Reconstruction in German A′-movement
An experimental investigation

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- major contributions
  - The first experimental investigation of reconstruction in German A′-movement
  - We propose an enhanced method to elicit coreference judgments
  - Reconstruction in German behaves differently from both English and what has been reported for German in the literature:
    - Condition C reconstruction is more robust than reported in recent experimental work on English
    - No evidence for an argument-/adjunct-asymmetry
    - Anaphor binding in both final and intermediate landing sites is possible
    - Logophoric anaphor binding may be (residually) possible after all

1 Background: Reconstruction in A′-movement

1.1 Theoretical aspects

- evidence for movement (movement vs. base-generation, cf., e.g., Aoun et al. 2001)
- Principle A: can be satisfied in different locations during the derivation:
  - evidence for intermediate movement steps: Barss (1986: 25), Fox (1999): SpecCP/SpecvP

    (1) [Which pictures of himself$_{i/j}$] did John$_i$ think __ Fred$_j$ liked __.
  - binding in the final landing site:

    (2) John$_i$ wonders [which picture of himself$_{i/j}$] Bill$_j$ likes __.
- Principle C: reconstruction to the lowest position obligatory

  (3) *[Which picture of John$_i$] do you think he$_i$ likes __.
- argument-/adjunct-asymmetries: only R-expressions inside arguments trigger Principle C effects, R-expressions inside adjuncts don't (merged late), cf. van Riemsdijk and Williams (1981: 201–204), Freidin (1986: 179), Lebeaux (1988, 1990, 1991), Fox (1999), Safir (1999):

  (4) a. *[Which claim that Mary had offended John$_i$]$_1$ did he$_i$ repeat __$_1$?
  b. [Which claim that offended John$_i$]$_1$ did he$_i$ repeat __$_1$

  (5) a. *[Which pictures of John$_i$] did he$_i$ destroy __?
  b. [Which pictures near John$_i$] did he$_i$ destroy __?
- predicate-/argument-asymmetries: predicates obligatorily reconstruct (contain trace of local subject/are non-referential), arguments do not (always), cf. Huang (1993), Heycock (1995)
  - asymmetry w.r.t. Principle A: no intermediate binding with predicates (vs. ex. (1)):

    (6) ... but [listen to each other$_{*i/j}$], they$_i$ say the kids$_j$ won't __.
  - distance effect: Principle C effects decrease with increasing distance between R-expression and pronoun (Huang 1993: 110, or even vanish, cf. Heycock 1995: 548ff.) under embedding with arguments but not with predicates:

    (7) a. ?*How many pictures of John$_i$ does he$_i$ think that I like __?
    b. ?How many pictures of John$_i$ do you think that he$_i$ will like __?

1.2 Empirical aspects

1.2.1 English

- data almost exclusively based on introspection
- Principle C in English: contested facts
  - Presence of Condition C effects under A′-movement questioned quite generally, cf. Heycock (1995), Fox (1999), Fischer (2002, 2004), Henderson (2007); cf. Safir (1999: 609)

    (8) a. [Whose criticism of Lee$_i$]$_1$ did he$_i$ choose to ignore __$_1$?
    b. [Which picture of John$_i$]$_1$ does he$_i$ like best __$_1$?
    c. [Most articles about Mary$_i$]$_1$ I am sure she$_i$ hates __$_1$.
    d. [That John$_i$ had seen the movie]$_1$ he$_i$ never admitted __$_1$.

  - argument-/adjunct-asymmetry
    - What qualifies as an argument/adjunct? Noun-complement clauses may not be complements after all (Stowell 1981); the status of PP-modifiers is contested; the clearest contrasts seem to involve event nominals, cf. Safir (1999: 589, note 1)
    - asymmetry has been generally called into question, cf. Fischer (2004: 161f.) for ex. showing reconstruction with adjuncts and non-reconstruction with arguments
- confounds:
  - logophoricity: once non-local binding (across intervening definite, quantificational subjects, sometimes without c-command) is possible, Principle A reconstruction with picture NPs ceases to be a diagnostic for movement/intermediate landing sites, cf. Pollard and Sag (1992: 267, 278), Reinhart and Reuland (1993: 681–685):

    (9) a. Bill$_i$ remembered that the Times had printed a picture of himself$_i$ in the Sunday edition.
    b. The picture of himself$_i$ in Newsweek dominated John$_i$'s thoughts.

  - implicit PRO (Principle A/C): Normally, both pronouns and reflexives are possible inside picture NPs, cf. (10-a); in some semi-idiomatic expressions, however, only the reflexive is possible, (10-b); possible explanation: these NPs contain an implicit PRO that binds the reflexive, cf. (10-c) → binding can obtain in the absence of reconstruction:

    (10) a. Lucie$_i$ saw a picture of her$_i$/herself$_i$.
    b. Lucie$_i$ told a story about *her$_i$/herself$_i$.
    c. Lucie$_i$ told [PRO$_i$ a story about *her$_i$/herself$_i$].

