and white line drawings (Snodgrass and Vanderwart, 1980). Event Related Potentials (ERP) baseline and post stimulation data was collected to monitor changes in semantic processing via the centroparietal negativity, N400.

Analyses conducted

Behavioural language assessments were compared as pre-post stimulation measures. The Snodgrass & Vanderwart picture stimuli (verbal responses) were analysed according to latency and accuracy of naming pre and post stimulation. ERP measures were analysed according to mean amplitude, area, latency and peak amplitude across three centroparietal electrodes.

Results

See attached table.

Final conclusions

Results indicated that rTMS has the capacity to modulate behavioural language in patients with non-fluent aphasia and are consistent with findings of previous studies (Naeser et al., 2004; Naeser et al., 2005). Changes in semantic processing measured by ERP are inconclusive and require replication based on larger samples.

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		BDAE				BNT	S & V pictures			ERP Semantic anomaly condition	
		Naming tools and implements	Naming of actions	Repetition of sentences	Picture description complexity index	BNT	Accuracy	Mean RT ms	SD	Av. Latency ms	Area μ V
Patient A	Baseline	8/12	10/12	8/10	1.1	44/60	118/144	1823.76	723.82	321.30	-136.83
	Post rTMS	11/12	11/12	10/10	1.5	52/60	132/144	1256.14	519.57	342.60	-243.86
Patient B	Baseline	8/12	8/12	8/10	1.6	31/60	76/144	1636.46	661.44	456.83	-440.49
	Post rTMS	7/12	7/12	7/10	1.4	38/60	96/144	1629.70	651.18	491.50	-570.59

Table 1: Behavioural language and picture naming results

Presented by: **Barwood, Caroline**

15. Clinical Profiles of Communication Impairments after a Right-Hemisphere Stroke

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It is now commonly admitted that right hemisphere damage (RHD) is likely to lead to communication disorders. Approximately 50% of individuals with RHD show impairment of prosodic, discourse, pragmatics and / or lexico-semantic dimensions of verbal communication. These impairments have essentially been studied separately but their possible coexistence in a same individual is still unknown. Moreover, the profiles of communication impairments, including their correlation with underlying cognitive deficits, lesion sites and types, are still unreported.

71 individuals (43 Canadians, 20 Brazilians, 8 Argentines) with a first and unique RHD have been included. Gender, age and education were controlled. In addition, data on the CVA nature in our sample are consistent with the prevalence found in the literature. Participants underwent a communication assessment (Protocole MEC, Joannette, Côté, & Ska, 2005) in conjunction with neuropsychological tasks (e.g. inhibition, flexibility, short-term memory). Z scores for each language task were used to perform a hierarchical cluster analysis. This method has identified five distinct clinical profiles as following (Lajoie et al., 2009). Table 1 describes in more detail the tasks failed for each profile. Results regarding the neuropsychological aspects suggest at this point that communication deficits are not only the indirect impact of other cognitive disorders. Preliminary data collected about the CVA site (in an ongoing study) show a double dissociation: brain injury in the same location can lead to distinct profiles of cognitive disorders, and different injury localizations can lead to the same profile. In contrast, it is the nature of the injury (i.e.: hemorrhagic versus ischemic) which seems to have a significant influence on clinical manifestations. It would thus mean that there is some kind of interaction between the nature and the site of the lesion.

These findings open to a new perspective on understanding the clinical profiles following RHD. Interestingly, the international recruitment shows that the clusters seem to be consistent across languages, thus suggesting that the

profiles described are “universal”. The study of these profiles as well as the exploration of neuropsychological impairments and CVA locations associated will participate to a better clinical knowledge and SLP intervention.

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Joannette, Y., Ska, B., Côté, H. (2004). Protocole Montréal d'évaluation de la communication (MEC). Isberques: OrthoÉdition.

Aspects	Tâches	1	2	3	4	5
Discours	Rappel de discours					
	Questions discours					
	Conversation	5	8	7		1
Pragmatique	ALI					
	Métaphores					
Sémantique	Évocation libre					
	Évocation orthographique					
	Évocation sémantique					
	Jugement sémantique					
	Métaphores					
Prosodie	Lg compréhension					
	Lg répétition					
	Ém compréhension					
	Ém répétition					
	Ém production					

Table 1: Language aspects impaired for each profile (1,2,3,4 and 5).

Presented by: Ferré, Perrine

16. Broca 0 – Wernicke 2: Contrasted Effects of Transcranial Magnetic Stimulation on Language in Chronic Aphasia

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Introduction

Post-stroke recovery is based on plastic changes in the central nervous system that can compensate for the loss of activity in affected brain regions. This brain reorganization or neuroplasticity (Kolb et al., 2003) means that the

human brain demonstrates the capacity to respond to a neurological insult such as a stroke (Raymer et al., 2008). To date, the cortical reorganization associated with language recovery in aphasia is partly unknown. Stroke in the left hemisphere (LH) overactivates the right hemisphere (RH) following the alteration of interhemispheric inhibition (IHI); in turn, exaggerated IHI from RH may hinder LH recovery. In a few studies with aphasic patients, repetitive transcranial magnetic stimulation (rTMS) was applied over Broca's right counterpart and entailed significant improvements in language production (e.g., Martin et al., 2007; Naeser et al., 2005). Our study focused on whether theta-burst stimulation (TBS, a specific rTMS paradigm) applied over Wernicke's (W) and Broca's (B) area could improve language production and comprehension in a chronic patient with severe aphasia.

Methods and materials

cTBS (continuous stimulations to down-regulate RH) and iTBS (intermittent to up-regulate LH) were applied in three consecutive treatment phases, 3 times a week per phase during 4 weeks. Three experimental tasks of word and sentence comprehension and syllable repetition helped measure TBS effect between baselines (2 weeks apart), pre- and post-TBS testing (once/week) and follow-ups (11 days after each treatment phase).

Results

Comprehension significantly improved at both Wernicke's phases (words: phases 1 & 3: $p < .01$; sentences: phase 1: $p < .01$; phase 3: $p < .05$), whilst unchanged at phase 2. Language production remained at baseline level. Follow-up measures in comprehension remained above the baseline, but without reaching the significance level.

Conclusion

These results suggest that TBS may be area-specific, at least for language function. An improvement of performance was also observed in motor function for Wernicke's phases, a result supporting TBS potential for balancing brain activity. Future studies are needed to test whether changes in hemispheric balancing facilitate the reactivation and re-recruitment of interconnected brain areas whose functioning was reduced by stroke. Once clearly identified, TBS effects could then be combined with more conventional therapy to strengthen the reactivation of networks dedicated to language rehabilitation.

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Presented by: **Macoir, Joël**

17.A Systematic Analysis of Executive Functioning in Adults with Aphasia

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Introduction

Emerging evidence suggests that it is the language disorder in conjunction with non-linguistic cognitive deficits, specifically executive functions, that is responsible for unsuccessful communication in aphasia (Glosser and Goodglass, 1990; Murray, Holland & Beeson, 1998; McNeil, Odell, & Purdy, 2002; Purdy, Duffy, & Coelho, 1994; Ramsberger, 2000). Executive function abilities refer to a collection of interconnected control processes that allow

us to self-regulate, adapt, inhibit, plan and organize our behavior. Thus, there is a broad range of cognitive processes contained under the umbrella of executive functioning, and little is known regarding whether these processes are differentially impaired in aphasia. The primary purpose of this research project was to systematically examine executive function ability in persons with aphasia and to examine the relationship between executive functioning and severity of aphasia.

Procedure

Twenty individuals diagnosed with aphasia participated in this study. The mean age was 58.5 (s.d. 8.18), mean time post-stroke was 7.4 years (s.d. 4.23), and mean education was 14.3 years (s.d. 2.22). The mean Aphasia Quotient as determined by the Western Aphasia Battery (WAB) was 69.2 (s.d. 21.2). Executive functioning was examined using subtests from the Delis-Kaplan Executive Function System (D-KEFS): Trail Making, Design Fluency, Tower Building, and Free Sorting. These subtests were selected since they do not require a verbal response, and thus were more appropriate for individuals with aphasia. The D-KEFS is designed to assess performance on the fundamental (attention, perception, language) and higher-order (concept formation, inhibition, planning, cognitive flexibility) skills.

Results

The mean scaled scores (standard deviation) for the various tests were as follows: Design Fluency Switch score = 7.62 (2.47), Trails condition 4 = 2.25 (2.64), Number of correct sorts = 7.62 (2.16), and Tower overall achievement score = 6.75 (4.18). The Trails test was the most difficult for the group, and many participants were unable to complete the fundamental tests for that section (sequencing numbers and letters). A wide range of performance was noted on the remainder of the subtests. A comparison of the means resulted in significant differences for the group among all 4 subtests.

Correlational analyses were completed for all variables. Results showed there was no significant correlation between severity of aphasia and any of the executive functioning variables. Significant correlations were seen between the Sorting test and Design Fluency ($r = -.62, p = .01$), and the Sorting test and Trails ($r = -.55, p = .026$). In order to control for aphasia, partial correlations were run. The correlation between the Sorting test and Trails remained significant ($r = -.83, p = .02$).

Discussion

These findings suggest that executive function skills may be differentially impaired in aphasic individuals, and be unrelated to aphasia severity. The significant correlations among Design Fluency, Sorting, and Trails suggests a similar underlying component to these tests, most likely cognitive flexibility. The Sorting and Trails subtests encompassed more conceptual knowledge while the Design Fluency was visual/spatial. The Tower test addresses planning and impulsivity. Future studies should examine the relationship between specific executive function components and functional communication in aphasia.

