Sentence Position and Time-course in Expectation-based Processing of Final Verbs

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Introduction

- Konieczny (2000) shows that presence of additional preverbal material can facilitate the processing of clause-final verbs.
- This is an example of an anti-locality result in syntactic comprehension (e.g., Gibson, Nakatani, & Chen, 2005; Konieczny & Döring, 2003; Vasishth & Lewis, 2006; Jaeger, Fedorenko, & Gibson, 2005).
- Levy (2006) argued that this type of anti-locality result arises as a result of *probabilistic expectations* (Hale, 2001).
- Potential confounds in Konieczny's original study:
  - lexicalization of the critical verb and the material preceding it varied across conditions;
  - plausibility was not controlled for;
  - the amount of preverbal material was confounded with the verb position;
  - the material immediately preceding the verb differed across conditions.
- Our aim: demonstrate that expectation-based effects persist when these confounds are removed.

Experiment

- This experiment investigated processing difficulty at German clause-final verbs, controlling for the potential confounds present in Konieczny (2000).
- We varied the *type* and *amount* of preverbal material in the matrix clause.
- For our materials, a DATIVE argument serves as a strong indicator for the upcoming verb; an ADJUNCT is a weaker indicator.
- Lexicalization, immediately preverbal material, and sentence position at the critical verb (V*) are completely controlled.

Method

- We used a 2×2 design crossing the factors, as in (1):
  - a DATIVE phrase appears in the matrix clause (a & b) or the subordinate clause (c & d);
  - an ADJUNCT phrase appears in the matrix clause (a & c) or the subordinate clause (b & d).

(1)
a. As NP.nom NP.acc V, has NP.nom PP.adj NP.dat NP.acc V*, ...
b. As NP.nom PP.adj NP.acc V, has NP.nom NP.dat NP.acc V*, ...
c. As NP.nom NP.dat NP.acc V, has NP.nom PP.adj NP.acc V*, ...
d. As NP.nom PP.adj NP.dat NP.acc V, has NP.nom NP.acc V*, ...

subordinate clause *matrix clause*

- There were 24 items instantiating the template in (1); for an example item see Appendix. Four lists were constructed using a Latin square.
- Each subjects was assigned one of the lists; the items in the list were presented in random order together with 24 fillers.
- Subjects' eye-movements were recorded using an Eyelink-II video-based tracker.
- 28 native speakers participated, each had normal or corrected-to-normal vision.

Results and Discussion

- The total reading times for the four conditions are graphed in Figure 1.
- There was a significant main effect of DATIVE in total time ($F_1(1,27) = 7.287$, $p = 0.012$; $F_2(1,23) = 4.532$, $p = 0.044$). This effect was marginal for second pass time and for gaze duration, and absent in the other measures.
- There was no significant effect of ADJUNCT and no interaction in any of the measures.
- The *mere presence* of additional material does not have an effect. Only a constituent that imposes substantial additional constraints on the verb (e.g., a dative NP) facilitates its processing.
- Critical-verb reading time was uncorrelated with plausibility (based on a pretest).
- Also, the *initial-clause* verb (V in (1)) was read (numerically) more quickly when preceded by a dative verb (conditions c-d).

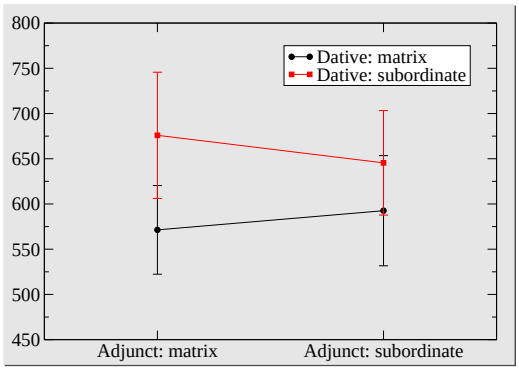

Fig. 1: Total reading time on the final verb in the four conditions.

Conclusions

- The anticipatory effects found by Konieczny and others are unlikely to be due to confounds of sentence position, lexicalization, plausibility, or superficial properties of immediately preceding material.
- The facilitative effect of preverbal datives appears in late but not early measures.
- This suggests that expectation-based effects in constrained syntactic contexts such as final verbs may be akin to well-known Cloze-type predictability effects, which occur primarily in late measures (e.g., Rayner & Well, 1996).

Future Work

- Some evidence suggests that processing difficulty at the verb in a relative clause is dominated by locality-based effects (Grodner & Gibson, 2005; Levy, Fedorenko, & Gibson, 2007, but see also Vasishth & Lewis, 2006).
- We are looking at reading behavior on similar stimuli in German relative clauses.
- We are also looking at other, more purely syntactic sources of expectation-based facilitation in German clause-final verbs.

References

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Appendix: Example Stimulus

(2) Weil [$_{NPnom}$ der Stadtrat] [$_{NPacc}$ den Antrag] [$_{V}$ ablehnte], hat [$_{NPnom}$ Jens
As [$_{NPnom}$ the councilor] [$_{NPacc}$ the proposal] [$_{V}$ rejected], has [$_{NPnom}$ Jens
Hartmann] [$_{PPadj}$ nach stundenlanger Erörterung des langen Berichts]
Hartmann] [$_{PPadj}$ after hour-long discussion of-the long report]
[$_{NPdat}$ dem schmierigen Politiker des kleinen Ortes] [$_{NPacc}$ den Finanzplan]
[$_{NPdat}$ the sleazy politician of-the small town] [$_{NPacc}$ the finance-plan]
[$_{V*}$ präsentiert], und so die Krise entschärft.
[$_{V*}$ presented], and hence the crisis defused