Pseudo-morphological priming with phonologically inconsistent targets: Evidence from response time and ERP Data

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Introduction

Masked morphological priming effects have been found whenever a prime and a target share orthographically defined (pseudo-) morphemes in the absence of a semantic relationship (e.g. 'corner'-'corn').

This finding suggests that recognising complex words begins takes place via a morphemic segmentation based on the analysis of orthography—a process known as morpho-orthographic segmentation (Rastle et al. 2004; Rastle and Davis, 2008).

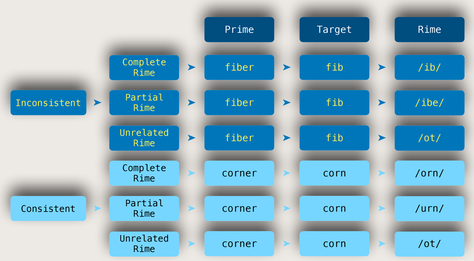
But to what extent are form-based morphological representations influenced by phonology? In the bimodel interactive activation model (BIAM) of word recognition, orthographic representations are mapped onto their corresponding phonological representations at a central orthography-phonology interface (Diependaele et al., 2010).

The BIAM predicts that psuedo-morphemes that share both orthographic and phonological overlap with their stems (e.g. 'corner'-'corn') may be more likely to be decomposed as compared to those that share orthographic but not phonological overlap (e.g. 'tower'-'tow').

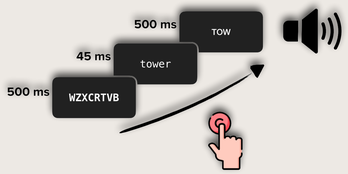
To test this hypothesis, we compared (a) response time and (b) event-related potential priming effects for phonologically consistent (corner-corn) and inconsistent (tower-tow) pseudo-morphological prime-target pairs using a masked priming paradigm.

Methods

Participants (n = 10) completed a rhyme judgement task (Leerdam et al., 2009) in which they saw a masked prime followed by a visual stem target and an auditory syllable rime. They were asked to judge whether the auditory rime and the rime of the visual word target were the same.

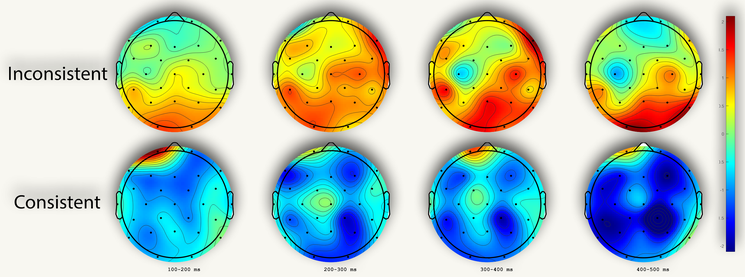


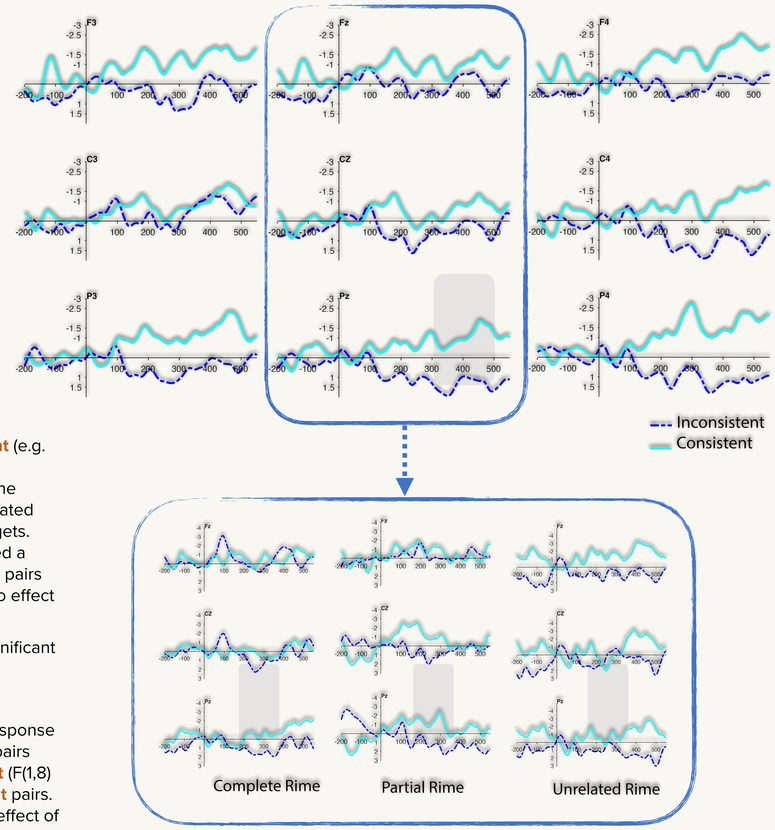
The auditory rime could be a **complete rime**, matching both the target nucleus and coda, a **partial rime**, matching only the target coda, or an **unrelated rime**, neither matching neither the target nucleus nor coda. (For inconsistent prime-target pairs , the nucleus of the partial rime corresponded to the nucleus of the first syllable of the masked prime.)