    → one should test nouns where a coreferential PRO is ruled out, either because the PRO would be disjoint, cf. (11), or because the noun is unaccusative and thus lacks an external argument (Bianchi 1999: 118–119, Cecchetto 2005: 16–18), cf. (12):

    (11) Arbeitnehmer$_i$ sollten Gerüchte über sich$_i$ nicht einfach ignorieren
    workers should.3PL rumors about self not simply ignore.INF
    'Workers shouldn't simply ignore rumours about themselves.'
    https://rp-online.de/leben/beruf/wie-man-auf-geruechte-richtig-reagiert_aid-22142659

(12) Il poeta descrive il [riflesso di se stesso$_i$] [che Narciso$_i$ vide __ nella fonte].
the poet describes the reflection of himself which Narcissus saw in.the fountain
'The poet describes the reflection of himself$_i$ that Narcissus$_i$ saw in the fountain.' *Italian*

- experimental work (Adger et al. 2017, Bruening and Al Khalaf to appear) provides evidence against Condition C reconstruction and argument-/adjunct- asymmetries, cf. appendix 3

1.2.2 German

- Principle A
  - no logophoric binding, cf. Kiss (2001: 186):

    (13) a. *Gernot$_i$ erinnerte sich daran, dass *die Zeit* ein Bild von
    Gernot remember.PST.3SG self there.on that the Z. a picture of
    sich$_i$ veröffentlicht hatte.
    self publish.PTCP have.PST.3SG
    'Gernot$_i$ remembered hat *the Zeit* published a picture of himself$_i$.'

    b. *Gernot$_i$ dachte, dass niemand ein Bild von sich$_i$ veröffentlichen
    Gernot think.PST.3SG that no.one a picture of self publish.INF
    wollte.
    want.PST.3SG
    'Gernot$_i$ thought that nobody would publish a picture of himself$_i$.'

    (14) a. *Das Foto von sich$_i$ in *der Zeit* beherrschte Peters$_i$ Gedanken.
    the picture of self in the Zeit dominate.PST.3SG Peter's thoughts
    'The picture of himself$_i$ in the *the Zeit* dominated Peter$_i$'s thoughts.'

    b. *Ihr$_i$ angenehmes Lächeln verleiht den meisten Fotos von sich$_i$ einen
    her pleasant smile give.3SG the most pictures of self an
    Ausdruck von Zuversicht.
    air of confidence
    'Her$_i$ pleasant smile gives most pictures of herself$_i$ an air of confidence.'

  - No binding in final ((15)) and intermediate ((16)) A′-positions ((16-a) is from Kiss 2001: 186, cf. Frey 1993: 136 for a similar ex.; other ex. from Salzmann 2017: 264f.; for Dutch, see van de Koot 2004: 187; for a case where intermediate binding is possible after all in German, cf. Frey 1993: 138):

    (15) a. Hans$_i$ fragt sich, [$_{CP}$ [welches Foto von *sich$_i$/ihm$_i$]$_1$ ich am besten
    John ask.3SG self which picture of self/him I the best
    $\_\__1$ mag].
    like.1SG
    'John$_i$ wonders which picture of himself$_i$/him$_i$ I like best.'

    b. Peter$_i$ denkt, [$_{CP}$ [dieses Buch über *sich$_i$/ihn$_i$]$_1$ fände ich $\_\__1$
    Peter thinks this book about self/him find.SBJV.1SG I
    interessant].
    interesting
    'Peter$_i$ thinks that this book about himself$_i$/him$_i$, I find interesting.'

    (16) a. [Das Buch über sich$_{*i/j}$]$_1$ glaubt der Urs$_i$ mag der Ulrich$_j$ $\_\__1$.
    the book about self believe.3SG the Urs like.3SG the Ulrich
    'This book about himself$_i$, Urs$_i$ thinks that Ulrich likes.'

    b. *Sich$_{i1}$ denkt Peter$_i$ immer, dass du $\_\__1$ magst.
    self think.3SG Peter always that you like.2SG
    'Himself$_i$ Peter$_i$ always thinks that you like.'

  → difference between G./Engl. w.r.t. intermediate binding linked to logophoricity
- Principle C effects in *wh*-movement/topicalization: robust according to Salzmann (2017)
- Experiment on binding in double objects: Featherston (2002): Dat binds Acc more readily than the other way around (falsifying the claims in the literature, cf. Grewendorf 1988)

2 Experiments: Reconstruction in German *wh*-movement

2.1 Method

- We did not directly ask for co-reference judgments as in Adger et al. (2017) as this may be unnatural for non-linguists and could lead subjects to engage in metalinguistic analysis
- We adapt the embedding method from Bruening and Al Khalaf (to appear):
  - indirect questions
  - Participants are presented with two potential antecedents for a pronoun: the R-expression inside the moved *wh*-phrase and an R-expression in the matrix clause
  - a question after the item then asks for the referent of the local subject

  → relatively natural task
- But we explicitly asked for each of the readings whether it is possible or not (two separate yes/no questions), as illustrated in the (translated) example below; cf. app. 1 for German ex.

