

Parafoveal and foveal sensitivity to semantic and syntactic violations in deaf and hearing readers: An ERP study



San Diego State University

UC San Diego

Emily M. Akers¹, Katherine J. Midgley², Phillip J. Holcomb², Karen Emmorey²

Joint Doctoral Program in Language and Communicative disorders, SDSU/UCSD¹, San Diego State University²

SDSU-UCSD Joint Doctoral Program in LANGUAGE COMMUNICATIVE DISORDERS

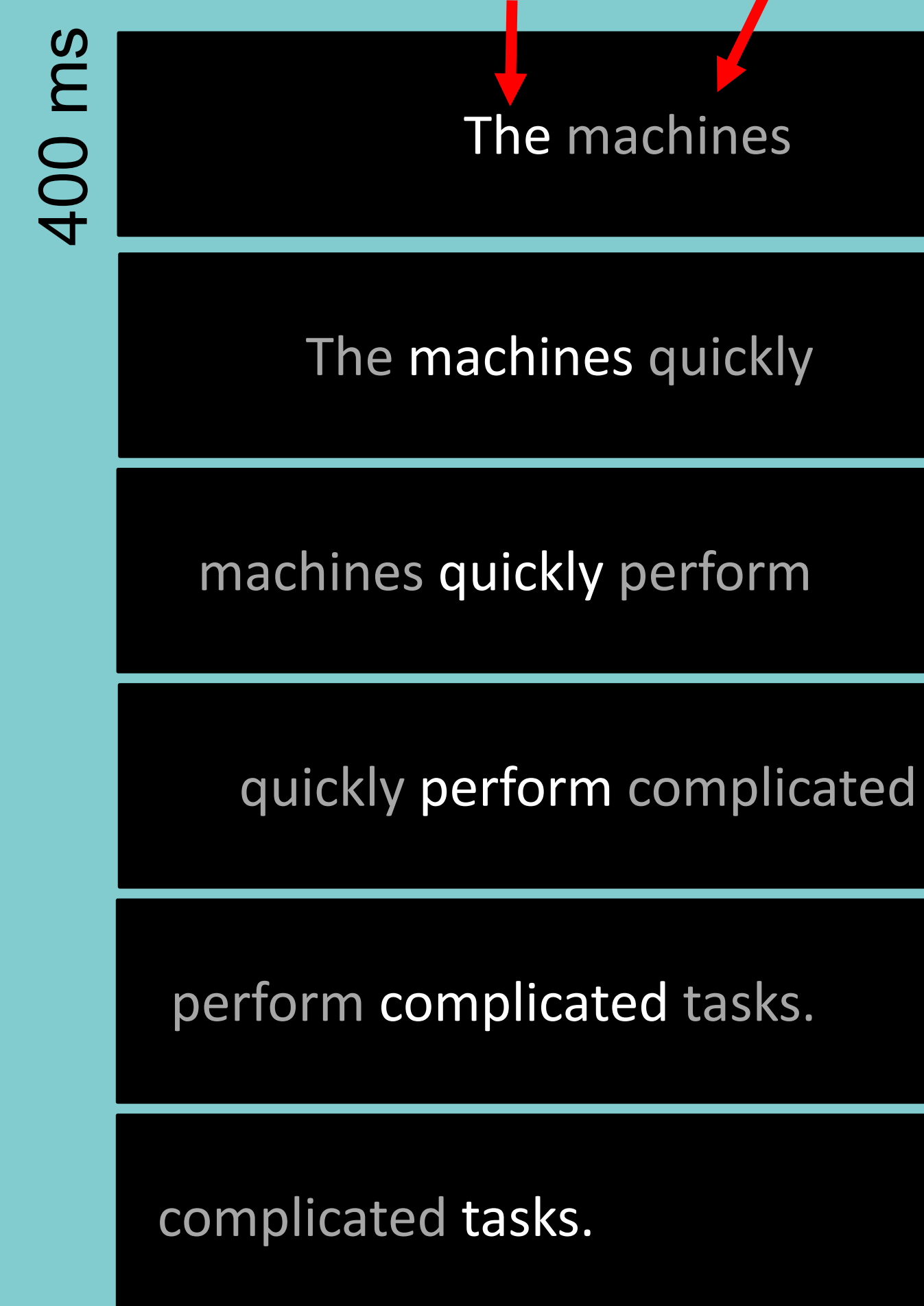
Introduction:

- Using an RSVP task Mehravari et al. (2017) found that deaf readers produced strong N400 effects to **semantic** violations but an absence of P600 effects for **verb-agreement** violations (hearing readers showed both effects).
- In a follow up² we found similar N400 and P600 results to Mehravari et al. (2017), but also showed strong P600 effects in deaf readers to **word order** but not **agreement** violations.
- Most previous ERP studies of sentence comprehension have used RSVP designs, but a frequent criticism is that this method does not resemble natural reading⁵.
- In other research deaf readers have been shown to have wider reading spans³ and to focus more attention to their visual periphery⁴ which could impact the processing of words in the **parafovea** during natural reading.
- The RSVP with flankers method partly overcomes such criticisms by presenting multiple words simultaneously thus allowing readers to process words both at fixation and to the right of fixation when a word is in the **parafovea**.
- Following our prior study² here we examined deaf and matched hearing readers while processing semantic and syntactic violations both in the **parafovea** and at fixation in an RSVP with flankers paradigm.

