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**Semantic Memory and Comprehension
Disorders**

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Semantic Aphasia: Deregulated Semantic Cognition.

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Background. Semantic cognition is composed of at least two interactive primary components; conceptual representations and executive control processes that regulate and shape activation within the semantic system. This study compared semantic dementia (SD) and a subgroup of aphasia patients with multimodal semantic impairments (semantic aphasia for short, SA). It examined the hypothesis that the impairment seen in both groups is qualitatively different reflecting: degraded semantic representations in SD and deregulated semantic cognition in SA.

Method. Seven patients with SA and two with SD were tested on three tasks which manipulated the executive semantic demands required for successful task completion. Semantic distance, lexical ambiguity and synonym judgement were explored in all patients using a mixture of group and case series methodologies.

Results. The results showed that SD patients were not affected by the manipulation of executive control demands, but instead showed a pattern of performance best explained in terms of a graded, frequency sensitive, decline in conceptual knowledge which was largely unresponsive to external support (e.g. cueing). In contrast, SA patients were greatly influenced by semantic control demands. Performance was impaired on synonym judgement when distracter foils were highly associated to the probe items. Similarly, when the semantic distance between a probe and its target was increased, performance greatly declined. Importantly, however, semantic representations were shown to be relatively intact in SA; the poor performance shown on the subordinate meaning of ambiguous items improved significantly when cued support was provided.

Conclusions. The current findings provide support for an amodal, anterior temporal store of semantic knowledge supported by an additional, highly interactive, control mechanism located in left inferior prefrontal and temporoparietal cortices. This latter mechanism is responsible for the task oriented regulation of semantic activity.

Word list repetition in semantic dementia: A comparison with nonword recall in healthy people

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Introduction

Despite having good phonological processing, people with semantic dementia (SD) perform poorly when repeating lists of words and make numerous phoneme migration errors in which phonological elements from different words are combined in recall (e.g. mint, rug → “rint, mug”).

This finding has led to the semantic binding hypothesis (Patterson et al., 1994), which holds that semantic knowledge is an important source of constraint over phonological activation. The theory predicts that healthy people will make similar errors when repeating lists containing nonwords. We tested this prediction by directly comparing (a) word list repetition in people with SD and (b) nonword list repetition in healthy people.

Method

Five individuals with SD and eleven healthy people were tested on an immediate serial recall task. This consisted of 40 “pure” lists containing only real words and 60 “mixed” lists containing an unpredictable mixture of words and nonwords.

Results

Healthy people recalled pure lists more accurately than mixed lists, but people with SD recalled both types of list equally poorly. Healthy people only made phoneme migration errors in mixed lists, while SD participants made these errors to both types of list. The errors made by healthy people to mixed lists mirrored those made by SD participants to pure lists.

Conclusions

The predictions of the semantic binding hypothesis were supported. Phoneme migration errors occurred in both groups when semantic support for list items was reduced. In individuals with SD, degraded semantic memory caused errors on both types of list. In healthy people, the presence of nonwords was necessary to disrupt support from semantics. The research highlights the importance of considering the role of semantics in tasks that depend on phonological activation.

Patterson, K., Graham, N., & Hodges, J. R. (1994). The impact of semantic memory loss on phonological representations. *Journal of Cognitive Neuroscience*, *6*, 57-69.

Towards an understanding of the varieties of comprehension disorder of stroke aphasia: the case of ‘pure’ word deafness

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Background

Damage to the posterior superior temporal/inferior parietal cortex has classically been associated with a subset of the aphasic comprehension disorder/s although the precise basis of the impairment is not well understood. Partly this is because the patients are challenging to work with: comprehension loss is often accompanied by disrupted jargon output. In addition, damage to this region gives rise not to one but to a variety of inter-related comprehension disorders. One of these – perhaps the easiest to consider – is the disorder of pure word deafness, following bilateral pathology to this brain region. Here, there is a dissociation between auditory and written comprehension, with relative preservation of spoken output.

Case study

We have been investigating a ‘pure’ word deaf case, AB, with tests of phonological input and output, as well as verbal and ‘non-verbal’ tests of semantic knowledge. Her spoken output is relatively intact so that her responses are, on the whole, quite reliable. As with other such patients, AB’s poor auditory processing affects not only her understanding of spoken language but also of environmental sounds. Phonological processing is more impaired than is apparent from her conversational speech, with poor performance on minimal pairs, non-word repetition, rhyme judgement and oral spelling. In contrast, performance on semantic tasks is much better, but still impaired.

Discussion

The profile indicates a dynamic interaction between phonology and semantics whereby disrupted phonological processing has an unexpected impact on performance even of ‘non-verbal’ semantic tasks, while intact semantic representations can be harnessed to boost performance where phonological processing is vulnerable. The profile will be discussed in the context of the primary systems model of language processing. The study demonstrates the effectiveness of a strong academic-clinical partnership in developing significant and clinically-relevant research.

Designing a crossover study to compare phonological and semantic therapy approaches for speech perception deficits in aphasia

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Difficulties in speech perception are common in aphasia and may affect many aspects of an individual's life. Despite this, there have been few experimental studies of auditory processing therapies in aphasia and these have shown conflicting results (Morris et al, 1996; Grayson et al, 1997; Maneta et al 2001). Several studies show that aphasic listeners may be heavily influenced by semantic context, suggesting a strategic use of meaning to compensate for impaired speech perception (e.g. Blumstein et al, 1982; Woolf, 2004). It follows that therapy promoting this strategy might be advantageous, by helping individuals make further use of semantic context to support comprehension.