Maria tells us how proud of Anna she is.		
Can this sentence be interpreted such that...		
...Mary is proud?	☐ Yes	☐ No
...Anna is proud?	☐ Yes	☐ No

  → explicit information about coreference possibilities

  → optionality can be captured; especially relevant for Principle A: binding in the final landing site and in intermediate positions
- In the questions, we did not use pronouns in order to exclude potential Principle A or C effects there. For example, we avoided asking questions like "Is Mary proud of Mary?" (cf. Featherston 2002, who used sentences like "Martin saw Martin" to enforce the intended reading in their experiment on binding in double objects).
- the order of referents in the answers was randomized
- We used SoSci Survey (www.soscisurvey.de) to create online questionnaires.
- We ran four experiments (32/48/36/36 participants, respectively).
- We used a Latin Square Design, with a 1:1 proportion of items and fillers (for a description of the fillers, see the appendix 2).

2.2 Design

Factors

- Principle C vs. Principle A
- DPs (arguments) vs. APs (predicates)
- in situ vs. moved
- distance (short, coord, emb 1, emb 2)
- R-expression inside argument vs. R-expression inside adjunct (DP-arguments only)

→ For an example of a complete item set, see appendix 1.

2.2.1 Principle C – Conditions

(17) Principle C: APs (predicates)

a. **Mary** tells (us) that she is very proud of **Anna**. *in situ*

b. **Mary** tells (us) [how proud of **Anna**] she is ___. *moved*

Principle C predicts: co-reference between *she* and *Anna* impossible.

(18) Principle C: DPs – R-exp. inside argument

a. **Mary** tells (us) that she saw a statue of **Anna**. *in situ*

b. **Mary** tells (us) [which statue of **Anna**] she saw ___. *moved*

Principle C predicts: co-reference between *she* and *Anna* impossible

(19) Principle C: DPs – R-exp. inside adjunct

a. **Mary** tells (us) that she saw a statue on the desk of **Anna**. *in situ*

b. **Mary** tells (us) [which statue on the desk of **Anna**] she saw ___. *moved*

Late Merger predicts: co-reference between *she* and Anna is *possible*

- argument vs. adjunct: R-expression contained in PP argument or PP adjunct to N
  - PP-arguments mostly involved selected prepositions: *an* 'at/to', *über* 'about', *für* 'for' etc.
  - ~50% of the nouns were event nominals (*ung*-derivations), ~50% were underived (e.g. statue, portrait, rumor) or verb-related (anger, hate, attack) → the former are more likely to take proper arguments (*ung*-derivations vs. other nouns did not end up behaving differently in the experiments)
  - a coreferential implicit PRO was ruled out (either unacc. noun or disjoint agent, cf. rumor)
- linear distance (local extraction): by means of NP-coordination, the linear distance between the R-expression and the pronoun in the *moved* condition was increased.

(20) a. **Mary** tells (us) [which statue of **Anna**] she saw ___. *short*

b. **Mary** tells (us) [which statue of **Anna** and the siblings] she saw ___. *coord*

- structural distance (another level of embedding):
  - 'embedding 1': R-expression and pronoun are not clausemates underlyingly.
  - 'embedding 2': R-expression and pronoun are clausemates underlyingly.

(21) a. **Mary** tells (us) [which statue of **Anna**] she thinks that you saw ___. *emb 1*

b. **Mary** tells (us) [which statue of **Anna**] you think that she saw ___. *emb 2*

- These conditions were adopted from Adger et al. (2017) and served to test the predictions of approaches in terms of Vehicle Change:
  - Ellipsis: R-expression in antecedent can correspond to pronoun in ellipsis site:

    (22) John likes Mary and she thinks that I do, too ⟨ like **her** ⟩.

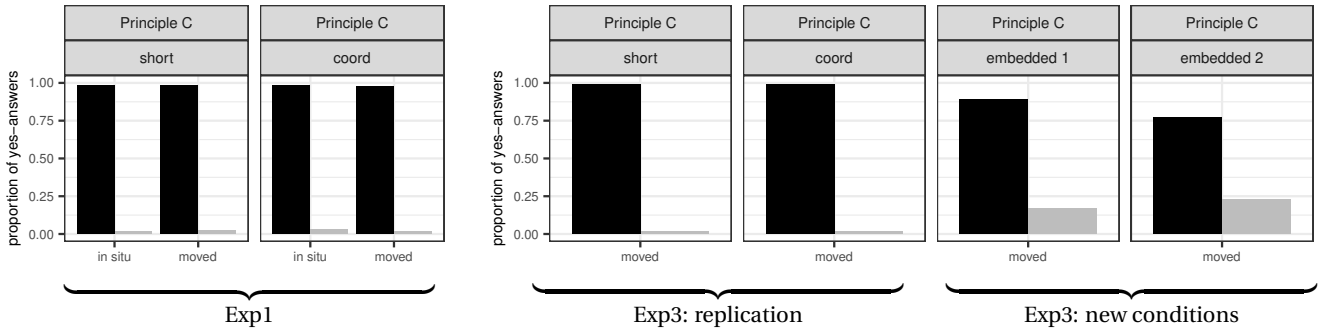
  - Vehicle change extended to A′-movement chains (Safir 1999): R-expression in higher copy can correspond to pronoun in lower copy.
  - Under Vehicle Change, the Principle C effect should vanish with nouns and adjectives, but in the 'embedding 2' structure, a Principle B effect should arise with adjectives (not with nouns):

