ERP evidence for the role of morphology in word recognition by deaf and hearing readers

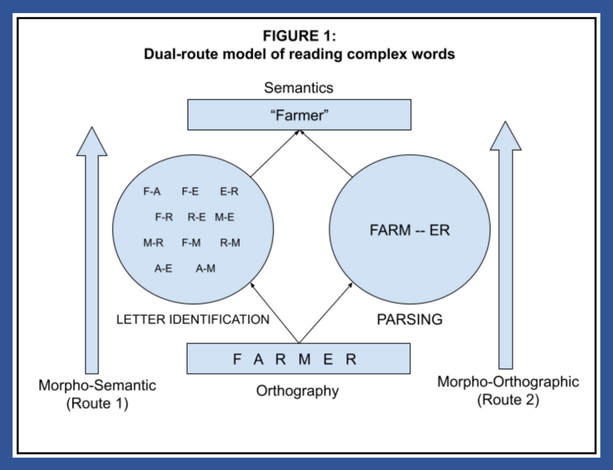
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Introduction

Phonological awareness is a strong predictor of reading ability for hearing, but not for deaf individuals[1].
Morphology provides an alternative route to reading which deaf readers may prioritize.

Morpho-semantic: *coarse-grained, whole-word recognition, fast access to semantics*[2]



Morpho-orthographic: *complex words are broken down into component parts*[2]

Previous work [3,4] has suggested that the ERP visual masked priming paradigm is sensitive to both routes of accessing morphologically complex words.

Methods

Participants
- 24 Deaf native ASL signers (mean age = 33)
- 24 Hearing English speakers (mean age = 29)

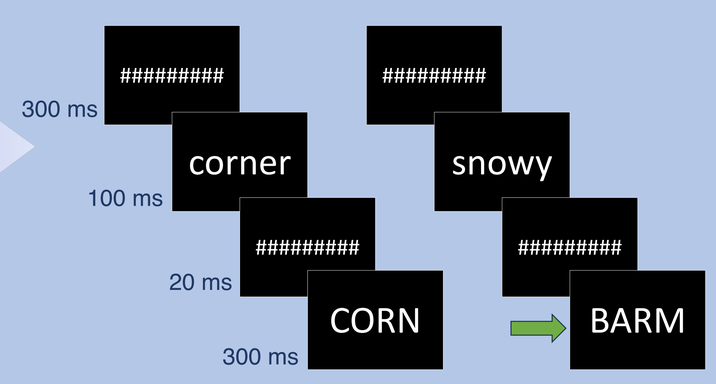
Stimuli

Critical stimuli
50 related and unrelated prime-target pairs of each:
- Complex primes **(hunter-HUNT)**
- Pseudo-complex primes **(corner-CORN)**
- Simplex primes **(scandal-SCAN)**

Probe stimuli
60 real word prime, non-word target pairs (snowy-BARM)
15 nonword prime, real word target pairs (galter-GOLF)

