

## Oscillatory brain dynamics during language processing: theta band responses in a lexical decision task

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Oscillatory brain dynamics are thought to play a role in transiently binding functionally related brain areas (1). In line with this notion, previous work has shown that theta and gamma oscillations show reliable power changes during sentence processing. Theta power increases during the course of a sentence over bilateral temporal and midfrontal areas (2), upon the occurrence of syntactic and semantic violations in sentences over midfrontal areas (3), and after presentation of open-class as compared to closed-class words over left temporal and left occipital areas. Gamma power increases over right frontal areas during the processing of correct sentences, but this effect disappears when a semantic violation is encountered. Here we investigate the reactivity of theta and gamma band oscillations in a lexical decision task, in order to compare the oscillatory brain dynamics during language processing at the word level with those previously observed at the sentence level. 16 subjects performed a lexical decision task while their EEG (61 electrodes) was recorded. Stimuli were legal Dutch words, pronounceable non-words, consonant strings, pictures of objects or scrambled pictures.

A time-frequency analysis of the event-related power changes revealed power increases in the 4-7 Hz band over left and right occipito-temporal electrodes, between 100 and 500 ms post-onset. Theta responses increased in the following order: from words to consonant strings, to real pictures, to nonsense pictures.

The reported theta increases are hypothesized to be parametrically related to retrieval effort. This fits our previous sentence processing results (3,4). An attempt to localise the sources of the theta oscillations with beamformer techniques suggests that the sources are in extrastriate cortex, probably BA 18/19.

- (1) Varela et al. (2001) *Nat. Rev. Neurosci.* 2: 229-39
- (2) Bastiaansen et al. (2002) *Neurosci. Lett.* 323: 13-6
- (3) Bastiaansen et al. (2002) *Neuroimage* 17: 1479-92
- (4) Bastiaansen et al. (2004) submitted

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Poster for Cognition & Behavior session.