    (23) a. How proud of Anna does she think that you are ⟨ how proud of her ⟩. *emb 1*

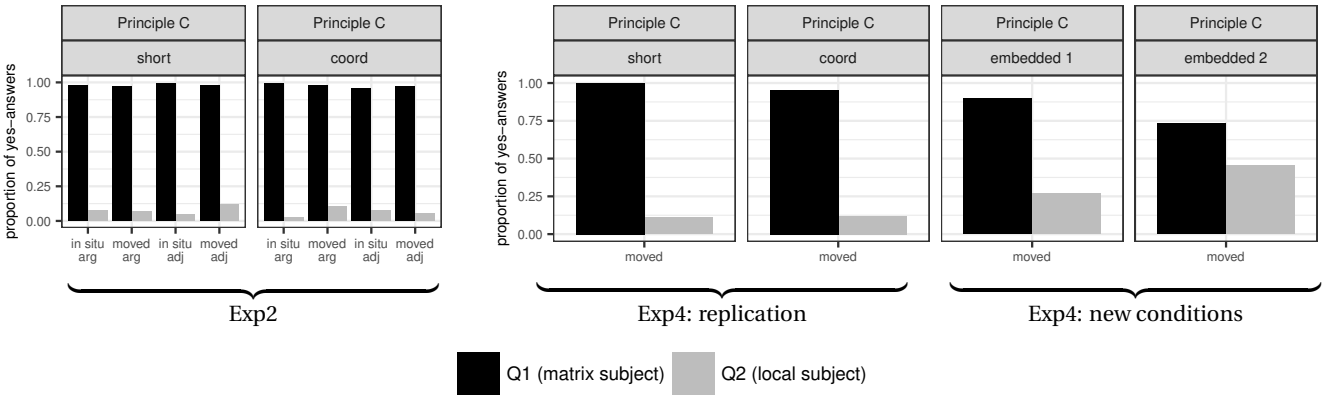
    b. *How proud of Anna do you think that she is ⟨ how proud of her ⟩. *emb 2*

2.2.2 Principle C – Results

PRINCIPLE C – APS



PRINCIPLE C – DPS



2.2.3 Principle C – Main findings[1]

- Reconstruction is very robust across conditions, and with both arguments and predicates[2]
- No support for the predicted argument-/adjunct-asymmetry (argues against a late-merger approach)[3]
- Significant effect of embedding (but not of linear distance),[4]
  but unlike in Adger et al. (2017), there remains a clear preference for non-coreference
- No evidence for vehicle change (reverse pattern: more acceptance of coreference with the lower R-expression for embedding 2 than embedding 1)

[1] All statistical results reported in this section are based on univariate GLMMs with yes-answers to Q2 (main indicator of Principle A/C violations) as the dependent variable. They were fit following the recommendations for identifying parsimonious models by Bates, Kliegl, Vasishth and Baayen (2015) using the R packages lme4 and lmerTest (R Core Team 2016, Bates, Mächler, Bolker and Walker 2015, Kuznetsova et al. 2017).

[2] No significant effect of/interaction with movement in the Principle C conditions of exp 1 (linear distance: z = 0.96, p = 0.33; movement: z = 0.52, p = 0.60; dist:mov: z = -1.04, p = 0.30; all binary factors sum-coded). See next footnote for a qualification concerning exp 2.

[3] In exp 2, there is a numerically small but significant three-way interaction between distance, movement, and arg./adj. (z = 2.83, p = 0.005): there is less reconstruction with adjuncts in the short conditions; in the coord. conditions, the opposite holds. But it is not the case that there is generally less reconstruction with adjuncts.

[4] In comparison to the short, local baseline increasing linear distance via coordination does not make a significant difference in exps 3 + 4, but embedding does (exp3: coord: z = -0.009, p = 0.99; emb1: z = 3.30, p < 0.001; emb2: z = 3.92, p < 0.001; exp 4: coord: z = 0.23, p = 0.81; emb1: z = 3.17, p = 0.002; emb2: z = 5.65, p < 0.001).

2.2.4 Principle A – Conditions

(24) Principle A: APs (predicates)

a. **Mary** tells (us) that **Anna** is very proud of herself. *in situ*

b. **Mary** tells (us) [how proud of herself] **Anna** is ___. *moved*

Principle A predicts: co-reference between *herself* and *Anna* possible (obligatory if AP contains trace of subject).

