

Discourse Processing in the Brain: Setting up new discourse referents

E. Kaan (UF Linguistics), A. Boller (UF Linguistics), N. Chevalier (UF Linguistics),
Y. Liu (UF Psychiatry)

Introduction

During listening or reading, language users construct a mental representation of the on-going discourse, which is continuously modified and augmented. One of the modifications is to set up a new discourse referent. For instance in [1], the word 'Three' in (a) refers to a subset of the set of ships mentioned in the first sentence, but in (b) it enforces the set-up of a different set of ships.

- (a) Five ships were in the port. Three had sailed out that morning. [1]
(b) Two ships were in the port. Three had sailed out that morning.

Over the past two years, we carried out an fMRI experiment to investigate which areas of the brain are involved in establishing new discourse referents and in detecting errors in this domain. Since previous neuropsychological research has implicated a right hemispheric dominance for discourse processing [1,2], we were particularly interested in differences between the hemispheres.

Experimental

This past year, we continued the experiment started in 2007. For this experiment, a total of twenty-one neurologically healthy, right-handed, monolingual speakers of English were scanned using the Philips 3T whole body system located at the McKnight Brain Institute. Participants viewed 133 sets of two-sentence groups (constructed on the basis of three offline pretests). The critical comparison was between sentences of type a and b in (2) below.

- (a) Five ships were in the port. All five were being loaded. [2]
(b) Five ships were in the port. All three were being loaded.

Five ships were in the port. All three that had left previously had not returned. [3]

In condition (2a), the underscored region refers to the previously mentioned set of five ships. In condition (2b), on the other hand, the underscored cannot refer back to a previously established set, leading to a problem with the interpretation of what 'all three' should refer to. Items such as in (3) were included as distractor items. In these items, the information following underscored region allows the establishment of a new discourse referent. The comparison of (2a) versus (b) is crucial to identify areas of the brain involved in detecting and resolving errors in discourse reference. The first sentence of each set was presented two words at a time, for 400ms each. The first two words of the second sentence were presented in the same manner; the rest of the second sentence was shown word-by-word for 300ms each. Participants were then cued to rate the plausibility of the connection between the two sentences by pressing buttons on a response pad.

Conclusions

Data analysis is still in progress, but preliminary results support the idea that the right hemisphere is involved in discourse processing: the right hemisphere cingulate, precentral, and postcentral gyri, as well as the left inferior parietal lobule are activated to a significant degree. A connectivity analysis will be carried out to determine which areas are functionally connected in processing new discourse referents.

Acknowledgements

This research is sponsored by NIDCD grant #5R03DC006160, and a start-up mini grant from the MBI, both awarded to EK.

References

- [1] Beeman, M. *Brain and Language*, **44**, 80-120 (2003).
[2] Tompkins, C.A. *et al.* *Journal of Speech, Language & Hearing Research*, **43**, 62-78 (2000).