Monolingual and Bilingual Logical Representations of Quantificational Scope: Evidence from Priming in Language Comprehension

Mieke Slim (in collaboration with Peter Lauwers and Rob Hartsuiker)
Ghent University, Belgium
mieke.slim@ugent.be

Doubly quantified sentences, such as "All hikers climb a hill", are scopally ambiguous. One possible interpretation is that all hikers climb a (potentially) different hill, whereas another possible interpretation is that all hikers climb the same hill. These interpretations depend on the scope relation between the two quantifiers. Note that the sentence is not ambiguous in any other way: The ambiguity is purely on the level of semantic scope. This level of linguistic representation will be referred to as *logical representations*. Studies in English have shown effects of *priming* in comprehension of these sentences: Participants tend to perseverate in their interpretation of these sentences (Raffray & Pickering, 2010; Feiman & Snedeker, 2016). These findings provide further evidence that people construct logical representations of semantic scope in language comprehension. In my research, the architecture of *bilingual* logical representations in language comprehension, also using the priming paradigm. The key question here, is whether bilingual logical representations are separate per language or rather shared between languages. We investigated this question by focusing on Dutch-French bilingualism.

Using sentence-picture matching tasks, we first investigated whether logical representations of doubly quantified sentences are also susceptible to priming effects in Dutch and French monolingual language comprehension. As in the example given below, the critical test sentences contain the quantifiers "all" (Dutch: "alle", French: "tous") and "a" (Dutch: "een", French: "un"). Experiments 1-2 showed no differences between Dutch (n = 69) and French (n = 62) in the spontaneous interpretation of these sentences. In Experiments 3-4, we manipulated the response choice by eliciting priming effects. These experiments showed (within-language) priming effects in both Dutch (9%, n = 66) and French (6%, n = 59). These findings suggest that the architecture of logical representations in language processing is not language-specific.

Experiment 5 tested whether logical representations can be primed between languages. Here, the primes are presented in Dutch (the participant's L1), and the targets in French (the participant's L2). The results indicated a priming effect (9%, n = 61). This finding suggests that bilinguals employ shared logical representations in language comprehension, as the residual activation of logical representation holds between languages (see Van Gompel & Arai, 2017; for review of such cross-linguistic priming effects). A follow-up question is whether logical representations constructed in the L2 are comparably strong as those constructed in the L1. We addressed this question in Experiment 6. Here, we investigated priming *within* the L2 (which was French). Again, we found a priming effect (12%, n = 66). Moreover, combined interaction analyses showed that all priming found in these experiments were comparable. These findings indicate that logical representations are comparably strong in an L2 as in an L1, and thus that bilinguals have (at least partially) shared logical representations.

Finally, it must be noted that these priming effects may also be the result of *visual priming*. We tested this alternative explanation in Experiment 7(n = 99). This experiment had the form of a visual search task in which the participants were not asked to match a picture to a sentence, but rather a picture to another picture. Importantly, the response pictures were the same as in the previous six experiments. Thus, this experiment was a completely visual, and thus non-linguistic, variation of the previous priming experiments. Experiment 7 did not show any effects of priming. This finding shows that the priming effects do not hold in a purely visual experiment, and thus that visual priming is not responsible for the abovementioned priming effects.

References
Feiman, R., & Snedeker, J. (2016). The logic in language: How all quantifiers are alike, but each quantifier is different. Cognitive Psychology, 87, 29– 52.
Raffray, C. N., & Pickering, M. J. (2010). How do people construct logical form during language comprehension? Psychological science, 21(8), 1090–1097.
Van Gompel, R. P., & Arai, M. (2018). Structural priming in bilinguals. Bilingualism: Language and Cognition, 21(3), 448–455.