(25) Principle A: DPs

a. **Mary** tells (us) that **Anna** saw the statue of herself. *in situ*

b. **Mary** tells (us) [which statue of herself] **Anna** saw ___. *moved*

Principle A predicts: co-reference between *herself* and *Anna* possible.

- linear distance between anaphor and R-expression: increased by means of NP-coordination

(26) a. **Mary** tells (us) [which statue of herself] **Anna** saw ___. *short*

b. **Mary** tells (us) [which statue of herself and the teams)] **Anna** saw ___. *coord*

- structural distance: embedding
  - 'embedding 1': R-expression and anaphor are not clausemates underlyingly.
  - 'embedding 2': R-expression and anaphor are clausemates underlyingly.

(27) a. **Mary** tells (us) [which statue of herself] **Anna** thinks that you saw ___. *emb 1*

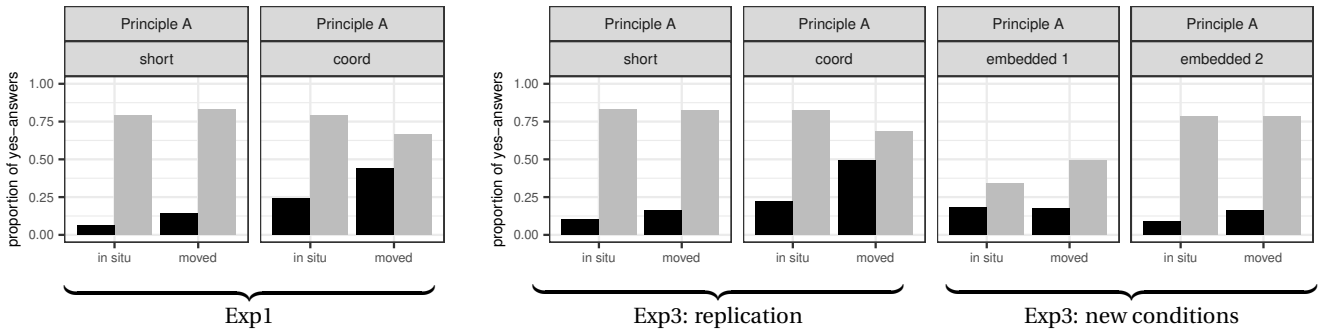
b. **Mary** tells (us) [which statue of herself] you think that **Anna** saw ___. *emb 2*

  - if full reconstruction is obligatory, *Anna* and *herself* can be co-referential only in emb 2
  - if binding in intermediate position is possible, *Anna* and *herself* can be co-referential in emb 1 as well (at least with DPs)
  - if Vehicle Change is possible (*herself* → *her*), *Anna* can be antecedent for *herself* in emb 1 without binding in intermediate position

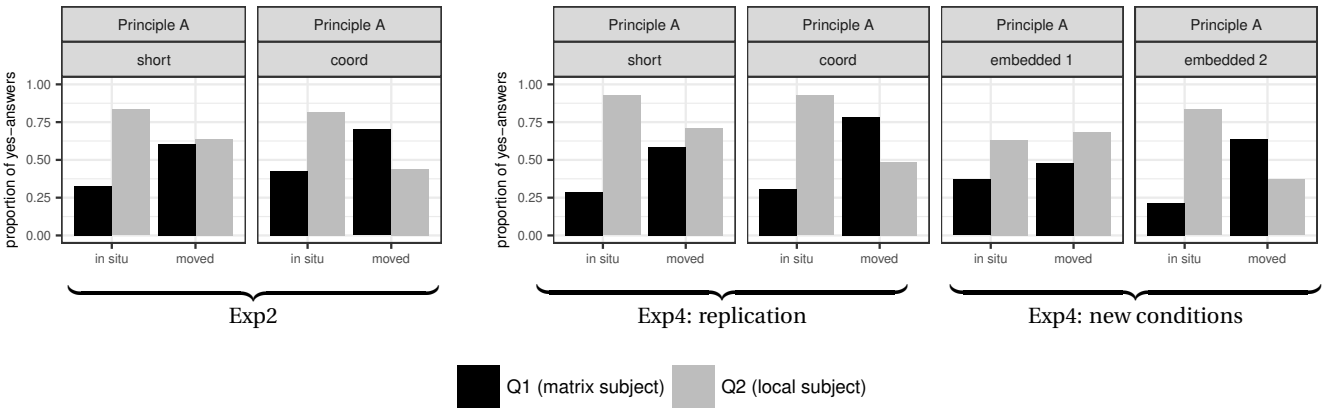
- Further predictions of Vehicle Change for Principle A
  - binding by matrix subject *Mary* possible (even if interpretation in final landing site impossible)
  - matrix binding should then only be possible in the moved condition but not in-situ (Vehicle Change only applies to movement chains)
  - Vehicle Change should have the same effect with APs and DPs (w.r.t. matrix and intermediate binding)

