Electrophysiological evidence of lexical competition from masked neighbor priming

Gabriela Meade[1,2], Katherine J. Midgley[1], Jonathan Grainger[3], Phillip J. Holcomb[1], Karen Emmorey[1]

[1]San Diego State University [2]University of California, San Diego [3]Aix-Marseille University & CNRS

Introduction

Lexical competition is a key component of interactive-activation models of visual word recognition.[1,2] According to these theories, when a word (e.g., *time*) is processed, form-similar orthographic neighbors (e.g., *tame*, *tire*) are also activated and compete for recognition.

In behavioral masked priming studies, neighbor primes elicit interference. Lexical decision responses to target words (e.g., *TAME*) are slower following a neighbor prime (e.g., *time*) than following an unrelated prime (e.g., *shop*). The effect is strongest when the prime is of a higher frequency than the target, for words with many neighbors, and for better spellers.[3]

Here, we used event-related potentials (ERPs) to track how this behavioral interference unfolds over time. We predicted that the onset of lexical competition between neighboring word pairs would occur between the N250 and the N400[4] and lead to to more effortful processing. Thus, we predicted that targets following neighbor primes would elicit smaller amplitude N250s, but larger amplitude N400s, than the same targets following unrelated primes.

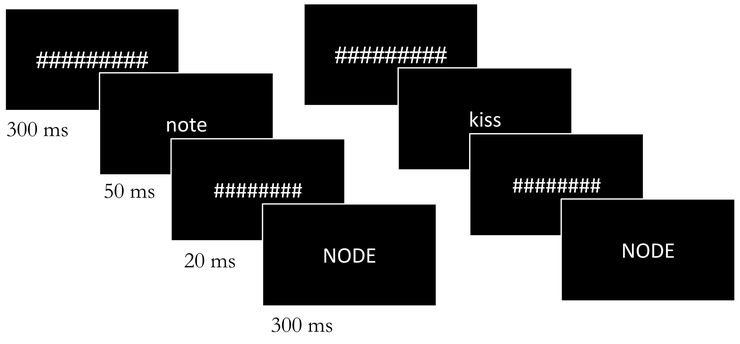
Finally, we examined whether the size of the N400 effect was sensitive to the same variables that are known to affect response times (i.e., neighborhood density and spelling ability).

Methods

- 24 young adults (19 F; mean age 22.1)
- Spelling recognition test[3] (mean 74.5; range 62-85 out of 88)

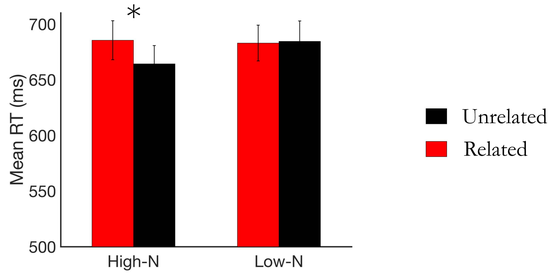
- Lexical decision to target

- 90 4-5 letter word pairs
  - prime frequency > target frequency
  - neighbor or unrelated prime
  - high-N (mean N: 10.4, *SD* .32) or low-N (mean N: 2.52, *SD* .17)



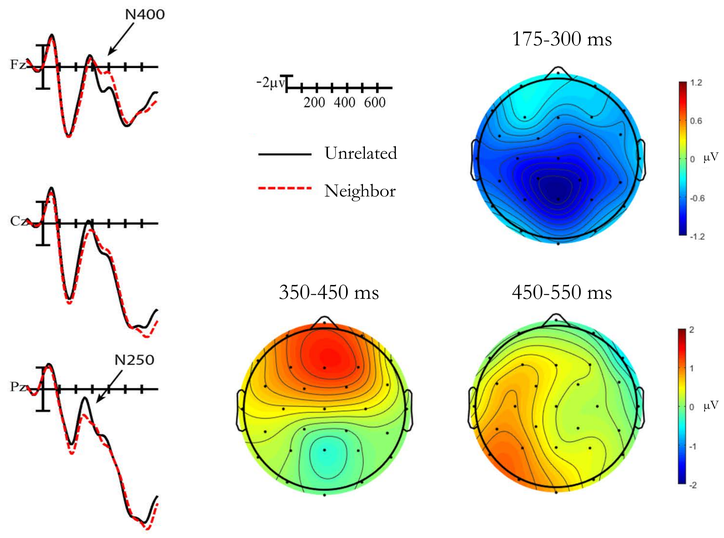
- ERPs time-locked to target
- N250: mean amplitude 175-300 ms (unrelated-related)
- N400: mean amplitude 350-450 ms, 450-550 ms (unrelated-related)

Behavioral Results



- Slower RTs for targets following neighbor primes relative to targets following unrelated primes, but only for high-N pairs

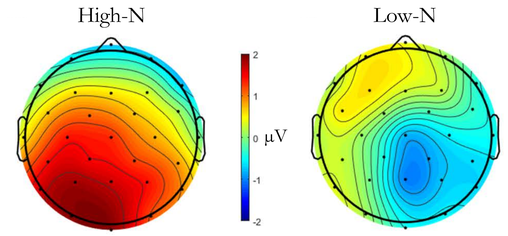
ERP Results: Main effect of Prime



- Attenuated amplitude N250 (i.e., priming) for targets following neighbor primes, relative to targets following unrelated primes

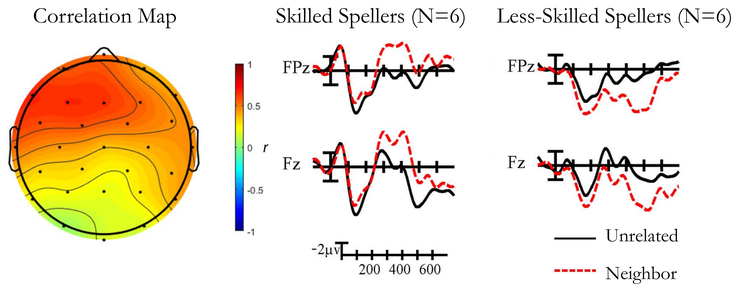
- **Larger** amplitude N400 (i.e., reverse priming) for targets following neighbor primes, relative to targets following unrelated primes

450-550 ms: Prime × Neighborhood



- Reverse N400 priming effect was only found for high-N words

450-550 ms: Prime × Spelling Skill



- Reverse N400 priming effect was only found for skilled spellers

Conclusions

Targets following neighbor primes elicited smaller amplitude N250s, most likely because the higher proportion of shared letters between the two words facilitated sublexical processing.

Within the N400 window, targets following neighbor primes elicited a **larger** amplitude negativity than those following unrelated primes. We interpret this pattern as reflecting greater competition between primes and targets in the case of neighbor pairs, as predicted by interactive-activation models. Together, the N250 priming effect and N400 reverse priming results are consistent with the prediction that lexical competition begins at some point between those two components.

This reverse N400 effect was sensitive to the neighborhood density of the word pairs and to individual differences in spelling ability, as was true of the interference effect reported in previous behavioral studies.[3] This strengthens the conclusion that both index the same underlying competition processes.

Neighborhood density and spelling ability both affect the quality of lexical representations. High-N words must be represented precisely to be dissociable from their neighbors. Skilled spellers also have better formed representations than less-skilled spellers. In both cases, the prime can be processed and suppress its neighbors more efficiently, leading to greater competition.

References

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