Two approaches to treatment of speech perception impairments in aphasia are currently being investigated in a three year project funded by The Stroke Association. This project aims to compare therapy that encourages use of semantics to support phoneme discrimination, with 'pure' phoneme discrimination therapy. The study is being carried out by Dr Wendy Best, Professor Jane Marshall, Anna Panton, Professor Stuart Rosen & Dr Celia Woolf (PI). The two approaches are being investigated with twenty aphasic participants using a randomised cross-over design with repeated baselines. Each therapy programme is based on matched sets of therapy tasks and materials, using a structured facilitation hierarchy. Computerised evaluation measures have been developed to explore which aspects of auditory processing are changed by the therapies, and whether effects extend to an everyday comprehension task.

This presentation will discuss some advantages and challenges of using a cross-over design in a group study of aphasia therapy. Theoretical and practical issues that arose during development of the therapy programmes and novel assessments will be highlighted, as well as issues that have arisen in therapy delivery. Many of these issues have interesting implications for both research and clinical management of auditory processing disorders in aphasia.

Assessment and management of a person with aspects of adynamic aphasia.

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Adynamic aphasia is a motor aphasia where the person has very little spoken output but when this output is heard, it is fluent and appropriate. Other language abilities (such as reading and repetition) are also relatively intact. (Robinson et al., 2005; Gold et al., 1997). The reported cases usually have anterior cerebral artery infarction with involvement of the anterior cingulate and/or supplementary motor area (Berthier, 1999). Within any S< caseload, it is unlikely that a person with such a 'pure' aphasia is likely to present but some aspects of this adynamic behaviour are likely to be familiar to the therapist.

This presentation describes JS, a woman of 55 who was admitted to hospital in October 2005 with an episode of subarachnoid haemorrhage. An angiogram revealed a left carotid artery aneurysm. Early CT scan showed left deep frontal intracerebral haematoma and hydrocephalus. One week later she developed a second lesion involving the temporo-parietal-occipital junction due to vasospasm. Functionally she presented with aphasia, mild right sided weakness and limb apraxia.

JS lives with her husband. She has three grown up children and a new grandchild. Her two sisters live nearby. She previously worked as a domestic.

Initial assessment findings suggested that she had some preserved semantic skills and relatively good single word repetition. She had major difficulties with naming and reading aloud. She produced a few well formed phrases for the Cookie Theft picture (Goodglass & Kaplan, 1983). This pattern was also evident in spontaneous speech. For example, when asked about a programme on the television she replied, "I don't know. I haven't been watching it."

In summary, JS presented with severe aphasia linked to the ischaemic infarct. However, assessment and management was strongly determined by the additional frontal lobe bleed. The dilemma for the S< managing JS was how to harness what appeared to be some preserved semantic abilities with little evidence of these in output tasks.

The initial treatment options chosen were development and maintenance of a core vocabulary using errorless learning techniques and using the stronger modality of repetition. Recently she has been involved in an ongoing trial of the drug Bromocriptine (Berthier 2005).

This presentation will look at the range of impairments identified in assessment and the response to the treatment options, in particular, changes in her language output following the use of Bromocriptine.

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Is monitoring failure in jargon aphasia modality specific?

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Background

Jargon aphasia describes spoken and/or written output which is semantically unrelated, perseverative or neologistic (nonwords). Those who produced jargon often showed an apparent lack of awareness of their language problems (Mayer et al., 1984; Panzeri et al., 1987; Marshall, 2006). Explanations for the monitoring failure observed in people with jargon output include; disruption within a perceptual loop (Levelt, 1983); a resource limitation (Shuren et al., 1995) and a result of specific linguistic demands (Marshall et al., 1998).

Study aims

1. Provide a profile of the language and cognitive abilities of a range of people whose spoken and/or written output included jargon.
2. Assess their abilities to monitor their own speech or written output and their abilities to monitor someone else's speech or written output
3. Examine these abilities in both on-line and off-line conditions

Method

Seven people with jargon aphasia participated in the same language and cognitive tests to provide a profile of their cognitive and psycholinguistic behaviours. Six experimental tests were designed to assess the monitoring skills in spoken naming and written naming. These tasks contrasted monitoring of their naming immediately after the event (on-line) with monitoring of their naming by listening to a recording (off-line). The tasks also included monitoring of the examiners speech on-line and off-line. The participants monitored both spoken and written output in these ways.

Results

All participants showed significant language and cognitive impairments and were impaired at spoken and written word monitoring. Three participants were significantly better at monitoring their speech than their writing. Three participants were significantly better at monitoring their writing than their speech. Two areas were highlighted to assist in understanding the variation across the cases: phonological abilities and attentional skills.

Discussion

Previous accounts of poor language and monitoring abilities in jargon aphasia have not examined linguistic, cognitive and monitoring skills of people with jargon aphasia together. We suggest that jargon aphasia results from a primary phonological problem interacting with attentional (and other cognitive) factors.

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