2.2.5 Principle A – Results

PRINCIPLE A – APS



PRINCIPLE A – DPS



2.2.6 Principle A – Main findings

- Reconstruction for Principle A is less systematic than for Principle C[5]
- Reconstruction for Principle A is more likely with predicates than with arguments
- APs (predicates): reconstruction all the way down preferred, but
  - intermediate binding accepted by 50% (argues against obligatory trace of subject within AP)
  - matrix binding much less acceptable: less than 20% [except with coord] (argues against vehicle change)
- DPs:
  - Intermediate binding accepted by 70% (against claims in the literature); fillers testing intermediate binding also showed a high acceptance rate: 65–87%
  - Matrix binding accepted by 50–60% (against claims in the literature)

  → Both argue against the presence of a silent PRO within DP

[5] Significant interaction between movement and linear distance in exp 1 (z = -2.44, p = 0.01) and exp 2 (z = -2.29, p = 0.02).

3 Further issues

Methodological insights:

- The findings from experiments 1 + 2 were replicated in experiments 3 + 4, supporting the reliability of our method.
- The responses to the fillers were consistent and mostly in line with the expectations (see appendix), confirming that subjects understood the task as intended and were paying attention.
- In experiment 3 + 4, we additionally collected acceptability ratings for the sentences (on a 1–7 scale), because the acceptability of long-distance movement varies between speakers. The ratings will allow us to potentially exclude speakers that do not accept this kind of structure, and to explore correlations between acceptability and coreference judgments: → A first inspection suggests that the patterns are robust even for items that received a low acceptability rating

Open issues

- With nominal arguments (exps 2/4), there is a surprisingly high proportion of matrix binding (around 30%) even in the short in situ condition. Can this be considered evidence for logophoric anaphor binding in German?
- For Principle A, the presence of coordination has a strong effect on the availability of matrix binding with adjectival predicates[6]. This could mean that a larger linear distance between the anaphor and the potential local binder makes this binding relation less likely. But then, the same effect would be expected for the 'embedding 2' structure; there, a similar increase of matrix binding is observed only for nominals, but not for adjectives.
- To do: more detailed analysis of the availability of matrix binding and its relation to the availability of local binding (multivariate statistical analysis including both Q1 and Q2 as dependent variables).

4 Conclusion

- Principle C
  - reconstruction is very robust across conditions, with both nouns and adjectival predicates
  - no argument-/adjunct asymmetry (against Late-Merger)
  - small effect of embedding, but (unlike in experiments on English) there remains a strong preference for non-coreference
- Principle A
  - reconstruction is less systematic than for Principle C
  - reconstruction is more likely with adjectival predicates than with nouns
  - nouns: binding in final and intermediate landing sites accepted to a high degree (against claims in the literature)

[6] According to a univariate GLMM with yes-answers to Q1 as the dependent variable, there was a significant effect of linear distance in exp 1: z = 3.25, p = 0.001.

References

Adger, David, Alex Drummond, David Hall and Coppe Van Urk (2017): Is there Condition C reconstruction?. *In:* A. Lamont and K. Tetzloff, eds, *NELS 47. Proceedings of the Fourty-Seventh Annual Meeting of the North East Linguistic Society. Volume 1*. GLSA, Amherst, pp. 21–30.

Aoun, Joseph, Lina Choueiri and Norbert Hornstein (2001): 'Resumption, Movement, and Derivational Economy', *Linguistic Inquiry* **32**(3), 371–403.

Barss, Andrew (1986): Chains and anaphoric Dependencies. Doctoral dissertation, MIT.

Bates, Douglas, Martin Mächler, Ben Bolker and Steve Walker (2015): 'Fitting linear mixed-effects models using lme4', *Journal of Statistical Software* **1**(67).

Bates, Douglas, Reinhold Kliegl, Shravan Vasishth and Harald Baayen (2015): 'Parsimonious Mixed Models'. arXiv:1506.04967 [stat.ME].

Bianchi, Valentina (1999): *Consequences of antisymmetry: Headed relative clauses*. Mouton de Gruyter, Berlin.

Bruening, Benjamin and Eman Al Khalaf (to appear): 'No argument-adjunct asymmetry in reconstruction for Binding Condition C', *Journal of Linguistics* .

Cecchetto, Carlo (2005): Reconstruction in relative clauses and the copy theory of traces. *In:* P. Pica, J. Rooryck and J. van Craenenbroeck, eds, *Linguistic Variation Yearbook 2005*. John Benjamins, Amsterdam, pp. 3–35.

Featherston, Sam (2002): 'Coreferential Objects in German: Experimental Evidence on Reflexivity', *Linguistische Berichte* **192**, 457–484.

Fischer, Silke (2002): Reanalyzing reconstruction effects: An optimality-theoretic account of the relation between pronouns and R-expressions. *In:* M. v. Koppen, E. Thrift, E. J. v. d. Torre and M. Zimmermann, eds, *Proceedings of Console IX*. SOLE, Leiden, pp. 68–81.