Presented by: **Purdy, Mary**

18. Neuroanatomical Organization of Functional Language Processing: an fMRI Study

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The neuroanatomical organization of language has always been a puzzling but curious topic among scientists. Beginning with neurophysiologists, joined by neuropsychologist, neurocognitivist, and neurosurgeons, researchers have tried to resolve this using a variety of relatively reliable procedures. There have been various studies highlighting different neuronal areas responsible for various speech language and cognitive tasks on the basis of the site of the lesion directly or indirectly triggering language impairment. Later, researchers realized that the use of neuroimaging techniques can further strengthen such outcomes. Functional imaging further facilitates the work of contemporary scientists in uncovering the organization of various linguistic and cognitive tasks.

Aim

The aim of the study was to understand the neuroanatomical organization of language processing for passage reading, covert judgment of semantically related and unrelated tasks.

Method

Task 1, Silent reading of a standardized passage (the Rainbow Passage) of 98 words. Task 2, judgment of semantically related words presented at a rate of 10 pairs over 30 seconds. Task 3, judgment of semantically unrelated words presented at a rate of 10 pairs over 30 seconds taken from the Western Aphasia Battery.

Procedure

A normal adult female was scanned using a 3 tesla General Electric scanner. The visual stimulus for Task 1 was presented in a customized way to avoid artifacts associated with motor movement during manipulation of the stimuli. The auditory stimuli for Task 2 and Task 3 were presented through headphones within the scanner. In Task 1 the subject was instructed to read the passage covertly without moving her head. In Task 2 and Task 3 the subject was asked to judge if the words were semantically related or not. The “Functool” software was used for analysis.

Results

The data obtained from thirty one oblique axial slices suggests that the areas primarily responsible for silent reading were left superior and middle frontal gyrus and precentral gyrus. The neuroanatomical correlates for covert judgment of semantically related words were mainly identified as right cerebellum, and left inferior temporal lobe. The primary areas of activation for semantically unrelated task were bilateral cerebellar hemisphere, bilateral temporo occipital lobe, left hippocampus, and left parahippocampal gyri.

Conclusion

Results from Indefrey and Levelt (2000) also revealed that a number of areas were responsible for performing a single task. Activation of several neuroanatomical sites for each specific task suggests that there is involvement of a number of neuronal structures in language processing. In spite of this execution of these tasks can occur very dexterously and spontaneously because of fine tuning of neuronal networks. The clinical implications of these studies can be to understand the qualitative and quantitative relationship between neuroanatomical sites and the corresponding cognitive and linguistic functions.

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Presented by: **Kumar, Vijay**

19. Longitudinal Recovery of Repetition and Comprehension in Aphasic Stroke Patients

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Introduction

Repetition (REP) and comprehension (COMP) are two prototypical tasks which preferentially involve dorsal and ventral processing streams: REP is subserved by a temporal-premotor network which interacts via a dorsal pathway along the arcuate and superior longitudinal fascicle (AF/SLF), while COMP involves a temporal-prefrontal network which interacts via a ventral pathway along the extreme capsule (EmC) (Saur et al., 2008).

In the present study, we investigated the longitudinal recovery of REP and COMP in aphasic stroke patients within these neuroanatomical frameworks.

Methods

We report preliminary data of three aphasic patients (P1-P3), who suffered from an embolic stroke of the left MCA-territory. Within one year post stroke, six consecutive examinations (Ex1-Ex6) were performed from the acute to the chronic phase. At each examination patients were investigated with an fMRI REP and COMP task. From an aphasia test battery, composite scores for REP and COMP were computed. In single subject repeated measures analyses (SPM8), scores for COMP and REP were correlated with activation in the respective tasks.

Results

P1 suffered from a left middle MCA infarction affecting central regions as well as the dorsal AF/SLF system (COMPE_{x1/Ex6} = 0.71/0.99; REPE_{x1/Ex6} = 0.64/0.92). Highest correlation between test scores and activation was found in preserved left frontal areas for both REP and COMP.

P2 revealed a left temporo-parietal lesion (COMPE_{x1/Ex6} = 0.95/1.00; REPE_{x1/Ex6} = 0.20/0.90). In this patient highest correlation between language performance and activation was found in perilesional posterior temporal cortex in both tasks and additional activation in right posterior temporal regions in the REP task.

P3 suffered from a left frontal stroke mainly affecting subcortical tissue including the insula and the ventral EmC fiber system (COMPE_{x1/Ex5} = 0.53/0.95; REPE_{x1/Ex5} = 0.65/0.98). Correlation between test scores and activation was mainly found in perilesional frontal tissue and homologue right frontal areas.

Discussion

In sum, these preliminary results demonstrate how longitudinal recovery of REP and COMP correlates with activation in perilesional, preserved left as well as homologue right language areas. We propose that functional reconnection of these areas along dorsal and ventral white matter pathways plays an important role for functional recovery. Further investigations of patient subgroups with lesions affecting distinct components of these processing streams are necessary to identify specific patterns of reorganization depending on lesion site and functional impairment.

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Presented by: **Kummerer, Dorothee**

20. Factor Analysis of the Data from the Mandarin Chinese BDAE

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Factor analysis was performed on 39 variables of the Mandarin Chinese version of the Boston Diagnostic Aphasia Exam (BDAE). Five factors were isolated from the data on 258 aphasic subjects. The first was clearly related to the writing subtests, excluding those for Mechanics of Writing. Factor Two was a composite of both auditory and reading comprehension tasks, including Word Discrimination, Body-Part Identification, Commands, Complex Ideational Material, Symbol and Word Discrimination, Word Recognition, Word-Picture Matching, and Reading Sentences and Paragraphs. Factor Three was a speech production factor, most heavily representing Repeating Phrases. Factor Four was most typified by the rating scales, including Melodic Line, Phrase Length, Articulatory Agility, Grammatical Form, Paraphasias in Running Speech, and Word Finding. Factor Five was highly selective for the Agility tasks, including Oral (nonverbal) Agility and Verbal Agility. The common mechanisms underlying the different language tasks were inferred and will be discussed. A comparison with the results of the factor analysis based on inclusion of all the measures in the English version of BDAE (Goodglass and Kaplan, 1983) will also be

presented.

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Presented by: **Lu, C.-C.**

21. Magnetoencephalography of Language: New Approaches to Understanding the Cortical Organization of Chinese Processing

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Background and Purpose

Chinese is a logographic language, which is different from alphabetic languages in many psycholinguistic characteristics. For instance, the tone in Chinese is one of the critical elements at the syllable level. There is no segmental correspondence between the character and syllable. The visual form of most characters can more or less provide cues to the meaning of each character. Although one-character morphemes are prevalent in Chinese corpora, some Chinese morphemes are composed of multiple characters. These distinctive characteristics of Chinese compared to alphabetic scripts might lead to different neural bases underpinning Chinese language processing. This study aimed to investigate the brain language centers for processing Chinese information in healthy Chinese speakers using Magnetoencephalography (MEG).

Methods

Ten healthy native Chinese speakers (six male, four female; age range: 28-37 years old) participated in this study. They were postgraduates and had no history of language disorders.

Our stimuli contained 180 Chinese characters: 90 real characters and 90 pseudo characters. The real characters were common in Chinese corpora (e.g., 纸, /zhi3/, paper). The pseudo characters were constructed by changing the strokes or logographemes of real characters (e.g., 𠃉). The two types of characters were matched for stroke number. The 180 characters were presented in pseudo-random order. Each character was visually presented for one second on the screen, following a one-second interval. The subjects were required to read silently the existing characters and to view the pseudo characters.

We used a 151 Channel MEG System to record the pattern of brain activation while the subjects performed the above task. The magnetic reaction with a latency of 100ms was treated as the early elements produced by vision. We therefore just selected the metaphase and late elements between 150ms and 700ms. We then carried out the analysis of the induced language stimulation, calculated the elements of stimulation reaction through a synthetic aperture magnetometry model, and obtained the position parameter of the reaction element doublet.

We then filtered the calculated doublet and combined the doublet figure and the MRI image. This allowed us to obtain information regarding the brain areas supporting language functions.

Results

After the presentation of the character stimuli, two late magnetic reactions were elicited, and the left wave shape had a better polarization. The late elements of the reaction waves had similar wave shapes. The results indicated that Broca's area was located at the back of left gyrus frontalis inferior or gyrus frontalis medius and Wernicke's area was located at the left gyrus temporalis medius, gyrus temporalis superior, or gyrus supramarginalis. Wernicke's area was activated earlier than Broca's area (Figure 1).

Conclusions

The language lateralization of brain function in Chinese native speakers is in the left hemisphere. The Broca's and

Wernicke's areas in Chinese speakers correspond to the classical language centers found in alphabetic languages. In general, functional brain areas observed in Chinese speakers are similar to those in speakers of alphabetical script languages.

