Single-parameter overlap phonological priming in American Sign Language: An ERP Study

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Introduction

- In spoken language, phonology refers to the sounds that make up words. In sign language, phonology refers to visual-manual parameters, including handshape, movement, and location.

- Previous ERP studies investigating rhyme priming in both spoken language [1] and sign language (two-parameter overlap) [2] have shown that targets elicit a smaller amplitude N400 following phonologically-related primes compared to unrelated primes.

- However, phonological priming in sign language may vary depending on which parameter is shared by the prime-target pairs. We investigated how single-parameter overlap effects lexical access in American Sign Language (ASL) by measuring ERPs as deaf signers viewed pairs of ASL signs that had the same handshape or the same location.

- We predicted a smaller amplitude N400 to handshape-related signs than to unrelated signs but a reversed N400 effect [3] for location-related signs because handshape overlap facilitates while location overlap impedes sign lexical decision. Hearing non-signers served as a control group in which no N400 effects were predicted.

Participants

- 21 Deaf signers (M_{age}= 34) (8 native; 13 early)
- 21 Hearing non-signer controls (M_{age}=31)
- Both groups reported having normal or corrected-to-normal vision.
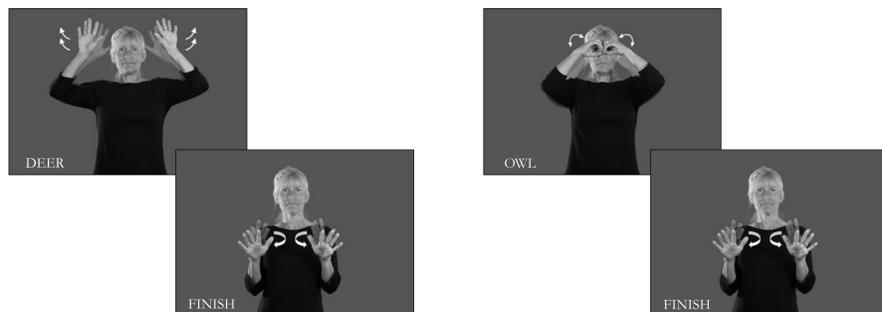
Stimuli

- 46 prime-target pairs in each condition
- Same targets occurred in both the related and unrelated conditions.
- Sign videos clipped to begin 2 frames before sign onset.
- 1300 ms Stimulus Onset Asynchrony (SOA).
- ERPs time-locked to target video onset.
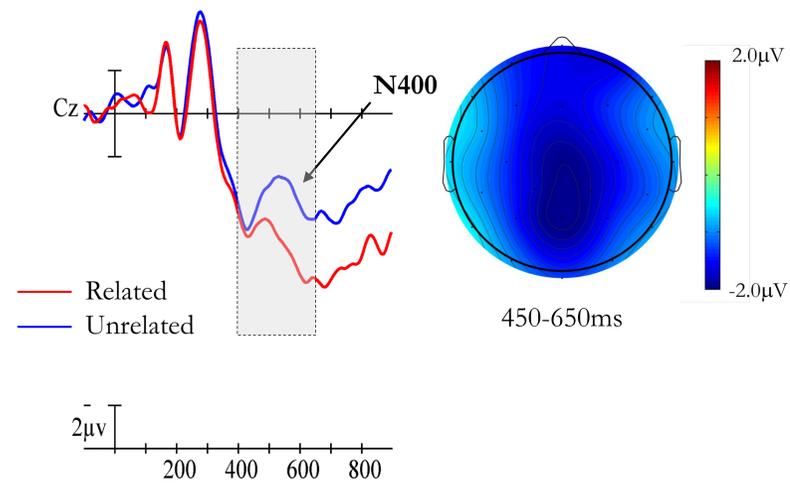
Related pairs   **Unrelated pairs**