Fischer, Silke (2004): Towards an Optimal Theory of Reflexivization. Doctoral dissertation, University of Tübingen, Tübingen.

Fox, Danny (1999): 'Reconstruction, Binding Theory, and the Interpretation of Chains', *Linguistic Inquiry* **30**(2), 157–196.

Freidin, Robert (1986): Fundamental issues in the theory of binding. *In:* B. Lust, ed., *Studies in the Acquisition of Anaphora, Volume I*. Reidel, Dordrecht, pp. 151–188.

Frey, Werner (1993): *Syntaktische Bedingungen fur die semantische Interpretation: Über Bindung, implizite Argumente und Skopus*. Akademie, Berlin.

Grewendorf, Günther (1988): *Aspekte der deutschen Syntax. Eine Rektions-Bindungs-Analyse*. Narr, Tübingen.

Henderson, Brent (2007): 'Matching and Raising Unified', *Lingua: International Review of General Linguistics* **117**(1), 202–20.

Heycock, Caroline (1995): 'Asymmetries in Reconstruction', *Linguistic Inquiry* **26**(4), 547–570.

Huang, C. T. James (1993): 'Reconstruction and the Structure of VP: Some Theoretical Consequences', *Linguistic Inquiry* **24**(1), 103–138.

Kiss, Tibor (2001): Anaphora and Exemptness. A comparative treatment of anaphoric binding in German and English. *In:* D. Flickinger and A. Kathol, eds, *The Proceedings of the 7th International Conference on Head-Driven Phrase Structure Grammar*. CSLI Publications, Stanford, pp. 182–197.

Kuznetsova, Alexandra, Per B. Brockhoff and Rune H. B. Christensen (2017): 'lmerTest Package: Tests in Linear Mixed Effects Models', *Journal of Statistical Software* **13**(82).

Lebeaux, David (1988): Language Acquisition and the Form of the Grammar. Doctoral dissertation, UMass, Amherst, MA.

Lebeaux, David (1990): 'Relative clauses, licensing, and the nature of derivation', *Proceedings of NELS* **20**, 318–332.

Lebeaux, David (1991): Relative clauses, licensing, and the nature of the derivation. *In:* S. Rothstein, ed., *Syntax and Semantics 25. Perspectives on phrase structure: heads and licensing.* Academic Press, New York, pp. 209–239.

Pollard, Carl and Ivan A. Sag (1992): 'Anaphors in English and the Scope of Binding Theory', *Linguistic Inquiry* **23**(2), 261–303.

R Core Team (2016): 'R: A language and environment for statistical computing', https://www.R-project.org.

Reinhart, Tanya and Eric Reuland (1993): 'Reflexivity', *Linguistic Inquiry* **24**(4), 657–720.

Safir, Ken (1999): 'Vehicle Change and Reconstruction in A′-Chains', *Linguistic Inquiry* **30**(4), 587–620.

Salzmann, Martin (2017): *Reconstruction and Resumption in Indirect A'-dependencies. On the Syntax of Prolepsis and Relativization in (Swiss) German and beyond*. De Gruyter Mouton, Berlin.

Stowell, Tim (1981): Origins of Phrase Structure. Doctoral dissertation, MIT, Cambridge, MA.

van de Koot, Hans (2004): Explaining Barss's generalization. *In:* A. Neeleman and M. Pearce, eds, *UCL Working Papers in Linguistics 16 (2004)*. UCL, London, pp. 165–195.

van Riemsdijk, Henk and Edwin Williams (1981): 'NP-structure', *The Linguistic Review* **1**(2), 171–218.

5 Appendix 1: Items: original German version

Experiment 1: adjectival predicates (local movement)

(28) Principle A

a. **Maria** erzählt, dass **Anna** sehr stolz auf sich (und die Mannschaften) ist. *in situ*

b. **Maria** erzählt, [wie stolz auf sich (und die Mannschaften)] **Anna** ___ ist. *moved*

→ Q1: Kann man den Satz so verstehen, dass jmd stolz auf **Maria** (und die Mannsch.) ist?

→ Q2: Kann man den Satz so verstehen, dass jmd stolz auf **Anna** (und die Mannsch.) ist?

(29) Principle C

a. **Maria** erzählt, dass sie sehr stolz auf **Anna** (und die Mannschaften) ist. *in situ*

b. **Maria** erzählt, [wie stolz auf **Anna** (und die Mannschaften)] sie ___ ist. *moved*

→ Q1: Kann man den Satz so verstehen, dass **Maria** stolz ist?

→ Q2: Kann man den Satz so verstehen, dass **Anna** stolz ist?

Experiment 2: nominal arguments (local movement)

(30) Principle A

a. **Maria** erzählt, dass **Anna** die Statue von sich (und den Geschwistern) gesehen hat. *in situ*

b. **Maria** erzählt, [welche Statue von sich (und den Geschw.)] **Anna** ___ gesehen hat. *moved*

→ Q1: ...so verstehen, dass jmd eine Statue von **Maria** (und den Geschw.) gesehen hat?