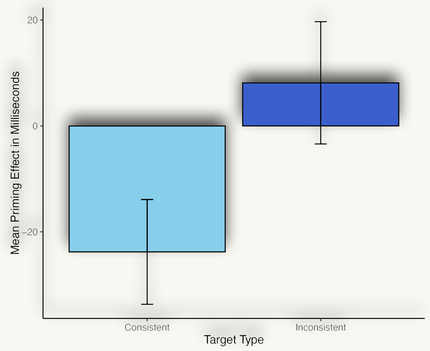


As they completed the task we measured we measured the amplitude of the **N250** and **N400** components which have been hypothesised to reflect sub-lexical and lexical processing respectively (Grainger & Holcomb, 2009; Holcomb & Grainger, 2006).

Results







We compared the N400 effect for **Consistent** (e.g. fib) and **Inconsistent** (e.g. corn) targets at electrode site Cz by subtracting the mean amplitude of the N250 and N400 components for related targets from those for unrelated targets. Consistent prime-target pairs showed a larger N400 effect than inconsistent pairs $F(1,8) = 7.26$, $p = .026$). There was no effect of the auditory rime.

For the N250 the effect was not significant ($F(1,8) = 4.1$, $p = .08$)

In contrast to the ERP data, in the response time data, **Consistent** prime-target pairs showed an **inhibitory priming effect** ($F(1,8) = 11.4$, $p = .01$) relative to **Inconsistent** pairs. As with the ERP data, there was no effect of the rime.

Discussion

Our goal was to investigate the role of phonology in form-based morphological segmentation by comparing pseudo-morphological priming effects for prime-target pairs that had the same degree of orthographic overlap between primes and targets but differed their degree of phonological overlap.

We predicted that pseudo-complex words with phonologically consistent (pseudo-)stems (e.g. corn-er) would be more likely to undergo form-based morphological decomposition and generate morphological priming effects than pseudo-complex words with phonologically inconsistent (pseudo-)stems (e.g. fib-er).

As we expected, in the **ERP data** we found **a greater N400 effect for consistent than for inconsistent words**, but the effect was not significant in the N250 time window. Surprisingly the **behavioral data** showed **an inhibitory effect for consistent prime-target pairs**. This is the opposite of what is generally found for pseudo-complex words in a masked priming task, but is consistent with data from supra-liminal priming.

The auditory rime appears to boost recognition of the prime, such that it competes with the target and results in inhibition. There was no priming effect—either facilitatory or inhibitory—for inconsistent primes. In the case of inconsistent primes, the boost to the prime is insufficient to render it competitive with the target.

Conclusion

The N400 effect for phonologically consistent primes suggests that consistent primes facilitate the mapping of sub-lexical to lexical representations, even as the inhibitory effect in the behavioural data suggest that they compete with the target to inhibit lexical access.

Although these data are preliminary and our current sample size is small, they suggest that although "the recognition of morphologically complex words begins with a rapid morphemic segmentation based purely on the analysis of orthography" (Rastle & Davis, 2008) phonology rapidly comes into play to either support or contradict that analysis.

References

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