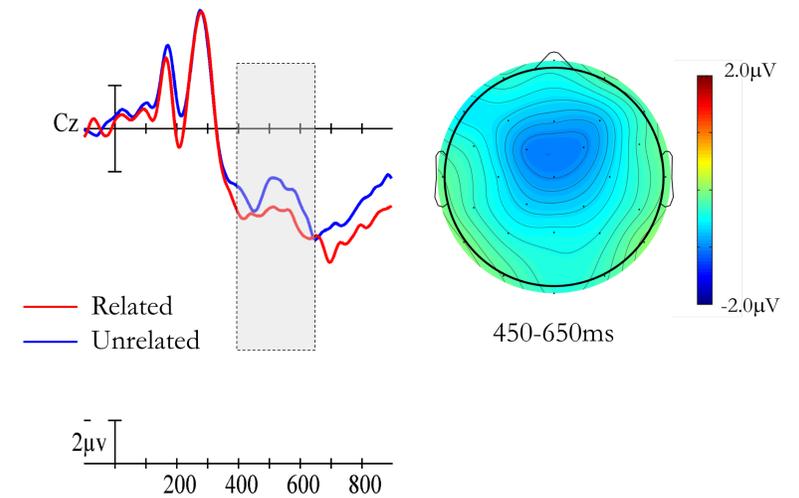## Handshape Overlap ERP Results

450-650ms

Location Overlap ERP Results

450-650ms

- N400 phonological priming effects went in the same direction as in previous spoken and sign language studies.

- Targets in the phonologically related pairs elicited smaller amplitude N400s (i.e., less effortful processing) than targets in the unrelated pairs.

- Handshape priming was significantly larger and more widespread compared to location priming.

- There were no N400 phonological priming effects found in the hearing controls.
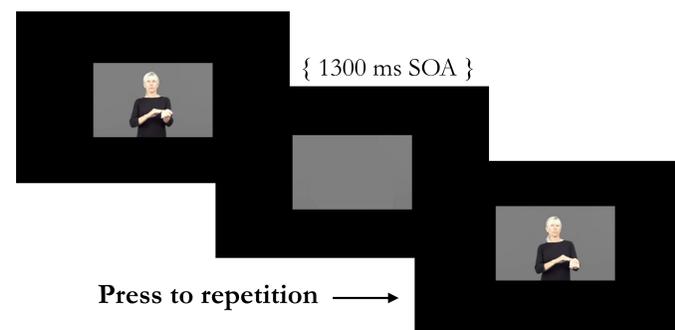
ERP Results for Hearing controls
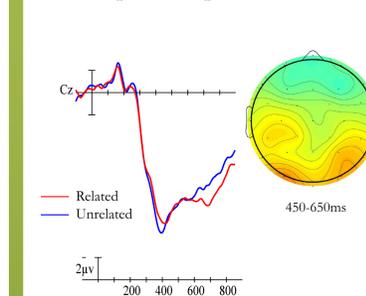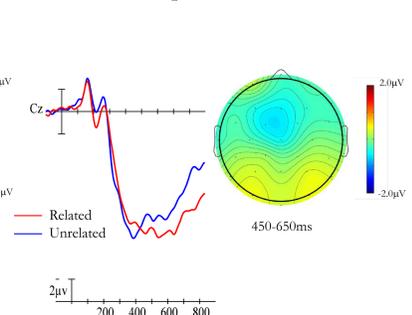
Task

- Repetition Detection Task (Go/No-Go): Press a button when both signs within the pair are identical (14% of trials).

{ 1300 ms SOA }

Press to repetition ⟶

Conclusions

- Deaf signers are more sensitive to handshape than location overlap.

- Stronger phonological priming effects for the handshape may occur because handshape is processed categorically by signers [4].

- Weak phonological priming effects for location may be due to lexical competition [3]. A reversed N400 effect might occur with a task that requires lexical access.

- The later ERP effects in the hearing controls are nonlinguistic and likely a result of strategies recruited to determine whether signs were repeated.

References

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[3] Gutiérrez, E., Müller, O., Baus, C., & Carreiras, M. (2012). Electrophysiological evidence for phonological priming in Spanish Sign Language lexical access. *Neuropsychologia*, *50*, 1335–1346.
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