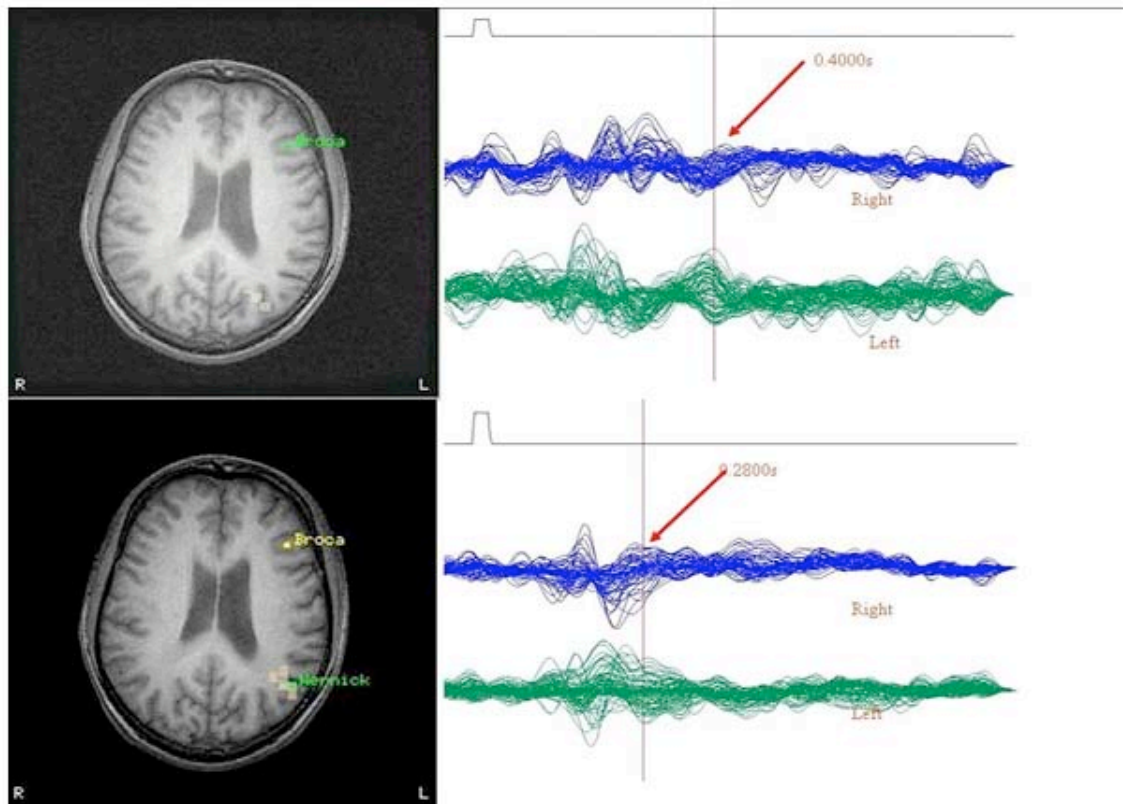


Figure 1 Language functional areas of a native Chinese speaker male

From the figure, we can see that both cerebral hemispheres induced two late magnetic reaction waves and the left wave shape had a better polarization; Broca's area appeared in 400ms after stimulation, located at the left gyrus frontalis inferior while Wernicke's area appeared in 280ms after stimulation, located at the left gyrus temporalis medius, and Wernicke's area appeared prior to Broca's area.

Presented by: **Yumei, Zhang**

Poster Session 1: Language in Context

22. A Multi-Level and Multi-Modal Framework for Analyzing Cantonese Aphasic Discourse Production: A Preliminary Proposal

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Background

Stroke survivors are often left with varying degrees of aphasia. Three major types of symptoms are commonly found in aphasia, including linguistic symptoms, speech symptoms, and symptoms of non-verbal behaviors. Despite the importance of these features for profiling the communicative abilities of language-impaired individuals, there is no comprehensive framework for assessing the production of Cantonese speakers with aphasia. Moreover, the development of such an analytic system must be based on a corpus of aphasic output that captures both verbal and non-verbal behaviors.

Method

Four speakers with aphasia (two fluent and two non-fluent) in Cantonese after a single stroke will participate in the investigation. Four age-, gender-, and education-matched normal speakers will participate as controls. Speech samples will be elicited through a protocol described by MacWhinney, Holland, Forbes, Spector, and Fromm (2008), including description of two single-pictures and two sequential-picture sets, and tasks of procedural-discourse, story-telling, and conversation.

The language samples collected will be phonetically and orthographically transcribed. The scripts will be linked to the digitized video and audio files and annotated using the Child Language Analyses computer program (MacWhinney, 2003). The Codes for Human Analysis of Transcripts format in Chinese (Lee & Wong, 1998) will be adopted for annotation of the linguistic properties, prosodic features, and gestural behaviors for further analysis. The text-based analyses will include word level analysis, measurement of communication efficiency, degree of speech cohesion, coherence, syntactic complexity, and ungrammatical sentence structure. Concerning the prosodic analyses, the different levels of prosodic units in Tseng, Pin, Lee, Wang, and Chen's (2005) framework for fluent speech prosody will be annotated by identifying the boundary breaks using the modified ToBI system (Tseng & Chou, 1999). The characteristic prosodic patterns will be measured in terms of the fundamental frequency, intensity, syllable and break duration, and speech rates. As for non-verbal behaviors, the employment of gestures, non-symbolic behaviors, props, writing or finger tracing, and drawing will be analyzed in terms of frequency, type, duration, rate, and accuracy of employment.

Conclusions

The results will allow us to evaluate how well the proposed multi-faceted analytic method can reflect differences between speakers with aphasia and controls, and among speakers with aphasia. They will further be modified as the aphasic data corpus is being established. It is believed that this initiative will provide the necessary foundation for research into theoretical and clinical issues related to Chinese aphasiology.

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Presented by: **Kong, Anthony Pak Hin**

23. Wisdom in Words: The Relationship between Language Production and the Perception of Wisdom

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The nature of wisdom has been debated for centuries without reaching a consensus. We explore the ambiguity of wisdom by focusing on how it is transmitted and perceived through language. The language-wisdom connection is particularly pertinent because both may be affected by age. Wisdom is widely believed to accrue with age, but language production often declines with age. Another example comes from the common public misperception that individuals with aphasia are assumed to be intellectually impaired.

The study discussed here is a pilot for a larger project, itself part of a collaborative interdisciplinary project called "Defining Wisdom." In the larger study, we investigate the language-wisdom paradox by assessing how language declines with age, and relating these changes to listener judgments of the speakers' wisdom. The pilot study tested the hypothesis that perceived wisdom is influenced by aspects of language other than the message. Specifically, we proposed that higher grammatical complexity (in mean number of clauses) and lexical diversity (type-token ratio) would result in higher judgments of wisdom.

We constructed speech samples to simulate two different responses to each of two advice-giving scenarios, e.g. "A fifteen-year-old girl wants to run away from home. What would you tell her and why?" We then manipulated their grammatical complexity and lexical diversity, creating four versions of each response (see Table 1). The 16 written samples were presented to eight young adults, who rated the "speakers" on several dimensions shown to contribute to conceptions of wisdom (see Table 2). In addition to these wisdom ratings, participants indicated the extent to which they agreed with each response, and estimated the age and education of the speakers.

Each rating was analyzed using a 2x2 ANOVA (GCxLD). Grammatical complexity showed a marginally significant effect ($p=0.077$) in the predicted direction on only one wisdom rating (communication). Lexical diversity showed the predicted effect on two wisdom ratings: knowledge ($p=0.077$) and communication ($p=0.049$). High LD samples were judged to come from speakers with more education. Unexpectedly, the samples with high GC often received lower ratings than those with low GC. For one rating (alternative solutions), a significant interaction was found: high LD samples were rated higher than low LD samples, but high GC samples were rated lower than low GC samples. A similar reversal was shown when participants rated their agreement with the responses (more agreement with low GC-high LD responses).

In correlational analyses, four of the wisdom ratings showed high inter-correlations ($r>0.50$), indicating a large degree of overlap, as intended. The communication rating, however, showed lower correlations ($r<0.30$) with the other wisdom ratings, counter to our hypothesis. Agreement ratings were highly correlated ($r>0.50$) with all wisdom ratings except communication, suggesting that participants' wisdom perceptions were mainly influenced by the extent to which they agreed with the responses.

Two main conclusions were drawn from this pilot study. First, grammatically complex speech does not appear to portray wisdom. Second, perceived wisdom appears to depend largely whether or not the listener agrees with the speaker. Although language variables had relatively weak, and somewhat counter-intuitive, effects, we propose that testing these hypotheses with more participants, and including agreement as a covariate, will reveal subtle effects of language on wisdom perception. Findings will contribute to our understanding of the complex relationship between

language and cognition, and how these conspire to shape our perceptions of the elderly, including those with language impairments such as aphasia.

Table 1: Linguistic manipulations of responses. Grammatical complexity is indexed by mean clauses per utterance (MCU); lexical diversity is indexed by type-token ratio (TTR)

	High Grammatical Complexity		Low Grammatical Complexity	
	MCU	TTR	MCU	TTR
High Lexical Diversity	2.26	0.649	1.21	0.676
	2.33	0.631	1.22	0.660
	2.41	0.632	1.23	0.627
	2.46	0.633	1.24	0.634
<i>Mean</i>	2.37	0.636	1.23	0.649
Low Lexical Diversity	2.30	0.416	1.23	0.404
	2.32	0.408	1.21	0.412
	2.59	0.400	1.32	0.419
	2.39	0.404	1.30	0.403
<i>Mean</i>	2.40	0.407	1.27	0.410

Table 2: Wisdom rating scales.

Personal Characteristics	Strongly Agree ----- Neutral ----- Strongly Disagree
1. This person is knowledgeable.	7 ----- 6 ----- 5 ----- 4 ----- 3 ----- 2 ----- 1
2. This person is perceptive.	7 ----- 6 ----- 5 ----- 4 ----- 3 ----- 2 ----- 1
3. This person considers alternative solutions.	7 ----- 6 ----- 5 ----- 4 ----- 3 ----- 2 ----- 1
4. This person is sensitive to the feelings of others.	7 ----- 6 ----- 5 ----- 4 ----- 3 ----- 2 ----- 1
5. This person communicates ideas well.	7 ----- 6 ----- 5 ----- 4 ----- 3 ----- 2 ----- 1
6. I would give similar advice.	7 ----- 6 ----- 5 ----- 4 ----- 3 ----- 2 ----- 1

7. How old do you think the speaker is?

- a) 21-30 b) 31-40 c) 41-50 d) 51-60 e) 61-70 f) 71-80 g) 81-90

8. How educated do you think the speaker is?

- a) Some High School b) High School Diploma c) Some College d) College Degree e) Graduate Degree

Presented by: **Gordon, Jean**

24. Repetition as Pragmatic Function in Left and Right Hemisphere Damage

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Introduction

The use of “pragmatic repetition,” the iteration of one’s own speech or the speech of a co-participant during discourse, has been overlooked in studies of language sciences and disorders (Johnston, 1994; Tannen, 1987). In adult communication disorders, repetition is commonly described from a pathological perspective (Christman, Bousten, & Buckingham, 2004) or used as a formal diagnostic parameter in aphasia. The use of pragmatic repetition in aphasic speech has not been systematically investigated. The purpose of this study is to examine spontaneous repetition in the verbal discourse of individuals following left hemisphere (LH) and right hemisphere (RH) brain damage. The hypothesis is that LH and RH damaged subjects use repetition in different amounts and for different functional purposes in spontaneous speech.

