

# Assessing sensitivity to semantic and syntactic information in deaf readers: an ERP study.

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## Introduction

- Mehravari et al. (2017) found that deaf and hearing readers exhibited similar N400 effects for semantic violations in sentences, but hearing readers exhibited a stronger P600 to syntactic violations (subject-verb agreement).
- The weaker P600 for deaf readers could occur because a) most deaf readers in the study were ASL late-learners and at risk for language deprivation<sup>2</sup>, b) English verb agreement has no parallel in ASL, and/or c) agreement errors are not re-analyzed by deaf readers.
- To assess these hypotheses, we tested deaf readers with early ASL exposure using the same sentences as Mehravari et al. (2017) and adding a phrase structure violation condition to assess general sensitivity to syntactic violations.

## Method

- 31 deaf participants (18 males)
  - Mean age = 33.1 years (range 18-53 years, SD = 7.3)
  - ASL AoA = 18 native, 13 early (before 6)
- 31 hearing participants (17 males)
  - Mean age = 32.0 years (range 20-58 years, SD = 9.4)
  - Monolingual native English speakers
- RSVP design presentation
- 4 sentence type X 30 trials
- Respond if sentence is correct or not
- Sentences 6 - 12 words long

Respond: YES or NO

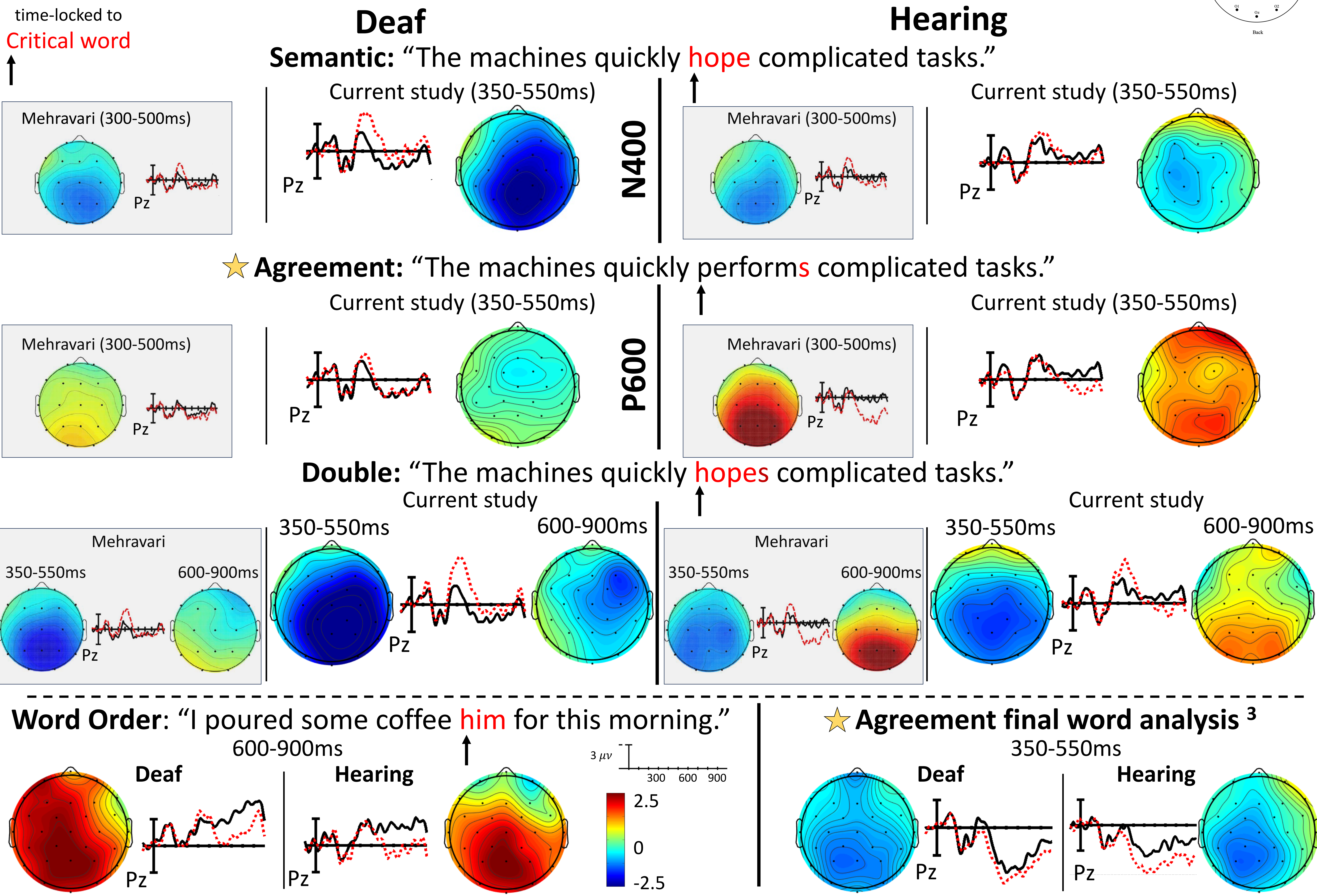
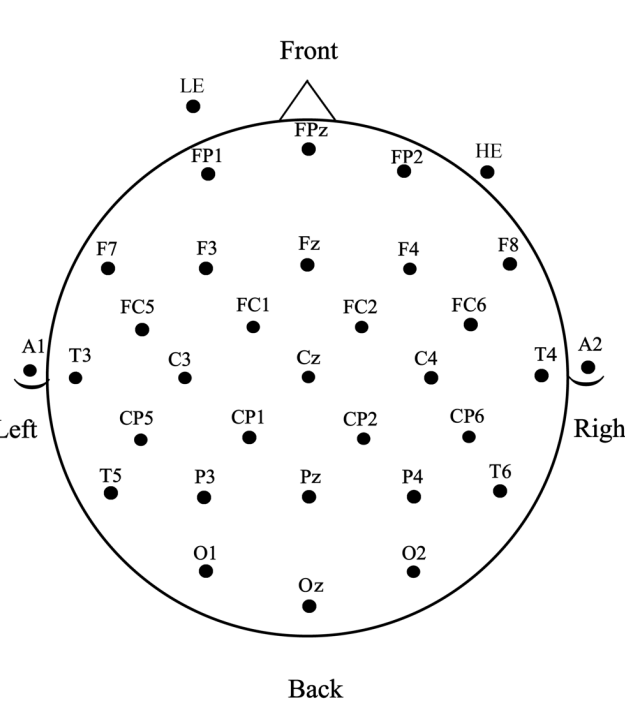
\*\* participants matched on age, multiple reading assessments: PPVT, WJ passage comp., WJ reading fluency

