

Competition between form-related words in bilingual sentence reading: Effects of language proficiency

Maud Pélissier¹, Dag Haugland², Bjørn Handeland², Beatrice Zitong Urland², Allison Wetterlin², Linda Wheeldon², and Steven Frisson³

¹ Université Paris Cité, CLILLAC-ARP, F-75013 Paris, France, ² University of Agder, ³ University of Birmingham

Sentence reading involves constant competition between lexical candidates. For a bilingual, this can be especially demanding as candidates from not one but two languages compete for recognition (e.g., Costa et al., 2000; Van Hell & Dijkstra, 2002). While there is ample evidence of competition mechanisms at work in isolated word recognition, research on normal sentence reading is scarce, especially for bilinguals reading in their second language (L2). Previous research with monolinguals has shown that the neighbours of a read word are inhibited, making their retrieval as a subsequent target more difficult (Paterson et al., 2009), but the duration of this interference may depend on reading skills (Frisson et al., 2014). These priming effects have been interpreted as reflecting competition between lexical candidates and facilitation from sublexical overlap (Davis & Lupker, 2006; Perry et al., 2008).

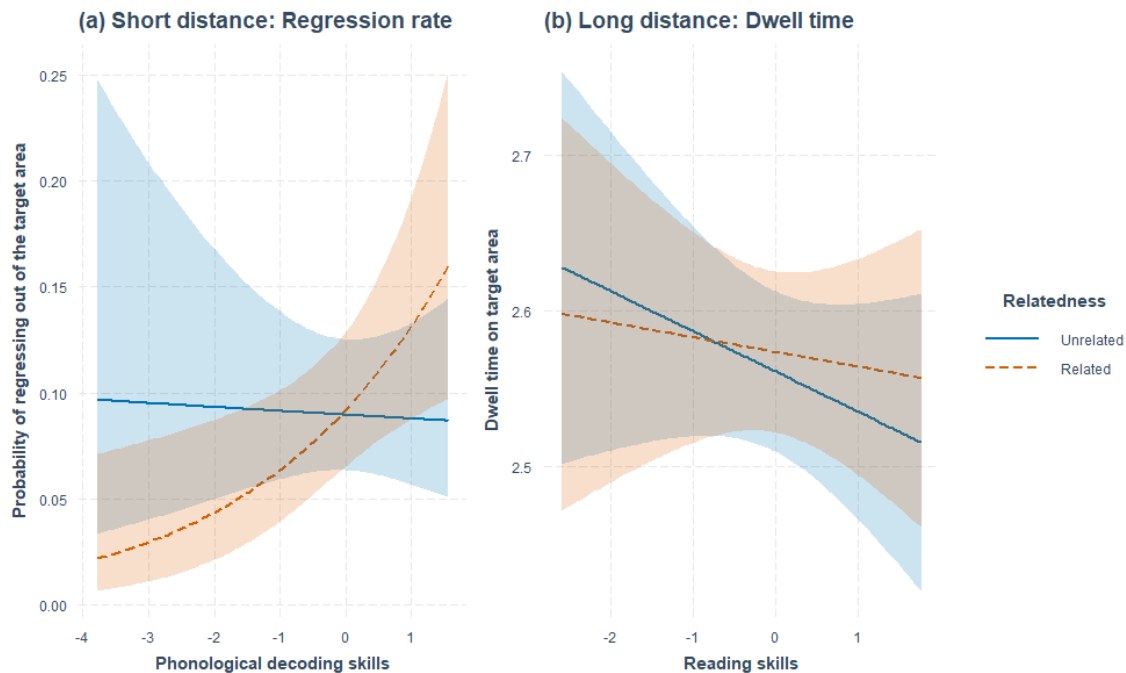
In this study, we examined neighbour priming effects in sentence reading among proficient Norwegian-English bilinguals reading in their L2. We investigated the effects of the distance between prime and target (short vs. long) and the nature of the overlap between the two words (beginning or end), and related these to differences in individual cognitive skills (reading skills and phonological decoding abilities). Eye movements were recorded while 48 participants read sentences containing a target word preceded by a form-related prime or a control neighbour (e.g., *The scary house was **brown** [blue] with a golden crown painted over the door*). The neighbouring prime always overlapped with the target both orthographically and phonologically. 128 pairs of sentences were constructed, where prime, target and control words were matched for mean frequency, number of letters and phonemes across conditions. A series of additional measures of proficiency were collected and analysed with a PCA, which yielded two factors (Reading skills and Phonological decoding skills) that were included as predictors in the linear mixed-effect models carried out on the eye-tracking data.

