

## THE EFFECT OF CONTEXT ON LOCAL SYNTACTIC COHERENCY PROCESSING

Hanno M. Müller & Lars Konieczny (University of Freiburg)

hanno.mueller@merkur.uni-freiburg.de

We present an eye-tracking reading study investigating whether or not contextual information can guide parsing towards ungrammatical processing of local syntactic coherences (LSCs). LSCs have been shown to interfere with grammatical processing in various constructions, languages, and experimental paradigms (e.g. Tabor et al. 2004). The effect has been attributed to a variety of sources, such as self-organized parsing (ibid.), simple recurrent networks (Konieczny 2005, Konieczny et al., 2009), bottom-up/top down balancing (Gibson 2006), good enough processing (Ferreira & Patson 2007), rationality (Hale 2011), and noisy channel processing (Levy 2008). To what extent these accounts would predict potential context effects remains to be debated.

This study investigates the effect of supporting contexts on the processing of German verb-final subordinate clauses, such as (1). An ambiguous adverb (“erfreut”/ *delightful*) succeeds a dative pronoun and a nominative NP. The adverb is formally identical with a finite verb (*delights*). As a finite verb, it could locally be combined with the proper noun *Daniela* and the subsequent NP *her boyfriend* to form a short transitive sentence (*Daniela delights her boyfriend*). This combination however should be ruled out by the preceding dative pronoun *him*, which cannot be integrated in such a construction (\**ihm Daniela erfreut ihren Freund/ him Daniela delights her boyfriend*).

(1) Als ihm **Daniela erfreut ihren Freund** vorstellt, lächelt Mark über das ganze Gesicht.  
*When him Daniela delightful/ delights her boyfriend introduces, smiles Mark over the all face.* (German word order)

When Daniela delightful introduces her boyfriend to him, Mark smiles all over the face.

Experimental target sentences like (1) containing a LSC were contrasted with controls, where the ambiguous adverb (“erfreut”) was replaced by an unambiguous mostly synonymous adverb („heiter“/ *lively*). Both were preceded by short contexts. Crucially, these contexts contained a proposition either entailing (2) or inhibiting (3) the local coherence meaning.

(2) Danielas new boyfriend **ate nothing better** than Tiramisu. To **make him happy**, Daniela had made some herself. Mark was also invited to dinner. (engl. translation)

(3) Danielas new boyfriend **detested nothing more** than Tiramisu. To **annoy him**, Daniela had made some herself. Mark was also invited to dinner. (engl. translation)

Two factors, *i. expond* (*experimental/lsc vs. control sentences*), and *ii. context* (*local support vs. global support*) were crossed in a 2x2 design. 21 German native speakers were each presented with 40 items in each condition. **Hypothesis 1:** If the local syntactic structure is processed as such, which assumes that the ambiguous word is interpreted as a finite verb, processing the subsequent actual finite verb should result in a garden-path alike reading time increase. **Hypothesis 2:** If a context containing a proposition entailing the local coherence meaning (= *local support*) facilitates the processing of the LSC, this effect should be elevated, compared to the condition in which the context does not contain such a proposition (= *global support*).

Residual first pass reading times (FPRT) and regression path durations (RPD) were each fitted in a linear mixed effects model with the two design factors and region (4 levels) as fixed effect predictors (including all interactions), and participant and items as random factors (including fixed effect slopes). As predicted by hyp. 1, FPRTs (fig. 1) revealed significantly longer reading times on the verb in the locally coherent (experimental) condition than in the control condition, regardless of context ( $t = 3.495, p < .001$ ). RPDs (fig. 2) however showed a significant interaction of *expond* and *context* at the verb ( $t = 2.315, p < .05$ ), as predicted by hyp. 2. The results suggest that contextual information can guide parsing towards ungrammatical processing of LSCs. The findings will be discussed w.r.t. their compatibility with the aforementioned accounts.

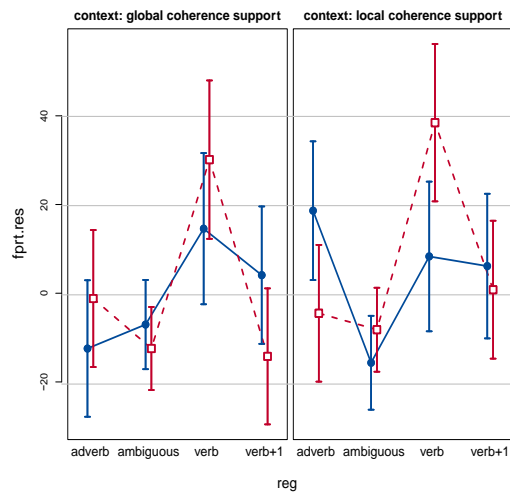


Figure 1: Residual first pass reading times as a function of context, *excond* (experimental/lsc vs. control), and region of interest (adverb encodes the ambiguous word (full verb/adverb), *ambiguous* refers to the words between the adverb and the finite verb referred to as *verb*, and *verb+1* represents the subsequent word).

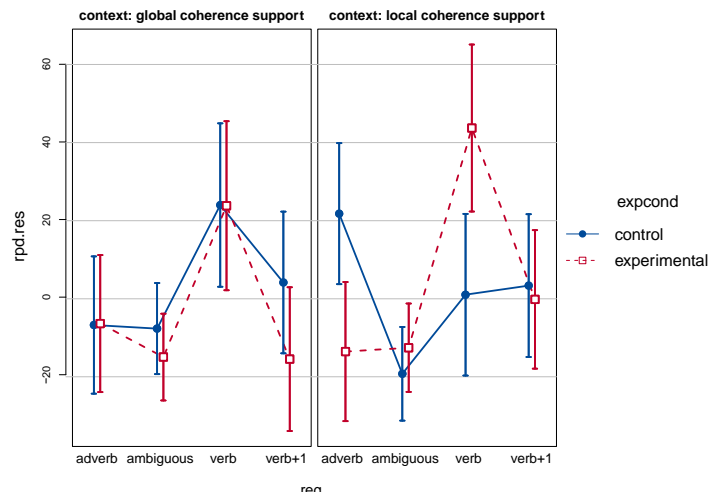


Figure 2: Residual regression path durations as a function of context, *excond* (experimental/lsc vs. control), and region of interest

## References

- Ferreira, F. & Patson, N. D. (2007). The 'good enough' approach to language comprehension. *Language and Linguistics Compass*, 1(1-2), 71-83.
- Gibson, E. (2006). The interaction of top-down and bottom-up statistics in the resolution of syntactic category ambiguity. *Journal of Memory and Language*, 54, 363-388.
- Hale, J. T. (2011). What a rational parser would do. *Cognitive Science*, 35(3), 399-443.
- Konieczny, L. (2005). The psychological reality of local coherences in sentence processing. *Proceedings of the 27th Annual Conference of the Cognitive Science Society*. Stresa, Italy.
- Konieczny, L., Müller, D., Hachmann, W., Schwarzkopf, S., & Wolfer, S. (2009). Local syntactic coherence interpretation: evidence from a visual world study. *Proceedings of the 31st Annual Conference of the Cognitive Science Society*, (pp. 1133-1138).
- Levy, R. (2008). A noisy-channel model of rational human sentence comprehension under uncertain input. *Proceedings of the 2008 Conference on Empirical Methods in Natural Language Processing*, (pp. 234-243), Honolulu, October 2008.
- Tabor, W., Galantucci, B., & Richardson, D. (2004). Effects of merely local syntactic coherence on sentence processing. *Journal of Memory and Language*, 50(4), 355-370.