



Assessing syntactic processing during natural reading in hearing and deaf adults:

An EEG/eye tracking co-registration study

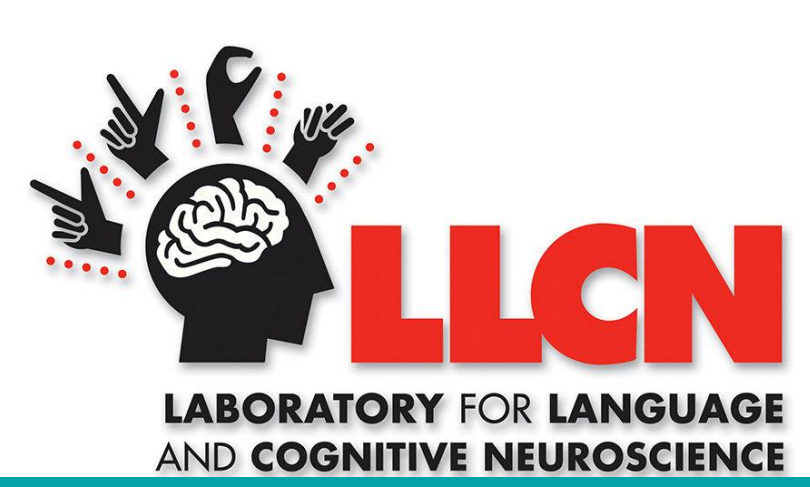
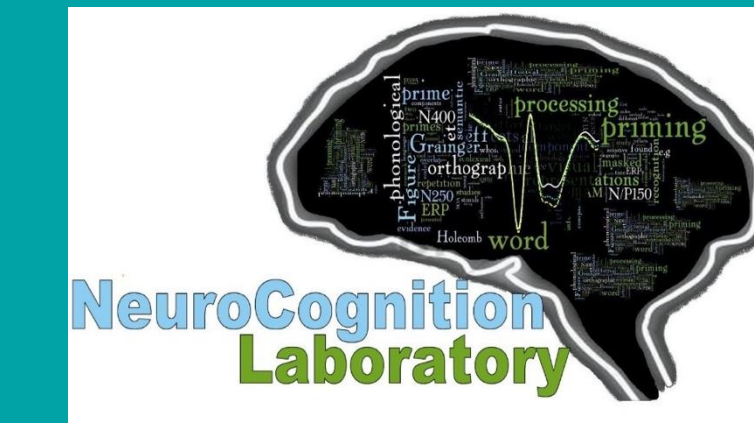
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Introduction

