Tracking the time-course of visual word recognition using different types of word-like stimuli: An ERP study

Polina Krom, Natasja Massa, Karen Emmorey, Katherine J. Midgley, & Phillip J. Holcomb
San Diego State University

The ability to rapidly recognize visually perceived words is fundamental to skilled reading.

Previous ERP studies have shown that the lateral distribution of the N170 is sensitive to early processing differences between linguistic (i.e., words) and nonlinguistic (i.e., symbol strings) stimuli [1], while later ERP components such as the N400 are sensitive to lexico-semantic processes (i.e., meaningfulness of stimuli) [2].

In the present study, we sought to investigate the neurocognitive processes involved in visual word recognition and extended the work of Emmorey et al. by incorporating five-letter consonant strings.

We focused on the N170 and the N400, which are negative peaks in the ERP waveform around 170 ms and 400 ms, respectively.

Methods

EEG data was recorded continuously from 39 scalp sites and averaged off-line to form ERPs time-locked to word onset.

Participants:

Monolingual native English speakers (N=15; Mage=29 )

Stimuli:

Three types of word-like stimuli:
- words
- consonant strings
- symbol strings

100 trials in each condition

Task:

Go/no-go repetition detection

Press button to repeats

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Conclusions

Consonant strings produced a larger N170 over left compared to right occipital sites similar to what Emmorey et al. reported for word stimuli.

At this early point of processing (170 ms), consonant strings are treated as linguistic stimuli.

Symbol strings did not show this asymmetry, therefore suggesting that they are not treated as linguistic units.

Later (300-500 ms) consonant strings differed from words with words showing large lexical-semantic N400 differences.

Future Directions

Collect data from deaf readers and see if we find a symmetrical N170 effect for consonant strings as we do for words in Emmorey et al., (see figure 1b).

Use linear mixed effects regression modeling (LMER) to explore whether our online neural measures of word processing are associated with behavioral reading test scores.

References