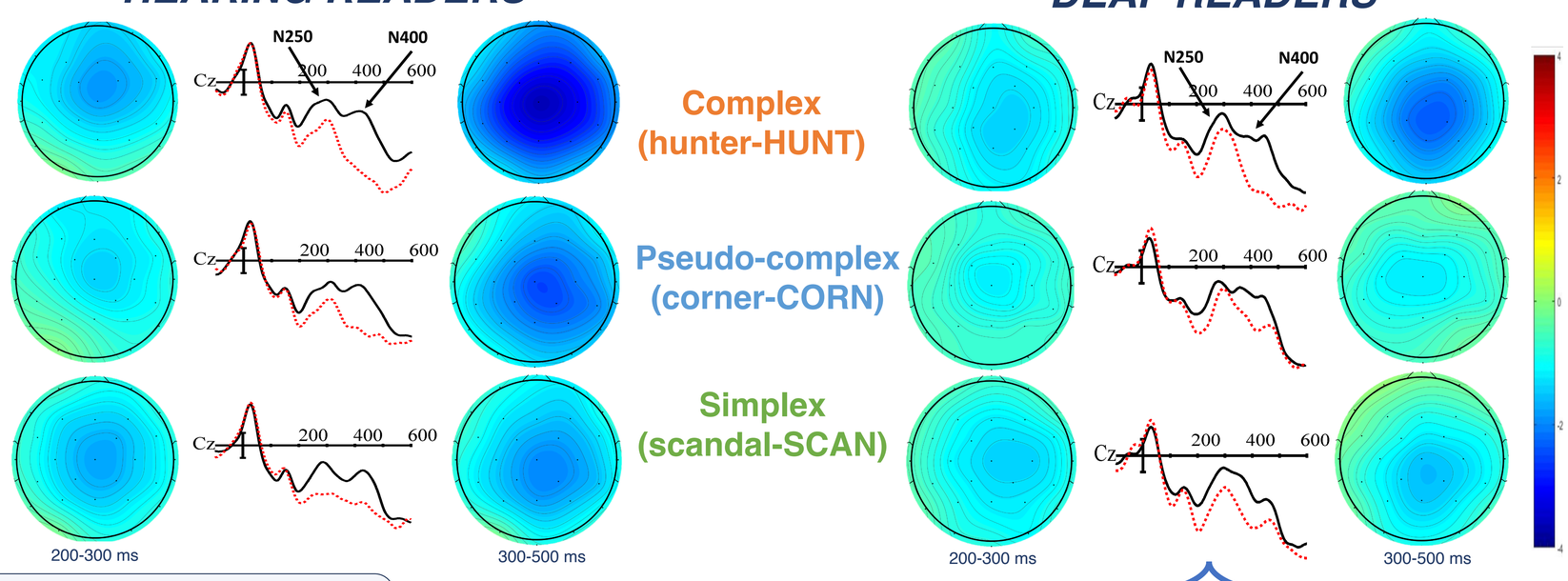
Procedure

Go/no-go lexical decision task:
Participants were instructed to press a button when they encountered a nonword.



Results

Components of interest:
N250 → indexes orthographic processing
N400 → indexes semantic activation



Deaf readers appeared to show **no differences across prime types** in the N250 window.

Morphological Awareness:
- Assessed using the three subtests of the Modified Test of Morphological Structure[5]
- Score given out of 48
- Median split on MA scores in the Deaf group (Low: M = 20, SD = 5.8; High: M = 35, SD = 4.5)