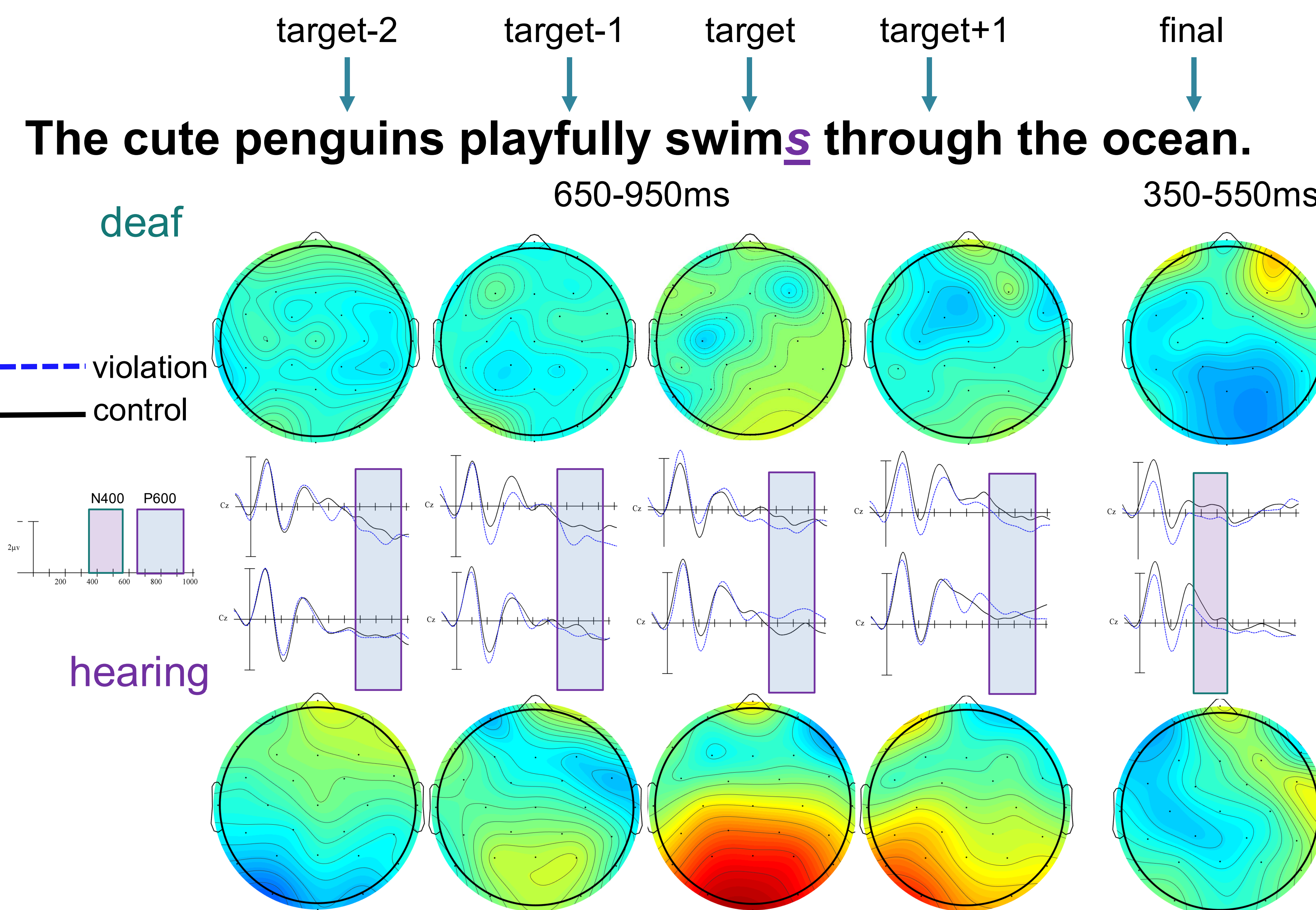
- Studying natural reading with ERPs is difficult because of the artifacts that result from eye movements
- Co-registration (EEG + eye tracking) fixes this problem by creating fixation-related potentials (FRPs) where EEG is time-locked to participants' fixations on words in the sentence
- Previous ERP studies using less natural presentation methods find that **deaf signers** are less sensitive to English verb agreement violations than their **hearing peers**, but both groups show similar sensitivity to word order violations^{1,2}
- Eye tracking research reveals that **deaf signers** are more efficient readers than their **hearing peers**: they skip more words and re-read less, without loss of comprehension, possibly due to their larger reading span^{3,4}
- The current study examines sensitivity to word order and agreement syntactic violations in **deaf** and **hearing readers** using natural reading and an EEG/eye tracking co-registration design

