Preliminary ERP evidence for different rapid feedforward orthographic and phonological masked-priming effects

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Introduction

- We conducted a masked priming study examining ERP’s (Event-Related Potentials), which are brain waves that reflect perceptual and linguistic processes in the cerebral cortex.
- Previous ERP priming studies have used Pseudohomophone priming as a measure of phonological processing, as well as Transposed-Letter priming as a measure of orthographic processing in hearing adults (Grainger et al., 2006) and in developing readers (Eddy et al., 2016).
- The present study builds on these existing studies and aims to extend the paradigm to deaf readers of English in order to compare orthographic and phonological processing in deaf and hearing adults because congenitally deaf readers have reduced access to phonology, but relatively intact orthographic processing.
- Two ERP components were examined: the N250 and the N400, which are negative-going peaks in the ERP waveform that occur 250ms and 400ms after visual word presentation. These components reflect sub-lexical and lexico-semantic processing, and both reflect mechanisms involved in processing orthography and phonology.

Terms

- Phonology—the sound of a word
- Orthography—the written form of a word
- Pseudohomophone (PH)—a non-word that sounds like a real word (e.g. brane—BRAIN)
- Transposed-Letter (TL)—a non-word that is made up of scrambled letters that appear in a real word, keeping first and last letter the same (e.g. tosat—TOAST)

Methods

Participants:
- 20 hearing English readers, F =11, mean age = 23, SD = 5.33, Fixation
- Data collection for deaf readers of English is ongoing.

Stimuli:
Go/No-Go Semantic Categorization Task:
- Press a button to occasional animal names (e.g. HORSE)
- Three Conditions
  - Pseudohomophones (PH)—non-word primes that sound like their target word (e.g. brane—BRAIN) and PH controls (e.g. brane—BRAIN)
  - Transposed-Letter (TL)—non-word primes with scrambled-letter versions of their target word (e.g. tosat—TOAST) and TL controls (e.g. torit—TOAST)
  - Repetition (e.g. party—PARTY) and Unrelated (e.g. elbow—PARTY)
- 200 trials, 160 five-letter critical items, 40 noncritical animal words (30 in target position, 10 in prime position)
- 2 Day study

Results

Amplitude & Timing
- Reduced negativity demonstrates priming effects of PH and TL primes, compared to controls.
- Early N250 Window:
  - PH primes produced a strong N250 effect, whereas TL primes produced a less significant N250 effect.
  - Both conditions showed evidence for priming effects, while phonological priming appeared sooner than orthographic priming.
- N400 Windows:
  - Both PH and TL primes produced strong priming effects.
  - Phonological priming effects continued on past the N400 window.

Scalp Distribution
- Phonological priming effects had a more anterior distribution in the early N250 window, and a more central distribution in the early and late N400 windows.
- Minor orthographic priming effects occurred at anterior sites in the early N250 window, and robust effects occurred at central and posterior sites in the late N400 window.

Expectations & Conclusions

- Our results indicate that, compared to control primes, Pseudohomophone and Transposed-Letter primes facilitate subsequent target word processing during reading.
- This is evidence that hearing readers can be primed by written form (orthography) and sound (phonology).

Future Directions

- We plan to extend the current study to include deaf English readers, and we expect to see an attenuated phonological priming effect for the deaf individuals, due to less robust phonological representations.
- We expect to see comparable, or even stronger, orthographic priming effects for the deaf individuals

References


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