Method

A method was developed for measuring repetition in discourse. It was determined that using the morpheme as the basic unit of measure, incidence can be reliably quantified, and factors or subtypes such as localness of repetition, preservation of the original form, source, unit of speech, function of repetition, and formulaicity can be exactly determined. The study analyzed repetition using transcripts of discourse by stroke patients with damage to either the left hemisphere, resulting in a fluent aphasia, or right hemisphere, compared to matched normal-control speech samples.

Results

Significantly higher use of repetition by LH (27%) than NC subjects (18%) was observed ($t(8) = 2.383, p = 0.044$). (Figure 1). The single outlier in the LH group had the highest BDAE severity score (3.5), indicating the mildest aphasia. The LH group used significantly more repetition of formulaic expressions (57%) than the RH group (30%), ($F(2, 12) = 4.984, p = 0.027$). Subtypes of repetition, including preservation of initial expression, source of repetition, and unit of speech differed between groups. Significantly fewer repetitions were used by the LH group (25%) for the function of enhancing the content of talk as compared to the normal control group (40%), reflect greater use for social enhancement of talk ($t(8) = -2.514, p = 0.036$). In contrast, the RH group used the smallest percentage of repetition for the function of socialization (15%).

Discussion

Findings from this study clarify repetition as a normal component of spontaneous verbal discourse and provide new information on how hemispheric neurological damage impacts its use. These results support descriptions of the RH-damaged population as compromised in pragmatic and social skills. Examination of other forms of disordered speech suggests that repetition becomes pathological when used entirely in place of novel language, such that linguistic content is severely impoverished.

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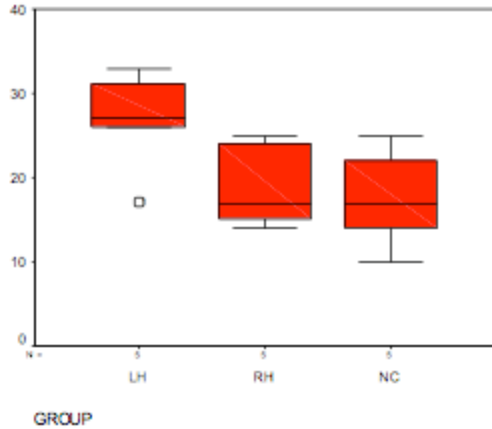


Figure 1. Boxplot – Percentage of Repeated Morphemes

Presented by: **Wolf, Rachel**

25. Impaired Theory of Mind and Irony Comprehension in Parkinson's Disease

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Idiopathic Parkinson's disease (PD) is associated with difficulties in processing pragmatic language. Specifically, changes within the fronto-striatal pathways in PD often lead to a decline in executive resources needed for higher level language processing (Monetta et al., 2008). Recognizing verbal irony necessitates the use of pragmatic knowledge to arrive at the intended meaning. One factor that appears to be critical for understanding verbal irony is an individual's theory of mind ability (ToM; Martin & McDonald, 2003). In the present study, we evaluated non-demented PD patients' ability to differentiate verbal irony from lies, and we investigated whether any deficits uncovered were associated with the ToM ability and/or with specific cognitive features of the PD patients.

Methods

Participants

Eleven English-speaking adults with PD (without dementia) and 11 age-, education- and gender-matched healthy controls (HC) participated in the experiment.

Materials & Procedure

Participants completed a battery of standardized neuropsychological tests. In the main experiment, subjects were presented with 12 pragmatic interpretation stories (see Winner et al., 1998). Each story described a situation where one person (the witness) observed another person (the protagonist) doing something sneaky. Half of the items were lie stories and half were irony stories, presented in a fixed random order. Six questions were asked at different time points during each story: 1) fact question, 2) first-order belief question, 3) second-order true or false belief question, 4) second-order belief follow-up question, 5) second order expectation question, and 6) pragmatic interpretation question.

Results

Both groups were highly accurate in responding to fact questions, indicating that they were able to understand the stories. PD participants exhibited errors in answering first-order belief questions, indicating that they had difficulty in drawing inferences [$F(1,20) = 6.23, p < .05$]. PD patients were also significantly less accurate overall in answering questions based on second-order beliefs [$F(1,20) = 8.54, p < .01$]. There was also a significant difference between HC and PD participants for the pragmatic interpretation questions [$F(1,20) = 4.69, p < .05$]. The ability to

make pragmatic interpretations was correlated with the ability to attribute second order beliefs (ToM) and with certain estimates of frontal lobe functioning in the PD group.

Discussion

The current findings argue that second-order ToM attributions and executive resource functions such as working memory in PD contribute in an overlapping manner to pragmatic abilities such as irony comprehension. This could be due to the common reliance of these functions on the fronto-striatal circuitry, which is progressively compromised in the course of the disease.

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Presented by: **Monetta, Laura**

26. Techniques for Eliciting and Comparing Narratives Obtained Within Aphasia Community Groups

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The purpose of this pilot study was to investigate the differences in language patterns between aphasic, healthy elderly and demented subjects. A small group of volunteer participants were administered a language sampling task adapted from the work of Anne Basting (2002). Preliminary results suggested that collection of narratives is a potentially useful diagnostic and therapeutic technique particularly in the community group environment. This is essential in providing quality care to those individuals who depend on services of this nature to support or maintain their language recovery.

Statement of problem

To investigate the differences in narrative style among healthy elderly, demented and aphasic clients using a conversational analysis approach

Procedures

Participants recruited from local community groups were engaged in a picture description task using the same stimuli. Participants were given minimal prompts consisting of open ended and closed questions designed to elicit independent discourse.

Results

The differences in qualitative and quantitative language of 3 subject groups can be obtained through a dynamic conversational paradigm, revealed differences consistent with expectations based on the literature. This encourages the use of the storytelling techniques and methodology in a naturalistic setting for elicitation of diagnostic language samples and suggest therapeutic modalities that may be useful in aftercare programs.

Conclusion

Due to limited sample size and pilot nature of this study, conclusions are limited at present. However, a more formalized indepth study of these patient groups is under way and shows promise for the evaluation of language changes associated with neurogenic disease in a differential fashion. Using discourse analysis models, assessment can be gained that is useful in augmenting traditional formal tests.

References

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Presented by: **Georgiou, Anastacia**

27. Communication Across Dementia Progression

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University of St. Andrews

This study explores the impact of dementia progression on communication by examining verbal and non-verbal communication in people with mild through to the advanced stages of Alzheimers' disease (AD). Video clips of 20 people with different stages of dementia interacting in a one-to-one session were coded for non-verbal communication such as imitation. The corresponding transcripts of the sessions were coded for verbal communication such as amount of vocabulary. Verbal indicators such as vocabulary declined as dementia severity increased. However the fundamentals of communication were present across all stages and became more pronounced as severity increased.

Introduction

The decline of different aspects of spoken language in people suffering from Alzheimer's disease (AD) has been well documented. However, it is possible that nonverbal communication, i.e. the behaviours humans possess from birth, may be functional even into the advanced stages of dementia (Astell & Ellis, 2006; Ellis & Astell, 2008). This study examines verbal and nonverbal communication in people at different stages of dementia with a view to elucidating the changes that occur in communication as the disease progresses.

Method

Twenty people with AD (mean age 83 years) were divided into four groups of five each based on MMSE score: Mild (19-24), Moderate (13-18), Severe (7-12) and advanced (MMSE<0) plus a control group of five healthy older people (MMSE 27-30).

A verbal coding scheme was devised based on Ripich, et al. (1997). A nonverbal coding scheme was developed using the ObserverTM system. A second rater coded 20% of all video clips and transcripts. Vocabulary size and imitation are reported here.

Results

The mean amount of vocabulary declined as dementia severity increased (Table 1; $H = 7.81$, $df = 3$, $p < .05$). A Jonckheere test revealed that the healthy controls ($p < .05$; median = 139) had significantly larger vocabularies than the severe dementia group (median = 108). In terms of nonverbal behaviour, imitation occurred at all stages of dementia (Table 1). Multiple comparisons revealed that the advanced dementia group (median = 4) used imitation significantly more than the control group (median = 0), however no other differences between groups were found.

Discussion

The findings suggest that as speech utility declines with dementia progression, the role of nonverbal communication increases. The findings suggest that there is potential for developing interventions to promote communication with people with advanced dementia based on nonverbal behaviour.

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Table 1. Mean (SD) vocabulary size and occurrence of imitation in the five participant groups

	Controls	Mild	Moderate	Severe	Advanced
Total vocabulary	145.6 (14.44)	117 (25.95)	99.2 (22.94)	81.2 (40.12)	
Imitation	0 (0)	0 (0)	2 (2.45)	0.6 (1.2)	4.4 (2.58)

Presented by: **Astell, Arlene**

28. How the Brain Grasps Pragmatic Meaning Through a Metaphorical Lens: fMRI and ERP Evidence in Favour of the Extra-linguistic Hypothesis

Bambini V.