In the short-distance condition, inhibition effects were found on the target area for good phonological decoders (regression rate: $\beta = 0.42$, $z = 2.90$, $\chi^2(1) = 8.22$, $p = .004$, see Figure 1a), and on the spillover area regardless of reading and phonological decoding skills (regression rate: $\beta = 0.52$, $z = 3.93$, $\chi^2(1) = 14.06$, $p < .001$, regression path duration: ($\beta = 0.03$, 95% $t(47) = 371$, $F(46) = 13.77$, $p < .001$). This is in line with prior results of inhibitory neighbour word priming in sentence reading, although our effects appeared later, i.e., on the spillover region and on later measures only (regressions and regression path duration). In the long-distance condition, only good readers exhibited inhibition effects in the target area (dwell time: $\beta = 0.02$, $t(2435) = 2.13$, $F(2432) = 4.55$, $p = .033$, see Figure 1b), which was also the case for the monolingual participants in Frisson et al (2014). This persistence of the influence of the prime after eight or nine intervening words conflicts with the assumption of competition models that activation decays over time.

The effects we found were modulated by individual differences, and, interestingly, the key factor was phonological. Our results show earlier effects for good phonological decoders in the short distance condition: more regressions on the target and fewer skips of the spillover region after related primes. It is not surprising to find that phonological decoding skills affect sentence reading: Previous research shows that the phonological codes of words are activated during reading, and that readers rely on them during normal sentence reading (see Rayner et al., 2012).

In sum, our results show that words in a sentence influence each other even in a second language, but that interference is affected by the reading skills and phonological decoding abilities of the reader. Our key findings replicate in bilinguals' L2 reading what has previously been found in monolinguals, which shows that form-related priming in sentence reading is a robust and important effect in language reading.

Figure 1. Plots for significant interactions between relatedness and individual difference predictors in the target area in the short-distance (a) and long-distance (b) conditions.



References

- Costa, A., Caramazza, A., & Sebastian-Galles, N. (2000). The Cognate facilitation effect: Implications for models of lexical access. *Journal of Experimental Psychology: Learning Memory and Cognition*, 26(5), 1283–1296. <https://doi.org/10.1037/0278-7393.26.5.1283>
- Davis, C. J., & Lupker, S. J. (2006). Masked inhibitory priming in English: Evidence for lexical inhibition. *Journal of Experimental Psychology: Human Perception and Performance*, 32(3), 668–687. <https://doi.org/10.1037/0096-1523.32.3.668>
- Frisson, S., Koole, H., Hughes, L., Olson, A., & Wheeldon, L. (2014). Competition between orthographically and phonologically similar words during sentence reading: Evidence from eye movements. *Journal of Memory and Language*, 73(1), 148–173. <https://doi.org/10.1016/j.jml.2014.03.004>
- Paterson, K. B., Liversedge, S. P., & Davis, C. J. (2009). Inhibitory neighbor priming effects in eye movements during reading. *Psychonomic Bulletin and Review*, 16(1), 43–50. <https://doi.org/10.3758/PBR.16.1.43>
- Perry, J. R., Lupker, S. J., & Davis, C. J. (2008). An evaluation of the interactive-activation model using masked partial-word priming. *Language and Cognitive Processes*, 23(1), 36–68. <https://doi.org/10.1080/01690960701578112>
- Rayner, K., Pollatsek, A., Ashby, J., & Clifton, C. J. (2012). *The Psychology of Reading* (2nd ed.). Psychology Press. <https://doi.org/10.4324/9780203155158>
- Van Hell, J. G., & Dijkstra, T. (2002). Foreign language knowledge can influence native language performance in exclusively native contexts. *Psychonomic Bulletin and Review*, 9(4), 780–789. <https://doi.org/10.3758/BF03196335>