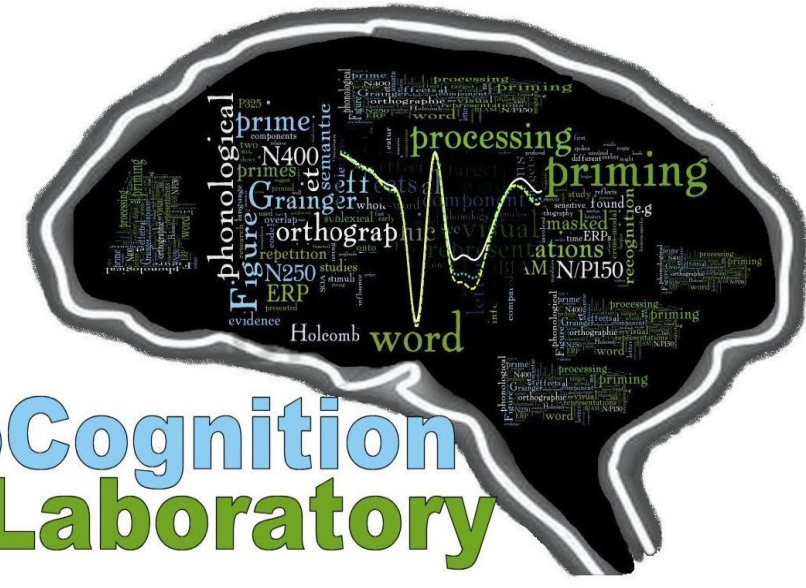


The Influence of Parafoveal Words on Foveal Word Processing in Deaf Readers



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Background | Methods

- Readers can process upcoming words adjacent to the word being fixated (**parafoveal preview**), but the nature of the lexical information available to the reader in the preview is unclear.
- Parafoveal preview can be measured with the **parafoveal-on-foveal (PoF) effect**: how parafoveally-presented words influence behavioral or neural processing of a foveal task-relevant target word.
- Snell et al. (2019) [1] used an EEG **lexical flanker** paradigm to observe how the PoF effect unfolds during word recognition.
- Parafoveal flanker words influenced sublexical and lexicosemantic processing of the target word.
- ERPs were more negative in the N250 and N400 windows when flanker words *differed* from the target word versus when they were *identical*, indicating that sublexical and lexical content of the flankers are being processed.
- Deaf people's visual attention resources are more widely distributed into the periphery, which influences their reading behavior by expanding the span of letters they read with one fixation. [2] [3]

We conducted two separate EEG lexical flanker studies to answer the following questions:

- {Study 1}** Do peripheral visual attentional adaptations in deaf people alter the time-course or strength of the PoF effect?
- {Study 2}** When parafoveal words are presented at a greater eccentricity, will we see a larger PoF effect in deaf readers as compared to hearing readers?

TASK

lexical decision to a **central** target word

EXPERIMENTAL MANIPULATION

conditions: no flankers, same flankers, different flank.

tests effect of: flanker presence, flanker identity

	STUDY 1 (NEAR)	STUDY 2 (FAR)
rock	rock	rock
scan scan scan	scan	scan scan scan
corn deer corn	corn	deer corn

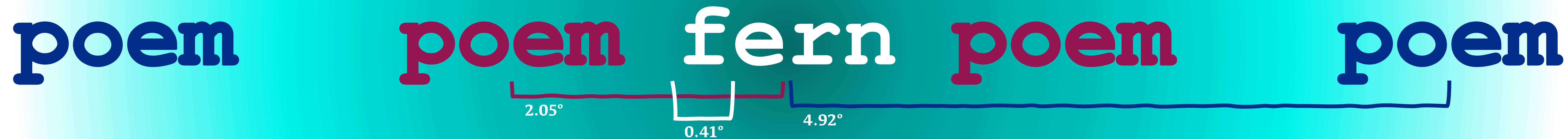
(45 words & 45 pseudowords per condition for a total of 270 trials over 15 minutes)

DATA COLLECTION

- 32-channel electrode cap
- Time-locked to onset of target word
- Blinks removed via independent component analysis using EEGLAB on MATLAB

PARTICIPANTS

STUDY 1 (NEAR): final sample 30 deaf ASL/English bilinguals; 30 hearing non-signers
STUDY 2 (FAR): preliminary sample 18 deaf ASL/English bilinguals; 18 hearing non-signers



Results & Conclusions

HYPOTHESES

The ERPs of deaf and hearing readers will show group differences for:

- flanker presence effects (different > no flankers)
- flanker identity effects (different > same flankers)

There will be a greater difference between deaf and hearing readers when flankers are presented at a greater eccentricity.

ERP COMPONENTS OF INTEREST

based on Snell et al. (2019)

N150 = early visual feature processing
N250 = sublexical processing
N400 = lexicosemantic processing

ANALYSIS

For each effect of interest:
A (2 groups x 2 conditions) ANOVA for each behavioral measure.
A (2 groups x 2 conditions) ANOVA for each ERP component of interest.

Figure 1. Mean (SE) accuracy and reaction time for target words in the lexical decision task.

Figure 2. ERP effects of flanker presence and flanker identity, displayed as voltage maps of t-values averaged over the time-windows corresponding to the three components of interest.

Figure 3. Difference waves at Fz for: NEAR flanker presence and identity, with N250 and N400 flanker main effects; and FAR flanker presence, with an N400 group x flanker interaction.

BEHAVIORAL RESULTS

- The deaf group had lower accuracy and higher RTs than the hearing group.
- There was no significant behavioral effect of flankers on task performance.

ERP RESULTS

- There are robust NEAR flanker identity and presence effects for all three ERP components for both groups.
- A main FAR flanker presence effect was only found at the N150 over occipital sites.
- A group x flanker interaction effect was found at the N400 for FAR flanker presence, but not flanker identity.

CONCLUSIONS

- Deaf and hearing people have largely similar parafovea-on-fovea effects for adjacent lexical information, with robust sublexical and lexical processing of NEAR (~2°) flankers, particularly if flankers differ from the target.
- These results replicate the findings of Snell et al. (2019). [1]
- FAR (~5°) flankers are processed only at the level of early visual features for both groups, and lexical identity does not influence visual processing at either flanker eccentricity.
- While neither hearing nor deaf participants are sensitive to the identity of FAR flankers, deaf participants are more sensitive to the presence of FAR flankers, possibly indicating additional lexical-level processing of the target when peripheral distractors are present..

References