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Introduction

The last decade has witnessed an increasing interest toward the neural mechanisms supporting metaphor comprehension. However, the literature suffers from a poor consideration of the phenomenon of metaphor in the broader picture of human cognition. Past research has focused on whether figurative meaning specifically engages regions in the right hemisphere, and whether these regions are recruited in a dual-step fashion: a wide variety of clinical, fMRI and ERP results disconfirms the traditional hypotheses [1,2,3]. But the question is: why is metaphor so interesting? Metaphor is a use of language where the gap between the linguistically encoded meaning and the pragmatic meaning is especially obvious. Speakers are able to fill such a gap by integrating contextual elements. Speaking metaphorically, metaphor offers a lens through which we can observe how the brain integrates language and context into pragmatic representations, which appears as one of the most timely topics in the neuroscience of language [4]. Here we present novel fMRI and ERP data on metaphor comprehension, along with a tentative account of pragmatic processing in the brain.

Results

The experimental design was based on the comparison between passage-pairs, e.g.: "Do you know what that fish is? A shark." (literal) / "Do you know what that lawyer is? A shark." (metaphorical). Modulations of familiarity and discourse information were included. The fMRI experiment showed that, compared to literal passages, metaphors activate a diffuse bilateral network, including frontal, temporal and parietal regions. In the ERP study, metaphor comprehension significantly elicited two components, i.e., the traditional N400 and the P600. Moreover, we observed a strong effect of familiarity and discourse, which seem to modulate especially temporal regions and the N400 component.

Conclusion

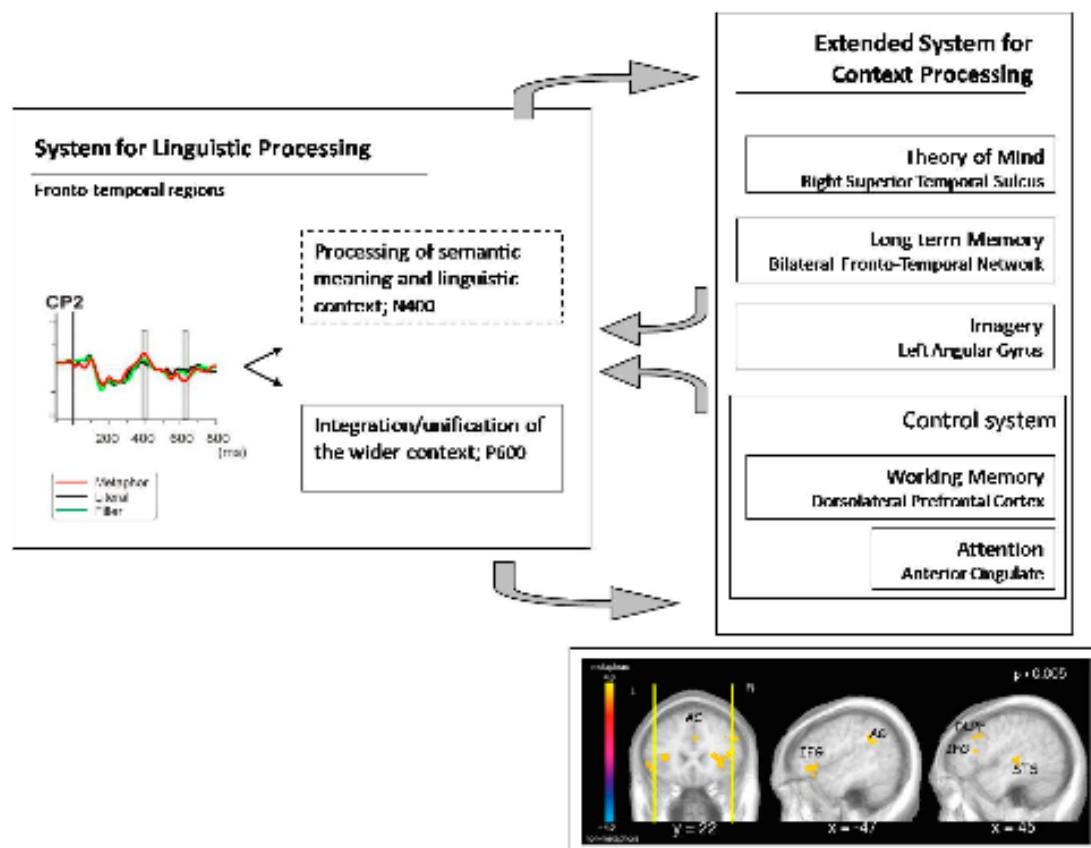
In light of similar results reported for other context-dependent uses of language [4], we ventured in the attempt of sketching a neuro-functional model of pragmatic processing. Our findings support a network model involving a linguistic system, plus an extended system responsible for context elaboration and related to extra-linguistic high-order functions (memory, attention, theory of minds, imagery). The recruitment of such a network is likely to be differently modulated – both spatially and temporally – depending on the specific contextual coordinates. In the clinical perspective, a similar model allows us to motivate pragmatic impairments across a variety of clinical populations: because pragmatics draws upon many different interacting sub-systems, similar pragmatic deficits may

result from different dysfunctions in the system.

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DISTRIBUTED NEURAL SYSTEM FOR PRAGMATIC PROCESSING



Presented by: **Bambini, Valentina**

29. Dialogue Inference Performance of Bilingual Brain-Damaged Subjects

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Recent research has suggested that the processing of language inference is performed mainly by the right hemisphere. In this study, we investigated the language inference performance of bilingual Mandarin and Taiwanese-speaking brain-injured subjects.

Two dialogue-inference tests were designed, one in Mandarin Chinese and one in Taiwanese. Four right hemisphere-injured subjects, five left hemisphere-injured subjects, 195 Mandarin-speaking control subjects and 215 Taiwanese-speaking control subjects were tested. The brain-injured subjects were Mandarin-Taiwanese bilinguals. They possessed native or near-native proficiency in the language being tested before stroke onset. All of them had sustained single CVAs, were 1 year post stroke onset, right-handed, and without any previous history of major neurological or psychiatric disease. For each subject a language background questionnaire and self-evaluation were collected. In addition to the Mandarin and Taiwanese dialogue-inference tests, the brain-injured subjects were also tested with the Mandarin version of the WAB (Western Aphasia Battery) and the Taiwanese version of the WAB. The Mandarin control subjects were tested with the Mandarin version of the dialogue-inference test and Mandarin version of WAB. The Taiwanese control subjects were tested with the Taiwanese version of the dialogue-inference test and the Taiwanese version of the WAB.

The control subjects' data were analyzed according to different education and age levels. Their error patterns were compared with the results of the brain-injured subjects. Results revealed that the dialogue inference performance of the two languages were not highly correlated. Analyses also explored the factors of age of acquisition, language dominance and lesion site (examined with MRI scans). Finally, additional analyses compared their performance on the WAB and dialogue inference tasks.

Presented by: **Lu, Ching-Ching**

Poster Session 1: Idioms and Formulaic Language

30. Language Decline in Alzheimer's Disease: The Influence of Age of Onset

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Introduction

In addition to a loss of memory, Alzheimer's disease (AD) is known for decline in language. Individuals with AD often use higher frequency lexical items, but the literature is divided on whether there is a decline in linguistic complexity (Garrard et al., 2005; Kemper et al., 2001). The status of formulaic language, including formulaic, idiomatic and conventional expressions, is less well documented in AD speech. Interest in formulaic language has recently increased (Wray, 2002). We examined lexical frequency, linguistic complexity, and formulaic expressions in discourse obtained from persons diagnosed with AD.

Method

Discourse samples were collected from eleven individuals with AD (3 years post-diagnosis) and five age-matched normal controls (NCs) (M age = 63.30 years, SD = 13.79). The AD group was further divided into younger (M age = 53.80 years, SD = 5.54; M MMSE = 14.60, SD = 4.92) and older groups (M age = 85.50 years, SD = 3.94; M MMSE = 18.67, SD = 1.63). We obtained mean frequency ratings for lexical items (nouns, verbs, adjectives)

(Francis et al., 1982) and analyzed linguistic complexity by categorizing utterances into clausal components. Finally, words in formulaic expressions as a proportion of total words were calculated and compared between groups.

Results

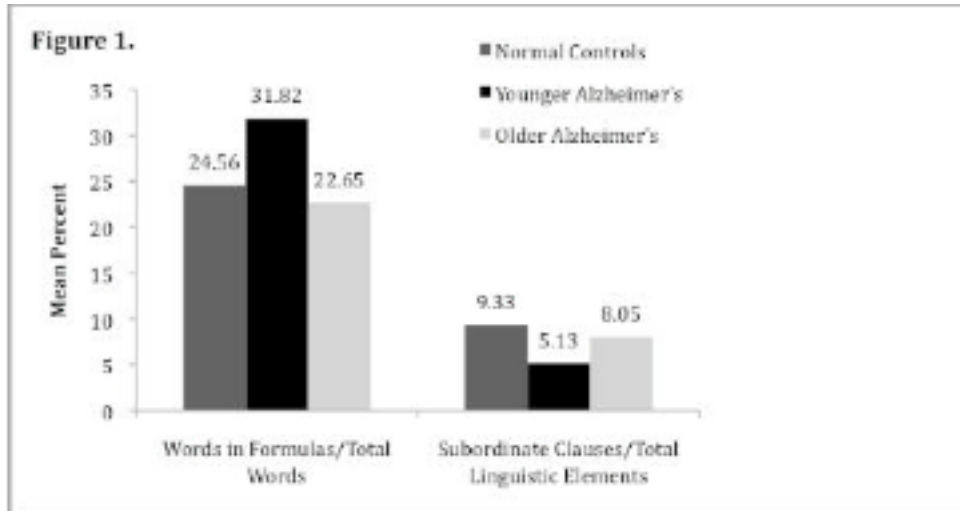
Although AD subjects used higher frequency words over all, significant differences were not found for lexical frequency between either AD group or NCs. Additionally, there were no significant differences in linguistic complexity between either AD group or NCs, although differences in subordinate clause use approached significance, with the younger AD group using fewer. For formulaic expressions, significant group differences were seen $F(2,13) = 4.08, p < .05$. Younger AD subjects had a larger percentage of words ($M = 31.82, SD = 4.79$) in formulaic utterances than older AD subjects ($M = 22.65, SD = 6.84$) and the NCs fell between AD groups ($M = 24.56, SD = 4.11$) (Figure 1).

