

## PLATFORM SESSION 6

1. Delayed Integration of Lexical Ambiguities in Broca's Aphasics:  
Evidence from Event-Related Potentials

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This study focuses on the time course of the integration of ambiguous words (e.g., BANK) into a higher order mental representation of the preceding sentence context in Broca's aphasics with comprehension deficits.

Recent evidence suggests that Broca's aphasics are unable to access the infrequent meaning of ambiguous words (Swinney, Zurif, & Nicol, 1989; Prather, Love, Finkel, & Zurif, 1994). Swinney et al. (1989) showed that these patients, in contrast to normal control subjects and Wernicke's aphasics, had faster reaction times (RTs) only to target words that were related to the most frequent meaning of ambiguous words. This was true even when the preceding sentence context biased the alternative, less frequent, meaning. They concluded from this study that Broca's aphasics either fail to exhaustively access word meanings, or alternatively, that in these patients "the lexical module operates on a slower-than-normal rise time."

In contrast, however, based on studies that varied the interval of silence between the ambiguous and target words, Hagoort, Brown, and Swaab (1993) argued that Broca's aphasics are able to exhaustively access all meanings of ambiguous words, and in addition, that contextual selection is delayed in these patients. They proposed that this is due to a delay in the integration of lexical meanings into an overall message representation of the preceding sentence context.

In the current study, we further tested this possibility using event-related brain potentials (ERPs). ERPs provide a millisecond-level temporal resolution measure of neural activity underlying language processes. Thus, they not only allow inferences to be made about the types of linguistic information that aphasic patients are (in)sensitive to, but also about possible changes in the time course of the relevant language processing events.

The most relevant ERP-component for this study is the N400, a negative peak in the waveform that is sensitive to semantic aspects of the linguistic input (Kutas & Hillyard, 1980). Recent evidence suggests that the N400 effect is especially sensitive to postlexical integration processes (e.g.,

Brown & Hagoort, 1993). The amplitude of the N400 is reduced for words that fit the context compared to words that do not.

The contextual resolution of lexical ambiguities in 12 Broca's aphasics and 12 age-matched neurologically unimpaired control subjects was inferred from the amplitude of the N400 to target words following sentences in three context conditions, and at two ISIs (100 and 1250 msec). For example,

Concordant condition	<i>The tall man planted the tree on the <u>bank</u> <u>slope</u></i>
Discordant condition	<i>The poor man made a call to the <u>bank</u> <u>slope</u></i>
Control condition	<i>The busy man gave his ticket to the <u>boy</u> <u>slope</u></i>

In the concordant condition, the sentence context always biased the subordinate meaning of the ambiguous sentence-final word. This meaning was related to the target (i.e., *slope*). In the discordant condition, the sentence context biased the dominant meaning of the sentence-final ambiguous word; this meaning was incompatible with the target. In the control condition, the sentence-final word was not ambiguous and, moreover, unrelated to the target. If the selection of the contextually appropriate meaning has been completed, we will only observe a reduction of the N400 amplitude to the targets in the concordant condition. If contextual selection has not (yet) taken place, reduction of the N400 amplitude is also expected in the discordant context.

The subjects were asked to listen to the sentences that were spoken at a normal rate, followed by an auditorily presented target after an ISI of 100 or 1250 msec. The task of the subjects was to listen attentively to the stimuli. No additional task was imposed. The same subjects were tested in both ISI versions. Time between sessions was at least three weeks.

At the ISI=100 msec, both subject groups showed a significant reduction of the N400 to targets in the concordant relative to the unrelated condition. However, in contrast to the normal controls, the Broca's aphasics also showed a significant reduction of the amplitude of the N400 to the targets in the discordant relative to the unrelated condition.

At the ISI=1250 msec, both subject groups showed the same pattern of results. That is, both normal controls and Broca's aphasics showed *only* a significant reduction of the N400 amplitude to the targets in the concordant relative to the unrelated condition. No N400 difference was observed between the discordant and the unrelated condition.

In conclusion, in contrast to earlier reports (e.g., Swinney et al., 1989), the results of this study show that Broca's aphasics are able to access subordinate meanings of ambiguous words. In addition it was found that Broca's aphasics differed from normal controls in the moment in time at which contextual selection was completed. Whereas in normal subjects contextual selection was already observed at 100 msec after the sentence-final ambiguity, in the Broca's aphasics this was only observed at the ISI = 1250 msec. This pattern

of results supports the claim that Broca's aphasics have a delay in the integration of lexical information into the preceding sentence context.

### References

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## 2. Semantic Deficits in Right Hemisphere Patients

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It is by now fairly well established that the right hemisphere plays a role in some aspects of language comprehension (see for an overview, Joannette, Goulet, & Hannequin, 1990). Lexical-semantic processing is one of these aspects. One kind of evidence for the involvement of the right hemisphere in lexical-semantic processing comes from patients with right hemisphere brain damage. These patients are reported to be impaired in retrieving or using lexical-semantic information (e.g., Gainotti, Caltagirone, Miceli, & Masulo, 1981). In general, the current evidence suggests that the left and right hemisphere might be differentially sensitive to specific types of semantic relations (Beeman, Friedman, Grafman, Perez, Diamond, & Lindsay, 1994; Chiarello, Burgess, Richards, & Pollock, 1990; Drews, 1987; Rodell, Cook, REGARD, & Landis, 1992). Several studies have observed a stronger right hemisphere effect for word pairs that were semantically but not associatively related (Chiarello et al., 1990; Rodell et al., 1992).

In our study we investigated lexical-semantic processing in 8 right hemisphere patients by recording event-related brain potentials (ERPs). We asked subjects to listen attentively to word pairs. The words in these pairs were either unrelated or related in meaning. Related word pairs consisted either of words that were *associatively* related (e.g., *bread-butter*) or of words