The machines quickly perform complicated tasks. ?

## Results

\* = p < .01

	Control *	Agreement	Semantic	Double	Word Order
Deaf % correct	88%	37%	79%	86%	84%
Hearing % correct	92%	46%	86%	88%	92%



## Discussion

- Both deaf and hearing readers were poor at detecting agreement violations, but only hearing readers showed neural evidence of syntactic re-analysis (P600), replicating Mehravari et al. (2017).
- Lack of a P600 to agreement violations for deaf readers was not due language deprivation – all were early signers.
- Sentence-final negativities were observed to agreement violations for **both** groups, suggesting later semantic processing of the violation.
- A strong P600 to word order violations for deaf readers suggests syntactic re-analysis for violations that are possible in both English and ASL.
- Deaf readers exhibited a larger N400 than hearing readers for semantic violations, suggesting greater sensitivity to semantics, possibly due to less reliance on English syntactic processing.

1. Mehravari, A. S., Emmorey, K., Prat, C. S., Klarman, L., & Osterhout, L. (2017). Brain-based individual difference measures of reading skill in deaf and hearing adults. *Neuropsychologia*, 101, 153-168.

2. Hall, W. C. (2017). What you don't know can hurt you: The risk of language deprivation by impairing sign language development in deaf children. *Maternal and Child Health Journal*, 21(5), 961-965.

3. Stowe, L. A., Kaan, E., Sabourin, L., & Taylor, R. C. (2018). The sentence wrap-up dogma. *Cognition*, 176, 232-247.