

The role of discourse, semantic and surface-level factors in real-time pronoun resolution

Claudia Felser¹, Clare Patterson^{1,2}, Janna Drummer¹ & Cecilia Puebla¹

(¹ University of Potsdam, ² University of Cologne)

We report the results from two eye-movement monitoring experiments investigating how real-time pronoun resolution in German is affected by potential antecedents' semantic type, pragmatic salience, and proximity to the pronoun. Our results suggest that linear proximity guides the early antecedent search more than either semantic or pragmatic factors.

Background. Pronominal reference resolution can be achieved in two different ways, either by binding or through coreference assignment. Only the former is traditionally assumed to require c-command. Previous findings by Cunnings et al. (2014) show that English speakers prefer to link ambiguous pronouns to coreference antecedents (see also Trompelt & Felser, 2014, for preliminary evidence from German). A variable-binding antecedent (i.e. a quantified NP) was considered only if it was linearly closer to the pronoun than a competing coreference antecedent (Cunnings et al., 2014). These findings call into question the universal validity of the binding preference hypothesis (BPH; Koornneef, 2008; Reuland, 2011). A follow-up study showed that non c-commanding subject QNPs were not considered as antecedents, however (Cunnings et al., 2015).

Method & predictions. Building on and extending the above research, we recorded adult native German speakers' eye movements while they read sentences such as (1) and (2) below that contained an embedded 3rd person subject pronoun and two potential antecedents.

(1) EXPERIMENT 1

Jeder Maurer, der sah, dass Georg auf der Baustelle war, ahnte, dass er heute fleißig arbeiten muss.

'Every builder who saw that Georg was on the building site suspected that he would have to work hard today.'

(2) EXPERIMENT 2

Der König, der jeden Gärtner kannte, war überzeugt, dass er mehr Bäume pflanzen sollte.

'The king, who knew every gardener, was convinced that he should plant more trees.'

A gender-mismatch paradigm was used in which the feature match between each NP and the pronoun was manipulated. In (1), NP1 is a c-commanding quantified expression and hence a potential variable-binder, whilst NP2 is a non c-commanding proper name that could only serve as a coreference antecedent. In (2), the relative order of the two potential antecedents is reversed, with NP1 a c-commanding definite description and NP2 a non-c-commanding quantified expression. While Experiment 1 primarily aimed at investigating participants' preference for either coreference or variable binding, Experiment 2 was designed to further explore the role of linear proximity. Table 1 summarises the predictions.

	<i>Salient antecedent / binding preference</i>	<i>Non-QNP preference</i>	<i>Proximity preference</i>
EXPERIMENT 1	NP1 effects	NP2 effects	NP2 effects
EXPERIMENT 2	NP1 effects	NP1 effects	NP2 effects

Table 1. Summary of predictions

Results & discussion. In Experiment 1 we observed NP2-mismatch effects in later measures at the pronoun region (rereading times: $t=2.035$, total reading times: $t=2.558$) but no NP1-mismatch effects. Given that NP2 was a coreference-only antecedent, this confirms previous findings on both English (Cunnings et al., 2014) and German (Trompelt & Felser, 2014) and provides further evidence against the BPH as a processing hypothesis. In Experiment 2 we found initial main effects of NP2 (the QNP) in both early (e.g. first-pass reading times: $t=2.201$) and later measures, even though variable binding is precluded here due to the absence of c-command; these findings contradict those of Cunnings et al. (2015) for English. Only in later measures did we find evidence of participants' also considering NP1 (the definite matrix subject NP) as an antecedent.

Taken together, our results indicate that German readers are strongly guided by linear proximity in their search for an antecedent, irrespective of antecedent type and of an antecedent's relative structural and pragmatic salience. That said, our results from Experiment 2 can also be seen as providing experimental evidence for the possibility of linking a pronoun to a non c-commanding QNP (Barker, 2012). Consider example (3) (from Radó et al., to appear), which illustrates 'telescoping' out of a relative clause.

- (3) *Der Dozent, der fast jede Studentin_i faszinierte, las ihren_i Text nochmal Korrektur.*
'The lecturer who fascinated almost every student proofread her text again.'

Our findings corroborate and extend those reported by Radó et al. (to appear) by showing that a 'bound' reading of the pronoun in contexts such as (2) or (3) is not only possible but may also be attempted very quickly during processing, most likely aided by linear proximity.

References

- Barker, C. (2012). Quantificational binding does not require c-command. *Linguistic Inquiry* 43, 614-633.
- Cunnings, I., Patterson, C., & Felser, C. (2014). Variable binding and coreference in sentence comprehension: Evidence from eye movements. *Journal of Memory and Language* 71, 39-56.
- Cunnings, I., Patterson, C., & Felser, C. (2015). Structural constraints on pronoun binding and coreference: Evidence from eye movements during reading. *Frontiers in Psychology* 6:840. doi:10.3389/fpsyg.2015.00840
- Koornneef, A. (2008). Eye-catching anaphora. Utrecht: LOT International Dissertation Series.
- Reuland, E. (2011). *Anaphora and language design*. Cambridge, MA: MIT Press.
- Radó, A., Konietzko, A., & Sternefeld, W. (to appear). Telescoping in relative clauses: Experimental evidence. In M. Krifka & M. Schenner (eds.). *Reconstruction Effects in Relative Clauses*. Berlin: Akademie Verlag.
- Trompelt, H., & Felser, C. (2014). Variable binding and coreference in non-native pronoun resolution. In *Proceedings of BUCLD 38*. Somerville, MA: Cascadilla Press, 471-483.