Method:

- Participants
 - 32 Deaf skilled readers (17 males)
 - Mean age = 35.5 (SD = 7.57)
 - ASL AoA = 15 native, 17 early (before age 6)
 - 32 Hearing skilled readers (11 males)
 - Mean age = 31.3 (SD = 9.33)
 - Monolingual English speakers
 - Matched on multiple reading assessments
- RSVP with Flankers design presentation
- 4 sentence type X 30 trials
- Respond if sentence is correct or incorrect

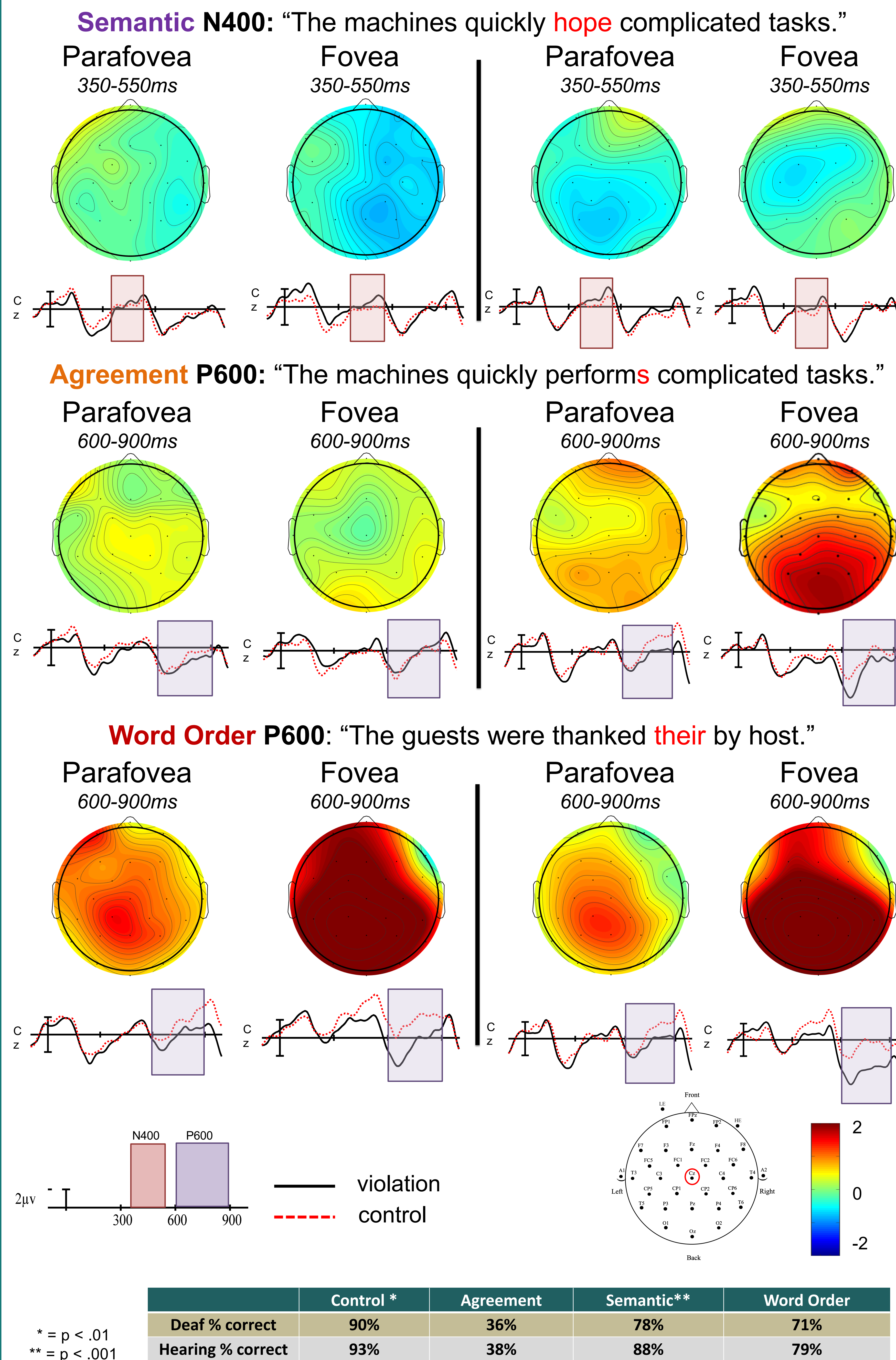
control sentence: fovea parafovea



Control example:	The machines quickly perform complicated tasks.
Semantic example:	The machines quickly hope complicated tasks.
Agreement example:	The machines quickly performs complicated tasks.
Word Order example:	The guests were thanked their by host.

Respond: YES or NO

Results: Deaf



Hearing

Discussion:

- Semantic:** Both deaf and hearing readers showed an N400 effect to semantic violations in the **fovea** (larger for deaf readers), but hearing readers also showed an N400 effect when the violation was still in the **parafovea**.
- Agreement:** Deaf readers were not sensitive to verb agreement violations in the **fovea** (replicating previous results^{2,3}) or in the **parafovea**. Hearing readers showed a strong foveal P600 effect that was also present (but weaker) when the critical word was in the **parafovea**.
- Word order:** Both deaf and hearing readers showed strong **foveal** and **parafoveal** P600 effects; however, the **parafoveal** effect was larger for the deaf readers.
- Deaf and hearing readers may be differentially sensitive to information in the **parafovea**.
- Future directions:** the RSVP with flankers paradigm may not extend far enough into the parafovea to assess the possible effects of deaf readers' larger reading spans. We plan to use eye-tracking/EEG co-registration methods to study natural reading when the entire sentence is presented.

References:

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