Discussion

The nonsignificant trends for younger AD persons to show more high frequency lexical items and less linguistic complexity than the other comparison groups merits further study. A significant difference between older and younger AD groups in use of formulaic expressions was observed. The evidence presented here suggests that younger individuals with AD are more severely affected than their older AD counterparts in that they utilized fewer novel utterances and rely more on over-learned formulaic expressions in discourse.

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Presented by: **Bridges, Kelly**

31. Script Generation in Mild and Moderate Alzheimer's Disease

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Introduction

Individuals with Alzheimer's disease (AD), who display a prominent decline in episodic and semantic memory (Kazui et al., 2003; Pekkala, 2004), tend to produce significantly fewer events for scripts but more events that fall outside the script boundaries, thus producing less informative scripts than healthy age-matched controls (Grafman et al., 1991). The present study examines how the degree of dementia affects the generation and informative content of scripts in AD.

Methods

Ten people with mild AD (miAD), 10 with moderate AD (moAD) and 10 normal controls (NC) matched for age, gender, and education, were asked to produce as many script events as possible in response to two questions: "What do you do between waking up and having lunch?" (the morning script) and "What happens at a doctor's appointment?" (the doctor script). Sixty seconds were allotted for each response. The scripts were scored for the total number of events (e.g., "taking a shower" / "waiting in the waiting-room"), the number of event repetitions, and the informativeness of the content (the ratio between the total number of the words produced for the script and the words used for the events).

Results

A Kruskal-Wallis test revealed a statistically significant difference among the participant groups in the total number of events produced and in the informativeness of the content but not in the number of event repetitions (Table 1). Pairwise analyses, conducted using the Mann Whitney U test, revealed that the miAD group ($U = 22.5$, $p < .05$) and the moAD group ($U = 0.5$, $p < .001$) produced significantly fewer events for the morning script than the NC group. The moAD group generated significantly fewer events for the doctor script than the NC group ($U = 10.5$, $p < .05$) and the miAD group ($U = 18.0$, $p < .05$). Compared to the NC group, the level of informativeness was significantly lower in the morning script generated by the miAD group ($U = 3.0$, $p < .001$) and in both scripts produced by the moAD group (the morning script: $U = 8.0$, $p < .001$; the doctor script: $U = 6.0$, $p < .001$). The informativeness of the doctor script was significantly lower in the moAD group than in the miAD group ($U = 23.0$, $p < .05$).

Conclusions

Our findings indicate that a reduction in the number of events and informativeness of scripts can be found early in AD, but script generation becomes quantitatively and qualitatively more impaired as the disease progresses into the moderate stage. This deficit can be explained by declining episodic and semantic memory in AD (Grafman et al., 1991; Kazui et al., 2003; Pekkala, 2004).

References

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Table 1

Performance of the NC group, the miAD group, and the moAD group on the script generation tasks

Variables	Morning script					Doctor script				
	NC (n = 10)	miAD (n = 10)	moAD (n = 10)	H (df = 2)	p	NC (n = 10)	miAD (n = 10)	moAD (n = 10)	H (df = 2)	p
Number of events										
Mean (SD)	9.6 (2.4)	6.2 (3.5)	3.1 (2.2)	14.987	.001	7.0 (2.8)	5.0 (2.7)	1.9 (2.7)	11.533	.01
Range	6.0–14.0	0.0–11.0	0.0–6.0			2.0–12.0	1.0–10.0	0.0–8.0		
Number of repetitions										
Mean (SD)	0.4 (0.7)	0.3 (0.7)	0.4 (0.7)	.261	.878	0.3 (0.5)	0.1 (0.3)	0.0	3.904	.142
Range	0.0–2.0	0.0–2.0	0.0–2.0			0.0–1.0	0.0–1.0			
Informativeness ratio (%)										
Mean (SD)	73.6 (15.6)	34.6 (15)	28.5 (26.9)	15.891	.001	63.5 (22.3)	38.4 (26.1)	15.6 (16.3)	12.681	.01
Range	45.5–94.3	0.0–47.7	0.0–90.5			9.6–83.9	10.3–85.1	0.0–37.0		

Presented by: Pekkala, Seija

33. Measuring Conversation Change in People with Agrammatic Aphasia

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Issue

Conversation Analysis (CA) has shown that utterances produced by agrammatic speakers in everyday conversation differ significantly from utterances elicited by assessment and therapy tasks (Beeke, Wilkinson & Maxim, 2007). As part of a new intervention for agrammatism focussing directly on grammar in conversation, a measure of change in conversation is being developed to analyse (i) stability in pre-therapy conversations and (ii) any change in post-therapy conversations. Previous research has found that CA can indicate reliability over time in (i) consistency in the nature of trouble sources and (ii) the mechanisms participants use to deal with them (i.e. strategies of both speakers) (Perkins, Crisp & Walshaw, 1999).

Method

Ten dyads where one person has agrammatic aphasia are being studied in three phases of eight weeks each: assessment, therapy and post-therapy assessment. A battery of impairment, activity/participation tests and interviews are administered and each dyad video-records a weekly 20 minute conversation during the assessment phases. Therapy is based on the SPPARC conversation training programme (Lock, Wilkinson & Bryan 2001), with a novel focus on turn construction.

Results

Preliminary analysis suggests that a small number of turn-based measures may capture change. Because the intervention does not target impairment, differentiation between agrammatic versus non agrammatic turns is not likely to be a key feature of post therapy change. Successful intervention is measured by change (i) in the aphasic speaker's turn (still agrammatic but more communicative and/or complete) and (ii) in the partner's response (quicker/more successful repair or no need for repair: partner responds to meaning; see table below).

Discussion

Within applied CA, there is growing acceptance of quantification if the analysis counts sequences that have the same

interactional function, not the same surface structure. Because conversational activities occur on the basis of interactional opportunity, and not time, it is vital to use proportions of any interactional function in relation to the total number of turns, not number of occurrences per time unit. A fine-grained interactional description of a sequence is key to making quantification valid.

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Roy takes a long agrammatic turn but it is complete and meaningful in context; Di's repair is quick and she then responds to the meaning of Roy's turn.

- | | | | |
|---|---|-----|---|
| 1 | → | Roy | uh- u:::: e- interesting actually, (0.3) uh- |
| 2 | → | | bu- bi- because- (2.4) er <u>now</u> , (2.1) <u>me</u> : |
| 3 | | Di | m |
| 4 | → | Roy | (0.3) I:, (0.9) think no, (0.5) er=er- (0.7) u=special. (0.3) honestly. |
| 5 | | Di | what, working with children. |
| 6 | | Roy | yeah, definitely. |
| 7 | | Di | yeah, not everyone can do it can they? |

Presented by: **Maxim, Jane**

34. The Effects of Neurological Damage on Formulaic Language

Sidtis, D.
New York University

Background

Interest in formulaic language, including speech formulas, idioms, proverbs, sentence stems, and other fixed expressions (Wray, 2006), has increased in recent years. Although proportions differ with speaker, topic, and context, about 25% of normal discourse consists of formulaic language. However, despite traditional attention to “automatic speech” in aphasia, little systematic investigation of the effect of left (LH) or right hemisphere (RH) damage on formulaic expressions has appeared. This presentation reviews recent findings of neurogenic effects on formulaic language and the implications for clinical evaluation and treatment.

Method and Results

New methods of classification and analysis (Van Lancker Sidtis & Postman, 2006) revealed that LH damaged subjects used significantly more formulaic expressions (29.5%) than matched healthy subjects (24.6%), and that persons with RH damage (16.5%) had reduced incidence of formulaic expressions ($F(2, 12) = 7.343, p < .01$). Mean numbers of formulaic expressions also differed significantly for each group (RH: 54.6, LH: 80.0, and NC: 70.4). In several documented cases of aphasic recovery, the larger portion of fluent speech consists of formulaic expressions. A recent study of single cases suggested a possible role of subcortical nuclei in production of formulaic expressions (Sidtis, et al., in press). Examination of the spontaneous speech of four stroke patients with left, right, or subcortical damage, compared to speech samples obtained from 10 healthy speakers, demonstrated that brain damage affected formulaic language competence differently, with a significantly ($p < 0.05$) smaller proportion of formulaic

expressions in subjects with RH or subcortical damage compared to LH damaged or healthy speakers. Proportions for two subjects with subcortical damage were 16.9% and 11.0%; for the RH subject, the incidence was 16.1%; the LH damaged person showed a proportion of 53.8% of words in formulaic expressions. In the first subject, premorbid speech supported a causal role of subcortical nuclei in diminished formulaic production: Patient 1's premorbid tally of 18.3% was not significantly different from normal (Figure 1).

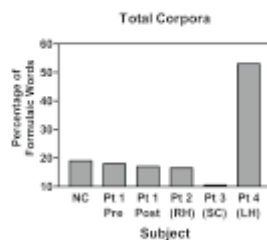
Conclusions

These findings converge with studies from Parkinson's, Alzheimer's and schizophrenic speech that support the proposal of a RH/subcortical circuit in the management of formulaic expressions, based on a dual-process model of language incorporating novel and formulaic language use. An overview of the effects of neurological damage on formulaic language reveals excess as well as impoverishment of this aspect of pragmatic competence. Clinical implications include the valid evaluation of aphasic speech, differentiating formulaic from novel language, and utilizing formulaic language for communication.