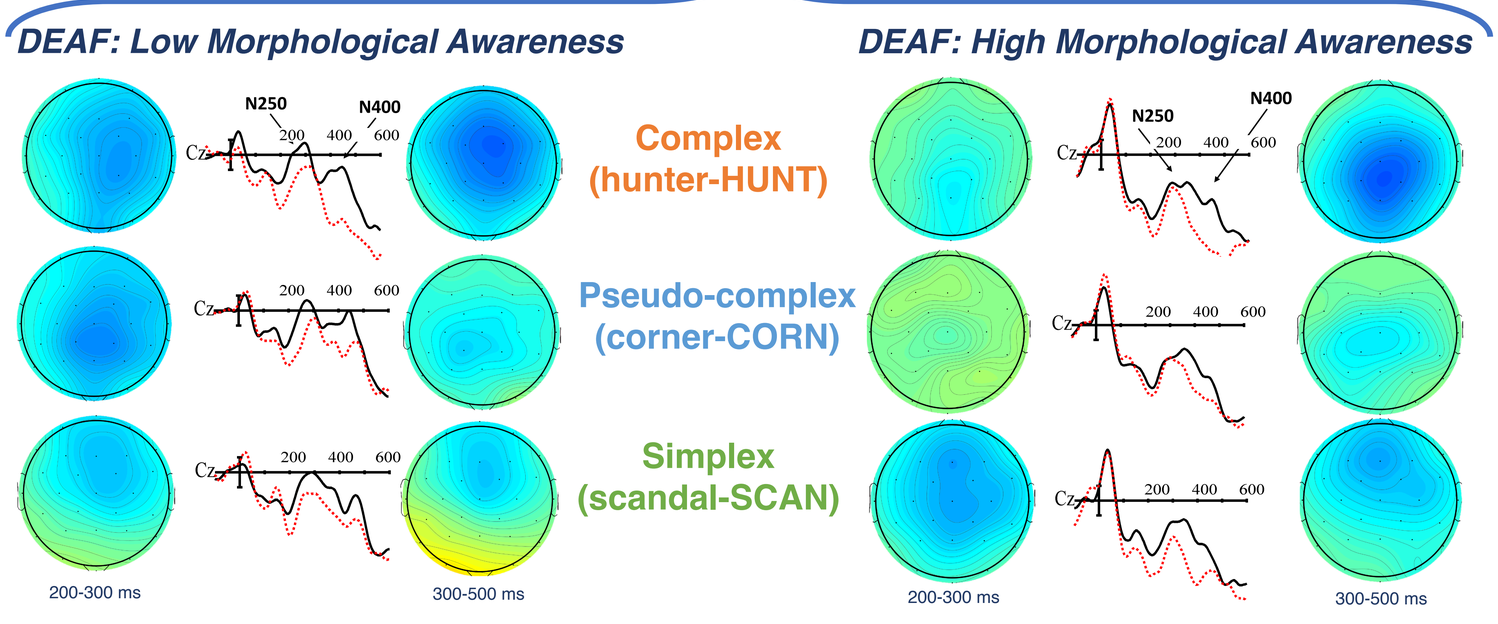
Part 1: Derivation
Perform. Tonight is the last _____.

Part 2: Decomposition
Continuous. How long will the storm _____?

Part 3: Nonword Choice
The ACQUITATION was reported in the newspaper.
- ❑ Jury decision
- ❑ Unsolved crime
- ❑ Resignation

FIGURE 2. Example of Morphological Awareness test items

Sample of Morphological Awareness Subtests



Discussion

HEARING READERS

Complex primes elicited stronger effects than **pseudo-complex** primes

→ *Suggests decomposition of primes like **corner** with interference arising in the N250 window due to the incompatible semantics of the target (**CORN**)*

Simplex primes showed moderate priming effects in both time windows due to orthographic overlap with the target and no semantic interference

DEAF READERS

Overall group showed no differential priming effects in the N250 window, and semantic interference from **pseudo-complex** primes in the N400

→ *Splitting the deaf readers into those with high vs. low morphological awareness (MA) reveals that those with high MA show early (top down) and longer lasting semantic interference effects when processing **pseudo-complex** primes*

Conclusions

Results from hearing readers replicated previous masked priming studies[4], suggesting that they utilize **both morpho-orthographic** and **morpho-semantic** processing routes.

Deaf readers with high morphological awareness **may weight morphological connections more strongly than hearing readers**, leading to a longer lasting semantic interference effects.

This prioritization of morphology could be a result of **learning English primarily through** print and does not appear to disadvantage deaf readers.

References

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[3]Morris, J., Frank, T., Grainger, J., & Holcomb, P. J. (2007). Semantic transparency and masked morphological priming: An ERP investigation. *Int J Psychophysiol*, 44(4), 506-521.
[4]Morris, J., Grainger, J., & Holcomb, P. J. (2008). An electrophysiological investigation of early effects of masked morphological priming. *Language and Cognitive Processes*, *23*(7-8), 1021-1056.
[5]Bernstein, S. E., Flipse, J. L., Jin, Y., & Odegard, T. N. (2020). Word and sentence level tests of morphological awareness in reading. *Reading and Writing*, *33*, 1591-1616.

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