Method

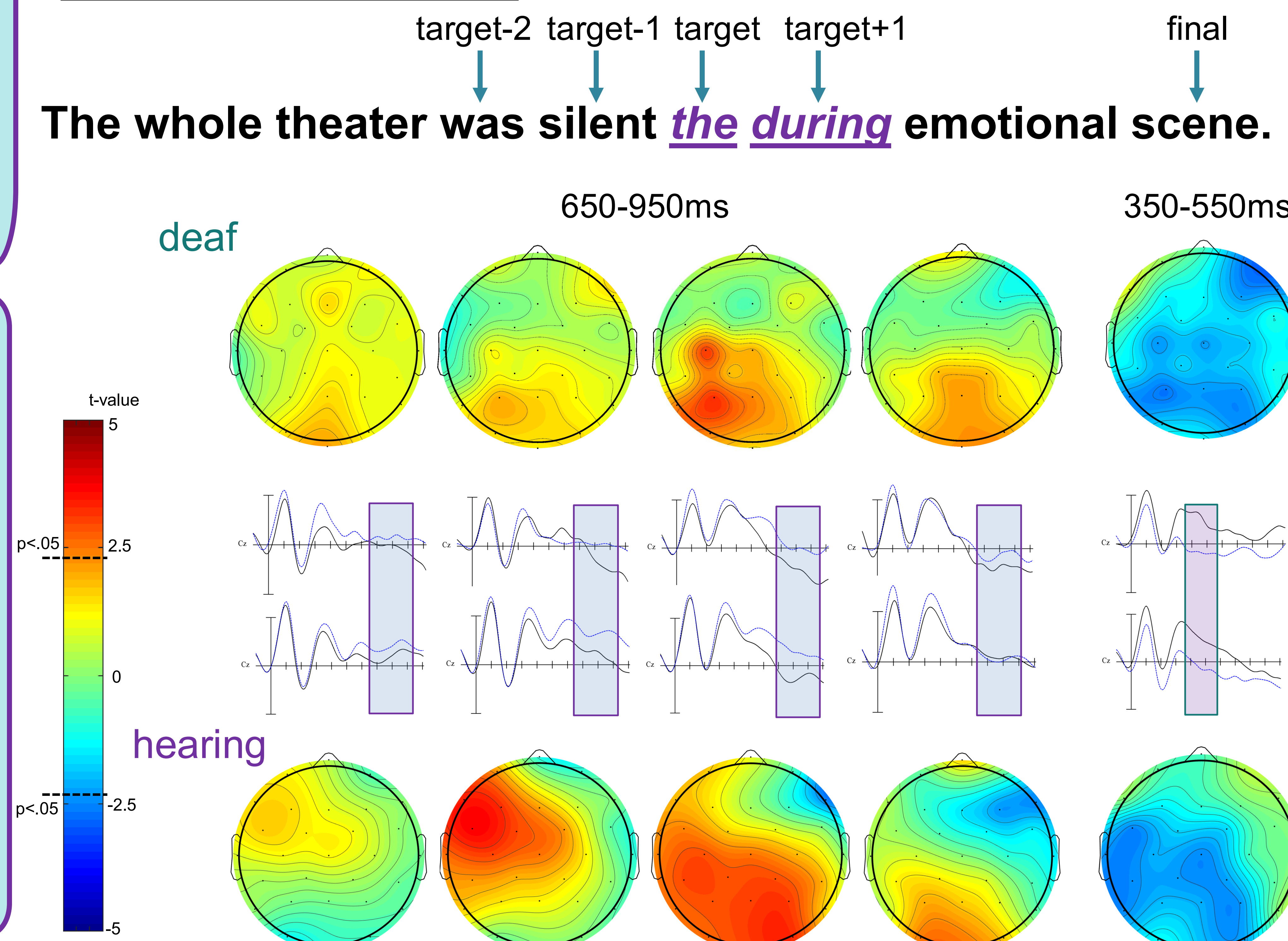
- Participants
 - 33 **deaf readers** (18 women + 15 men)
 - mean age = 35.9 (9.1 SD)
 - ASL AoA mean age = 1.25 (1.6 SD), all < age 5
 - 32 **hearing readers** (26 women + 6 men + 1 NB)
 - mean age = 32.1 years (10.3 SD)
 - Matched on English reading comp. + vocabulary
- Full sentence presentation
- TASK:** sentence acceptability judgement
- 40 word order x 40 agreement x 80 control