References

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Figure 1. Words in formulaic expressions in normal control (NC) subjects, Patient 1-subcortical damage (SC) (pre- and post-morbid); Patient 2-RH damage, Patient 3-subcortical damage, and Patient 4-LH damage.



Presented by: **Sidtis, Diana**

35. Formulaic Language in Alzheimer and Parkinson Speech

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¹ New York University Department of Communicative Sciences and Disorders, Nathan Kline Institute for Psychiatric Research, ² Nathan Kline Institute for Psychiatric Research

Introduction

Formulaic expressions (FEs) are integral in daily interactions. Previous studies showed decreased production of FEs in subcortical damage (Speedie, et al., 1993; Sidtis, et al., 2009). In contrast, clinical descriptions of Alzheimer's Disease (AD), a cortical dementia, reveal preserved FEs despite impaired cognition. We evaluated cortical and subcortical processing of FEs by examining spontaneous speech of persons with PD and AD, hypothesizing that subcortical structures play a role in FE production.

Method

Subjects: In this preliminary report, speech samples from 5 PD, 2 AD and 6 normal-control (NC) subjects matched

for age and education and native American English speakers, were studied.

Materials and Procedure: Three protocols were used to examine production and comprehension of FEs: 1. A structured interview designed to elicit FEs in discourse; 2. Formulaic and Novel Language Comprehension Test (FANL-C), which uses line-drawings for responses; 3. The Northridge Evaluation of Formulas, Idioms and Proverbs in Social Situations (NEFIPSS), for which subjects choose a response to a described social scenario. The mean words in texts for PD subjects = 677.2; AD subjects = 538.5; and NC = 731. Transcripts were evaluated by two raters using methodology previously verified (Van Lancker Sidtis & Rallon, 2004).

Results

The PD group had the smallest proportion of FEs (21.6%), while the AD group had the highest (44%). The NC group (30.3%) fell between these values. FANL-C scores indicated intact formulaic and novel language comprehension by PD (93.0% & 94.0%) and NC groups (92.5% & 98.3%), while AD subjects (77.0% & 95.0%) were impaired in the formulaic subtest. For the NEFIPSS, PD (84.7%) and NC (89.4%) groups performed similarly, while AD subjects performed poorly (58.3%). A Mann-Whitney test yielded a significant difference in FE proportion ($p < .05$) between PD and NC. In a 95% confidence interval procedure, the FEs for both AD subjects (55.4%, 40.2%) were significantly different from PD. FANL-C (formulaic) and NEFIPSS, comprehension tests, showed reduced performance for AD only (Figure 1 below).

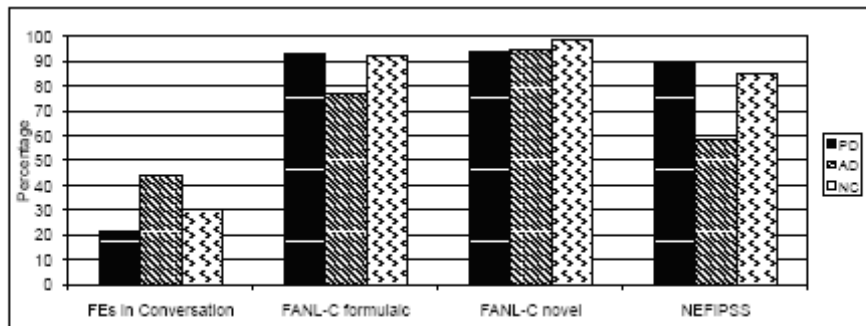
Discussion

FE production is reduced in PD, but spared in AD where the basal ganglia are intact, likely reflecting procedural processes. Normal performance on the FANL-C and NEFIPSS in PD and NC indicates declarative knowledge of FEs. AD subjects had the highest proportion of FEs production in conversation, but the lowest comprehension scores (Kempler et al., 1988). Additional subjects are required for confirmation.

References

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Figure 1. FE percentage in conversation and formal tests.



Presented by: **Rogers, Tiffany**

Poster Session 1: Morphology

36. Does Word Morphology Affect Vocabulary Knowledge and Word Retrieval in Old Age?

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Previous research has shown that vocabulary knowledge improves with age but at the same time age is associated with increasingly more word retrieval difficulties. The aim of the current study was to examine whether word morphology interacts with age-related changes in word knowledge and retrieval. We assumed that morphology processing would be insensitive to aging (Kavé & Levy, 2005) and hypothesized that morphological structure would contribute to vocabulary knowledge as well as alleviate age-associated retrieval difficulties.

Forty-eight neurologically intact native Hebrew speakers participated in the study, half young (mean age: 23.5) and half old (mean age 73.9). Three main issues were investigated: (a) the effect of word morphology on vocabulary knowledge; (b) the effect of age on morphological processing; and (c) the possibility that word morphology alleviates age-related retrieval difficulties. Two experimental tasks were constructed to address each of these issues. (a) Vocabulary knowledge was examined through multiple-choice meaning identification questions, as well as through production of word definition. In each of these tasks, half of the target nouns contained a Semitic consonant root, and half contained no root. As expected, older adults had a greater vocabulary. Yet, unexpectedly, all participants performed more poorly when nouns contained a consonant root relative to nouns with no root. (b) Age effects on morphological processing were examined through a paper-and-pencil identification of semantically and phonologically ambiguous roots, either by asking participants to determine whether two roots were related to each other or by asking them to produce a related word with a similar root. In both tasks, no age differences were found and all participants were sensitive to the morphological manipulations. (c) The effects of word morphology on retrieval were investigated through two tasks of naming-to-definition. These tasks examined whether young and old adults experienced the same rate of tip-of-the-tongue (TOT) states and whether their performance was mediated by the degree of semantic and phonological transparency of the word's morphological structure. There were significantly more TOT states in the old group while young adults experienced more "don't know" cases. In both tasks, all participants experienced more difficulties in retrieving words that contained transparent consonant roots relative to words that contained opaque roots.

Our results show that all participants found words with transparent roots more difficult to retrieve than words with no roots. Advanced age was associated with greater word knowledge as well as with more TOT responses, but no differences in morphological processing were seen between old and young adults. These findings do not support the prediction that morphological transparency would be associated with ease of word retrieval, most likely because larger morphological neighborhoods interfere with correct word retrieval. The data shed light on existing models of word production, lexical representation, and processes of cognitive aging, and are thus highly relevant for aphasia research.

References:

Kavé, G., & Levy, Y. (2005). The processing of morphology in old age: Evidence from Hebrew. *Journal of Speech, Language, and Hearing Research*, 48(6), 1442-1451.

Presented by: **Kavé, Gitit**

37. Testing Cue-Cost and Cue-Validity Concepts on Inflectional Morphology-Error Pattern in a Kannada-Speaking Individual with Agrammatism

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Cross-linguistic error patterns in agrammatic speech have been fairly well-explained by the concepts of cue-cost (associated with computational factors) and cue-validity (associated with informational value) (Bates et al., 1991), but to date this analysis has not been applied to an agglutinative language like Kannada, a South Indian language where complex interplay between cue-cost and cue-validity obtain. In Kannada the noun/pronoun-inflections or case-markers and the verb-inflections are highly valid cues differing in costs. The dative is the only case-marker with three distinct forms, and the genitive case-marker has a phonologically less salient form than the other case-markers, making the genitive- and dative-markers higher in cost than the other case-markers. Verb-inflections carry multiple units of information such as tense, person, number, and gender, making them highly valid cues. Further, the informational value of verb inflections is far greater than the noun-inflections as the language allows for subject and object ellipsis (Sridhar, 1990). Considering the aforementioned cost and validity factors with respect to nouns/pronouns and verbs, we hypothesized that in agrammatic Kannada discourse

1) Datives and genitives will occur less frequently than accusatives, locatives, and instrumentals, relative to controls' proportions.

2) Verb-inflections will be preserved, even though structurally-simpler forms exist.

We present data from four participants. The patient, AG, was a 42-year old male with agrammatism resulting from a single stroke. The three normal controls were matched for linguistic background with AG. The tasks included picture description and story narration. Tape-recorded language samples were transcribed and analyzed. As the purpose of this study was to examine the linguistic output in terms of the frequency of the different kinds of inflections, a token-counting method was employed. Findings revealed that AG produced datives less frequently (3.66%) than the controls (M=22.7%, SD=5.3), supporting hypothesis 1. However, contrary to hypothesis 1, we found that the frequency of genitives was comparable to that of the controls and to AG's own accusative production, which motivated us to carry out an additional analysis that examined the root words that the inflections were attached to. Whereas for the controls, at least 50% of genitives occurred on nouns, almost 100% of genitives occurred on personal pronouns for AG. Attaching genitives to personal pronouns follows a uniform pattern and involves only a slight morphophonemic modification unlike noun modifications, making the former a relatively less "costly" computation. Consistent with the second hypothesis concerning "validity" of verb-inflections, these were preserved despite the availability in the language of relatively simple verb forms such as imperatives and infinitives. In sum, in this highly-inflected language, the results are consistent with both cue-cost and cue-validity predictions.

References

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Presented by: **Karthikeyan, Sethu**

38. Compounds in Different Aphasia Categories: A Study on Confrontation Naming.

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Introduction

This study investigates the production of compounds in Italian-speaking patients affected by different aphasia categories, i.e. Broca's, Wernicke's and Anomic, in a confrontation naming task. Interesting differences in processing compounds have been found in the past (e.g., Semenza, Luzzatti and Carabelli, 1997; Chiarelli, Menichelli and Semenza, 2007). However, in the most recent and linguistically complex studies the limited amount of patients for each category or the limited amount of items did not allow firm conclusions. This study was designed to test a sufficient number of patients, on a sufficient number of items, allowing fruitful comparisons among different syndromes.

