



SAN DIEGO STATE UNIVERSITY

The Temporal Dynamics of Visual Word Recognition in Deaf Adults

Karen Emmorey¹, Katherine J Midgley¹, Jonathan Grainger², Phillip J Holcomb¹
 San Diego State University¹, CNRS and Aix-Marseille University²



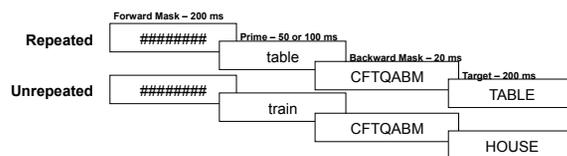
INTRODUCTION

- Reading presents a significant challenge for those who are born profoundly deaf because they cannot hear the language that is encoded by print.
- It is unknown whether the underlying neurocognitive mechanisms used by relatively skilled deaf readers are the same or different from those used by hearing readers.
- A number of prior studies have shown that recording ERPs to visual words in the masked priming paradigm reveals a wealth of information about the time course of word processing (see Grainger & Holcomb, 2009).
- In the present study, we applied this approach to tracking the temporal dynamics of visual word processing adult deaf readers.

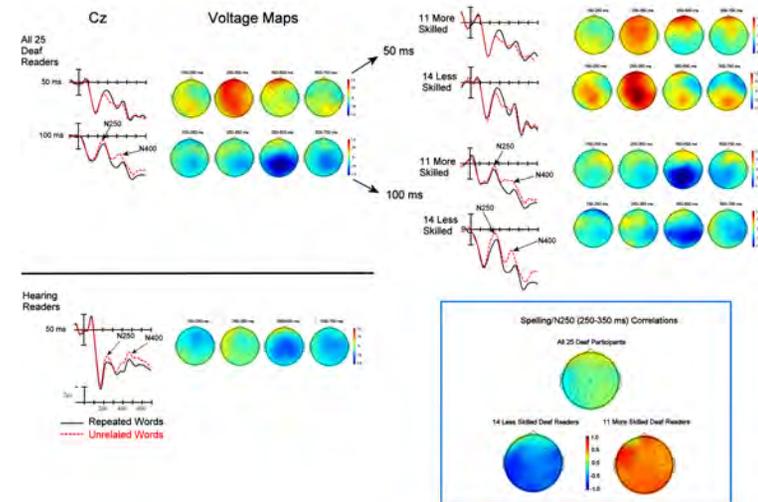
METHODS

- 25 deaf participants (ages 18-49)
 - 11 skilled readers (PIAT score ≥ 87 ; reading grade ≥ 10)
 - 14 less skilled readers (PIAT score < 87 ; reading grade < 10)
- Reading and spelling measures
 - Peabody Individual Achievement Test Revised (PIAT): Reading Comprehension Subtest
 - Spelling recognition (Andrews & Hersch 2010)
 - 11 skilled readers: Spelling recognition score: $M = 78.8$, $SD = 6.5$
 - 14 less skilled readers: Spelling recognition score: $M = 70.8$, $SD = 6.5$
- Masked Repetition Priming – Semantic Categorization (press for an animal word)
 - Conditions: repeated vs. unrepeated target words, 50 vs. 100 ms prime duration
- 29 Channel Event-Related Potentials (ERPs)

TRIAL EXAMPLE



RESULTS



CONCLUSIONS

- With 100ms primes, deaf readers exhibited a pattern of neural responses similar to that observed for hearing readers with 50ms primes, suggesting that with more time, deaf readers utilize a similar set of neuro-cognitive processes during visual word recognition.
- With 50 ms primes, we observed an unusual pattern: the typically larger N250 and N400 for unrelated target words were replaced by positivities. These effects were stronger for less-skilled deaf readers, suggesting that a “repetition enhancement” effect at short prime durations might be associated with reading skill (or reading style) for deaf readers.
- Skilled and less skilled deaf readers exhibited distinct correlations between the size of N250 ERP priming effect (100 ms primes) and spelling ability. Less skilled readers who were better spellers showed larger N250 priming while for skilled deaf readers larger N250 priming was associated with poorer spelling.
- These correlation patterns fit recent predictions of a model outlined by Grainger and Ziegler (2011) if we assume that more skilled readers tend to use direct orthography to semantic mapping via coarse-grained orthographic representations and less skilled readers use fine-grained representations that help perform some form of recoding.

REFERENCES

- Grainger J. & Holcomb P.J. (2009). Watching the Word Go by: On the Time-course of Component Processes in Visual Word Recognition. *Lang Linguist Compass*, 3(1):128-156.
 Grainger, J., & Ziegler, J. (2011). A dual-route approach to orthographic processing. *Frontiers in Language Sciences*, 2(45), doi: 10.3389/fpsyg.2011.00054.