FRP Results

Agreement Violations



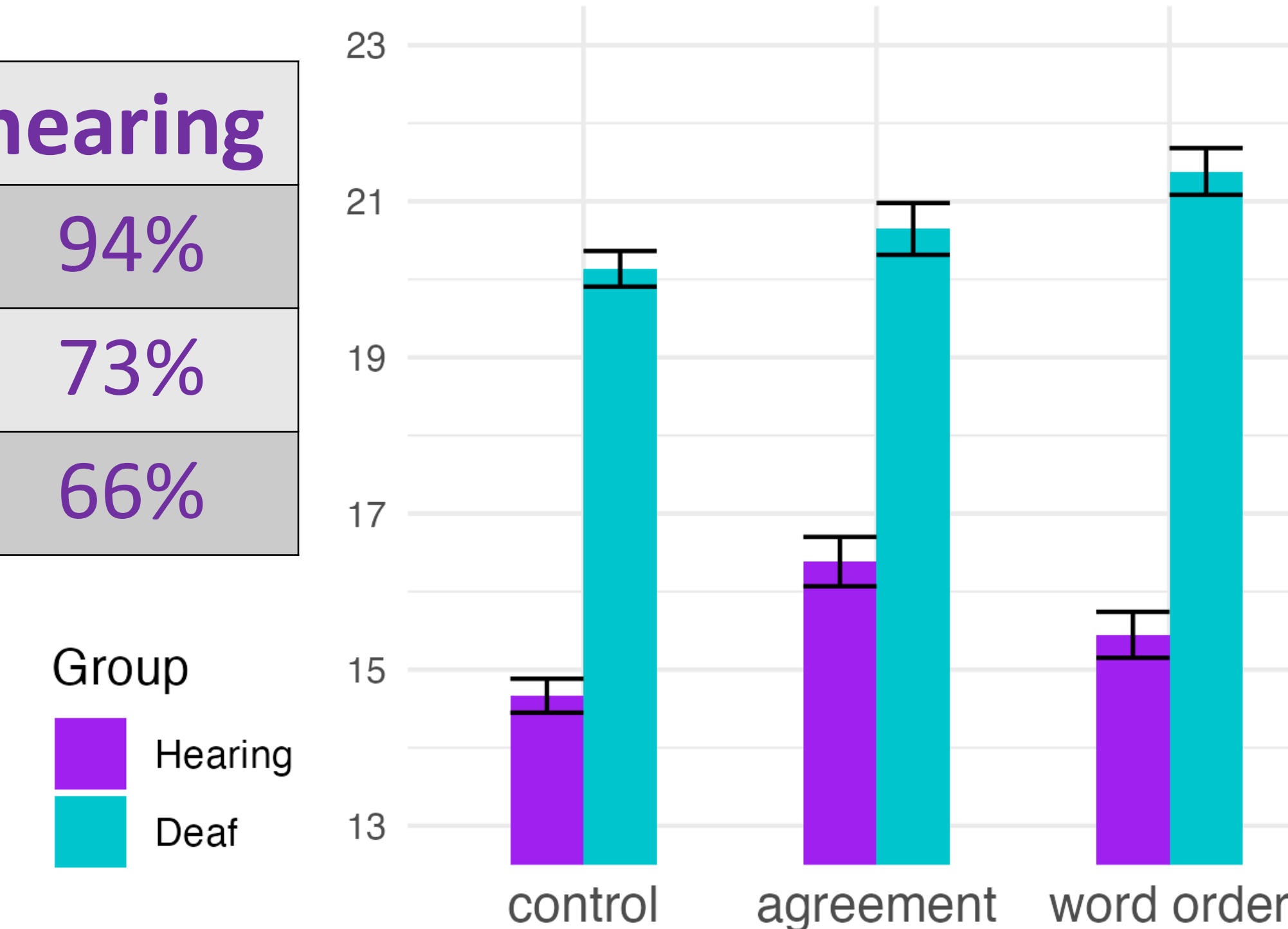
Word Order Violations



Eye Tracking + Behavioral Results

accuracy	deaf	hearing
control	89%	94%
agreement	39%	73%
word order	66%	66%

Percent Regressions



Discussion

- For agreement violations, **hearing readers**, unlike the **deaf readers**, may use morphosyntactic prediction strategies to immediately detect errors
- Both groups are sensitive to word order violations at target word (P600) and sentence finally (N400)
- For word order violations, **deaf readers** have a more dispersed effect across the parafoveal words around the target compared to **hearing readers**, suggesting more widely distributed attention⁵
- Performance on word order violations suggests a transposed word effect⁶ – two swapped words go unnoticed because they are automatically corrected during fluent reading
- Unlike previous studies, **deaf readers** regressed more than **hearing readers**; the requirement to make acceptability judgment about English (their second language) may have led to more re-reading

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