Methods

A picture naming task was administered, consisting of 50 pictures which are consistently named with a two-word compound noun. These pictures were intermixed with 50 pictures which are named only with simple nouns. Compound types included Verb-Noun compounds, the most productive type of compound in Italian, as well as other compounds (Noun-Noun, Noun-Adjective, Adjective-Noun) that were collapsed for the purpose of statistical analyses into a the single group "Other". This was done because compounds that can be pictured in Italian are very limited in number and their categories in such collections cannot be equally represented.

Participants

Nine Broca's, 23 Wernicke's and 16 Anomic patients participated in this study.

Results and Discussion

The main results were the following:

- 1) The "compound effect" was confirmed. In word substitutions, patients tended to replace compounds with compounds and simple words with simple words. This shows that patients retain information about the morphological structure of a word whose phonological form they cannot retrieve. Nothing in the each picture could in fact suggest whether its name was a compound or not.
- 2) Broca's patients committed more single component omissions than substitutions, while the reverse was found in the other two aphasia categories.
- 3) A different position effect was found among the three aphasia categories: while Broca's aphasics omitted or substituted the first component about three times as often as the second component, such difference between components was not found in both Wernicke's and Anomic aphasia.
- 4) A triple interaction was found of position effects with the category of aphasia and the type of compound. Broca's aphasics omitted/substituted the first component irrespective of the compound category. Wernicke's and Anomic patients more frequently omitted/substituted the second component in Verb-Noun compounds and the first component in Others.

These findings confirm and extend findings obtained in previous research. Aphasia category is shown to interact significantly with the position of the components and their grammatical class.

Chiarelli, V., Menichelli, A., and Semenza, C. (2007) Naming compounds in Alzheimer's disease. *The Mental Lexicon*, 2, 259-269.

Semenza, C., Luzzatti, C., & Carabelli, S. (1997). Morphological representation of a noun: A study on Italian aphasic patients. *Journal of Neurolinguistics*, 10(1): 33-43.

Presented by: **De Pellegrin, Serena**

39. The Mental Parsing of Italian Nominal Compounds: Evidence from Deep Dyslexia.

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Whether compound words are accessed through their constituents or stored as a whole in the mental lexicon is a long-debated issue. Indeed, a number of priming experiments (e.g., Libben et al., 2003) suggest that constituents are accessed during compound processing. Converging evidence is also provided by neuropsychological studies (e.g., Mondini et al., 2004). However, it has been suggested that high-level properties of compounds (i.e. semantic transparency) can modulate access to the constituent representations: opaque compounds would be represented as a whole, while transparent compounds would be accessed through their constituents (Sandra, 1990). In the present study, we investigate the processing of Italian compound words in two reading experiments with a patient, RG, suffering from deep dyslexia.

RG was unable to read pseudowords and function words. Regarding content words, she made several semantic and morphological errors. A concreteness effect was also found, but no frequency effect.

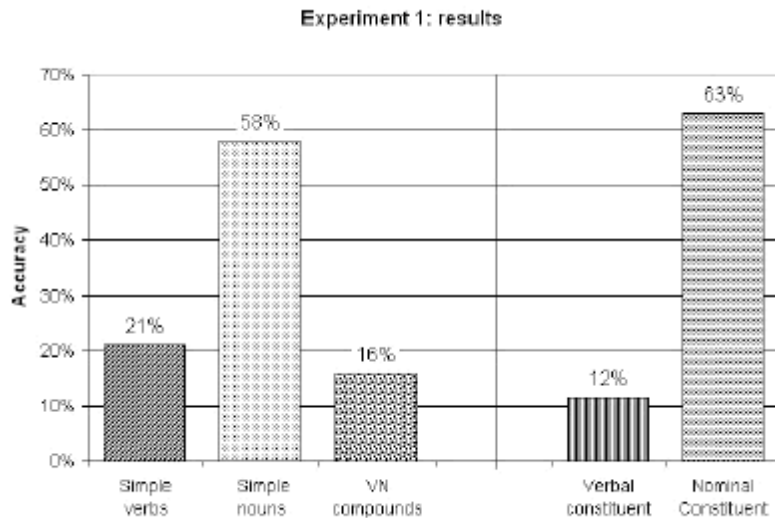
RG's reading ability of nominal compound was tested. In the first experiment, verb-noun (VN) compounds and their individual constituents were employed as stimuli. In a following experiment, the same procedure was applied with noun-noun (NN) compounds to assess the effect of semantic transparency.

Figure 1 summarizes the results of the first experiment. When constituents were presented individually, RG read nouns better than verbs. However, when asked to read VN nominal compounds, she made as many errors as for simple verbs, even though VN compounds are globally nouns. Moreover, these errors (omissions and substitutions) concerned more often the verbal than the nominal constituent, with a rate that was similar to that emerged for verbs and nouns in individual presentation. Also in the second experiment (reading of NN nominal compounds), RG's reading accuracy was higher with the individual constituents (56%) than with the compound stimuli (33%). Errors were mostly omissions and substitutions of either the first or the second constituent (no position effect). The accuracy rate was inversely related to the semantic transparency of the stimuli.

In the first experiment, RG made more errors with the verbal than with the nominal constituent of VN compounds. Since VN compounds are nouns, results indicate that Italian compounds are parsed during reading, thus providing converging evidence to what was observed by Mondini et al. (2004) for compound naming. The results of the second experiment indicate that the more transparent a compound is, the more likely it is that segmentation takes place, confirming that the parsing procedure is modulated by the semantic transparency of the compound (Sandra, 1990).

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The left-side graph shows the reading accuracy for simple verbs, simple nouns and VN nominal compounds; the right-side graph portrays the accuracy in reporting the verbal and the nominal constituent when reading VN nominal compounds.

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40. Morphological Therapy Protocol: New Therapy for Language Impairment after Stroke

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Investigations of morphological impairment in aphasia have revealed that patients may retain knowledge of a word's morphological status even when they cannot access that word (Delazer and Semenza, 1998). Aphasiological investigations have also shown that patients display more difficulty (i.e., morphological, phonological, and semantic paraphasias) with words that have internal morphological structure than with simple words (e.g., Nasti & Marangolo, 2005). Furthermore, according to recent neurolinguistic and psycholinguistic research, complex words are represented and accessed in terms of their constituents. Individuals with aphasia seem to have retained sensitivity to morphological status and morphological structure of words, yet they are unable to process morphologically complex words with ease. The goal of this study was to investigate whether a therapy that specifically focuses on morphology will activate areas of morphological ability that may not be computed in these patients.

The morphological therapy protocol (MTP) specifically addresses morphological deficits in aphasia. Through word game tasks the MTP reveals linguistic components that encompass our morphological ability: the tacit understanding of the morphological rule system of a particular language (i.e., which morphemes combine to make legal words) and the awareness of the combinatorial nature of words (i.e., inflected and derived versions of words). Essentially, patients decompose and compose inflected, derived, and compound words with the help of the computer-assisted MTP.

The results of four English-speaking adult non-fluent individuals with aphasia demonstrate the therapeutic effectiveness of the MTP by comparing pre-therapy naming with post-therapy naming of simple and complex words. Word naming improvement was highly significant ($p < 0.0001$).

References

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Presented by: **Nault, Karin**

41. Novel Compound Processing in Broca's Aphasia

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Introduction

Complex words, i.e., inflections (raining), derivations (rainy), or compounds (rainbow), are generally processed effortlessly by adult unimpaired speakers, but might pose specific difficulties for developing or impaired populations.

To date, research on compound processing in aphasia has mainly focused on lexicalized compounds. Aphasics' abilities to process novel compounds (e.g., cricket mom) are assumed to be intact, based on the morphological well-formedness of their neologisms and substitution errors (Delazer & Semenza, 1998).

Using hybrid object stimuli in a naming task, traditionally employed to investigate the acquisition of compound processing in children, Borgwaldt and Bose (2008) presented data from three fluent aphasics, who showed severe impairments in the production, but not in the comprehension of novel compounds. The current study investigates whether the above findings replicate for Broca's aphasia.

Method

Participants. Participants were two English-speaking moderately aphasic individuals with non-fluent Broca's aphasia. They were at least 1 year post-onset to their neurological disorders and had no other significant sensory and/or cognitive deficits that interfered with their performance in the study.

Tasks and procedure. The tasks and procedure were identical to Borgwaldt and Bose (2008): The stimuli were digitally manipulated photographs, depicting hybrid objects composed of two equally salient components, such as apple tent.

In the production task, 50 hybrid object images had to be named as compounds. In the comprehension task, 50 auditorily presented novel compounds had to be matched with the corresponding hybrid object image that was presented along with three distractors.

Scoring

Production performance was scored for well-formedness: either as morphologically correct (apple tent), or as one of two types of errors, (a) insertions such as “and” between the components (apple and tent), or (b) other, such as descriptions. Comprehension performance was scored for accuracy.

Results and Discussion

Participants	Aphasia Type	Production (n = 50)			Comprehension (n = 50)
		Morphologically correct	Errors		Correct
			Insertions	Other	
1	Broca	64%	0%	36%	94%
2		66%	6%	28%	58%
3 fluent aphasics, reanalysis of Borgwaldt & Bose (2008)	Anomia (2) & Wernicke (1)	4.7%	72.7%	22.7%	81.3%

Table 1. Results for novel compound production and comprehension tasks.

Broca's aphasics displayed relatively intact novel compound production abilities, in contrast with the production patterns of the fluent aphasics. For both types of aphasia, comprehension accuracy for novel compounds was relatively high.

The striking difference between the two groups' novel compound production performances supports the assumption that novel compound processing mechanisms involved in explicit naming tasks might be selectively impaired across aphasia types.

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