

The Long Goodbye: Sentence-Final Integration in Language Processing

Jan Chromý (jan.chromy@ff.cuni.cz)¹, Lucie Guštarová (lucie.gustarova@ff.cuni.cz)¹

¹Institute of Czech Language and Theory of Communication, Charles University

Background: It is well established that readers typically spend more time processing sentence-final regions than other regions within a sentence. Such “wrap-up effects” have been primarily attributed to increased integrative processing [cf. 1, 2]. However, several studies have suggested that additional factors contribute to sentence-final slowdowns, such as intonational factors [cf. 3], or an interplay of mechanisms including oculomotor hesitation, or the co-occurrence of punctuation with processing difficulty [4]. More recently, Stowe et al. [5] rejected the wrap-up hypothesis altogether, arguing that there are no principled differences between sentence-final and earlier positions, as sentence processing proceeds incrementally throughout. The present study examines clause- and sentence-final effects using systematically controlled stimuli in Czech.

Method: Three moving-window SPR experiments are reported (Ns = 209, 220, and 203 for Exp1–Exp3, respectively). In all three experiments, four sets of items were used: (a) sentences with transitive verbs; (b) sentences with ditransitive verbs; (c) sentences with motion verbs; and (d) OVS word order sentences with inanimate objects. Each item contained a “core” clause. Items appeared either in a short condition, containing only the core clause, or in a long condition, which was a two-clause sentence containing the core clause and an additional clause (see Item Example). The experiments differed in the structure of the long condition. In Exp1, the core clause appeared as the first clause of the long condition, allowing a direct comparison between clause-final and sentence-final effects. In Exp2 and Exp3, the core clause appeared at the end, allowing a comparison of sentence-final effects in short and long sentences with an identical second clause. In Exp2, two sets of items used the same agent in both clauses, while two other sets used different agents. In Exp3, three conditions were used, manipulating agent sameness within items. Based on the information integration hypothesis, we expected stronger wrap-up effects in longer sentences and in same-agent conditions.

Results: RTs on the final word of the core clause were compared using linear mixed-effects modeling, with each item type analyzed independently (see Figure 1). Exp1 showed significantly slower RTs on the sentence-final word in the short condition than on the corresponding clause-final word in the long condition for all four item types. Exp2 showed significantly slower RTs on the sentence-final word in the long condition for all four item types. Exp3 showed significantly slower RTs for same-agent sentences than for the short condition across all item types. Moreover, the different-agent conditions yielded significantly slower RTs than the short condition in three of the four item types.

Discussion: The results reveal a robust distinction between clause-final and sentence-final effects, with consistently stronger slowdowns occurring at sentence boundaries. Sentence length emerged as a reliable predictor of sentence-final effects, indicating that wrap-up costs increase with the overall amount of information to be integrated at sentence completion. However, the absence of the length effect in case of one item type with different agents points out that wrap-up effects reflect integrative processing demands that depend not only on sentence length, but also on how information is structured and related across clauses and cannot be reduced to a purely cumulative effect of additional sentence material.

References

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Item Example

- (a) *Tomáš koupil na farmářském trhu oranžovou dýni.* ('Tomáš bought an orange pumpkin at the farmers market.') [Exp1, Exp2, Exp3]
- (b) *Tomáš koupil na farmářském trhu oranžovou dýni a odjel domů tramvají.* ('Tomáš bought an orange pumpkin at the farmers market and took a tram home.') [Exp1]
- (c) *Martina plánovala dovolenou a Tomáš koupil na farmářském trhu oranžovou dýni.* ('Martina was planning the vacation and Tomáš bought an orange pumpkin at the farmers market.') [Exp2]
- (d) *Nejdřív přečetl recept, potom Tomáš koupil na farmářském trhu oranžovou dýni.* ('First he read the recipe, then Tomáš bought an orange pumpkin at the farmers market.') [Exp2, Exp3]

Figures and Tables

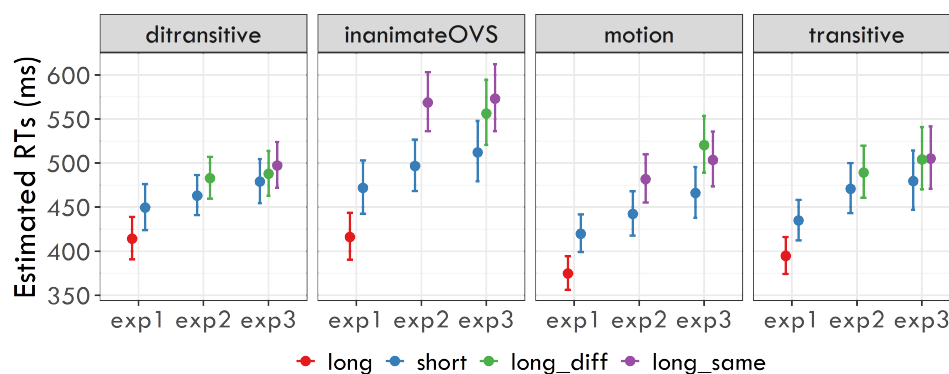


Figure 1: Linear mixed-effects model estimates for the three experiments and four item types.