→ Q2: ...so verstehen, dass jmd eine Statue von **Anna** (und den Geschw.) gesehen hat?

(31) Principle C (argument)

a. **Maria** erzählt, dass sie die Statue von **Anna** (und den Geschwistern) gesehen hat. *in situ*

b. **Maria** erzählt, [welche Statue von Anna (und den Geschw.)] sie ___ gesehen hat. *moved*

→ Q1: Kann man den Satz so verstehen, dass **Maria** eine Statue gesehen hat?

→ Q2: Kann man den Satz so verstehen, dass **Anna** eine Statue gesehen hat?

(32) Principle C (adjunct)

a. **Maria** erzählt, dass sie die Statue auf dem Tisch von **Anna** (und...) gesehen hat. *in situ*

b. **Maria** erzählt, [welche Statue auf dem Tisch von Anna (und...)] sie ___ gesehen hat. *moved*

→ Q1: Kann man den Satz so verstehen, dass **Maria** eine Statue gesehen hat?

→ Q2: Kann man den Satz so verstehen, dass **Anna** eine Statue gesehen hat?

Experiment 3: adjectival predicates (local and long-distance movement)

(33) Principle A (only additional conditions):

a. **Maria** erzählt, dass **Anna** denkt, dass du sehr stolz auf sich bist. *in situ, emb 1*

b. **Maria** erzählt, [wie stolz auf sich] **Anna** denkt, dass du ___ bist. *moved, emb 1*

→ Q1: Kann man den Satz so verstehen, dass du stolz auf **Maria** bist?

→ Q2: Kann man den Satz so verstehen, dass du stolz auf **Anna** bist?

c. **Maria** erzählt, dass du denkst, dass **Anna** sehr stolz auf sich ist. *in situ, emb 2*

d. **Maria** erzählt, [wie stolz auf sich] du denkst, dass **Anna** ___ ist. *moved, emb 2*

→ Q1: Kann man den Satz so verstehen, dass du denkst, dass jemand stolz auf **Maria** ist?

→ Q2: Kann man den Satz so verstehen, dass du denkst, dass jemand stolz auf **Anna** ist?

(34) Principle C (only additional conditions):

a. **Maria** erzählt, [wie stolz auf **Anna**] sie denkt, dass du ___ bist. *moved, emb 1*

→ Q1: Kann man den Satz so verstehen, dass **Maria** denkt, dass du stolz bist?

→ Q2: Kann man den Satz so verstehen, dass **Anna** denkt, dass du stolz bist?

b. **Maria** erzählt, [wie stolz auf **Anna**] du denkst, dass sie ___ ist. *moved, emb 2*

→ Q1: Kann man den Satz so verstehen, dass du denkst, dass **Maria** stolz ist?

→ Q2: Kann man den Satz so verstehen, dass du denkst, dass **Anna** stolz ist?

Experiment 4: nominal arguments (local and long-distance movement)

(35) Principle A (only additional conditions):

a. **Maria** erzählt, dass **Anna** denkt, dass du die Statue von sich gesehen hast. *in situ, emb 1*

b. **Maria** erzählt, [welche Statue von sich] **Anna** denkt, dass du ___ gesehen hast. *mvd, emb 1*

→ Q1: Kann man den Satz so verstehen, dass du eine Statue von **Maria** gesehen hat?

→ Q2: Kann man den Satz so verstehen, dass du eine Statue von **Anna** gesehen hast?

c. **Maria** erzählt, dass du denkst, dass **Anna** eine Statue von sich gesehen hat. *in situ, emb 2*

d. **Maria** erzählt, [welche Statue von sich] du denkst, dass **Anna** ___ gesehen hat. *mvd, emb 2*

→ Q1: ...so verstehen, dass du denkst, dass jmd eine Statue von **Maria** gesehen hat?

→ Q2: ...so verstehen, dass du denkst, dass jmd eine Statue von **Anna** gesehen hat?

(36) Principle C (only additional conditions):

a. **Maria** erzählt, [welche Statue von **Anna**] sie denkt, dass du ___ gesehen hast. *mvd, emb 1*

→ Q1: Kann man den Satz so verstehen, dass **Maria** denkt, dass du eine Statue gesehen hast?

→ Q2: Kann man den Satz so verstehen, dass **Anna** denkt, dass du eine Statue gesehen hast?

b. **Maria** erzählt, [welche Statue von **Anna**] du denkst, dass sie ___ gesehen hat. *mvd, emb 2*

→ Q1: Kann man den Satz so verstehen, dass du denkst, dass **Maria** eine Statue gesehen hat?

→ Q2: Kann man den Satz so verstehen, dass du denkst, dass **Anna** eine Statue gesehen hat?

6 Appendix 2: Fillers

- (Almost) the same filler materials were included in all four experiments.
- They were all constructed in such a way that two yes/no questions could be asked about their interpretation, to keep the task constant.
- Description of the filler groups:

1. Subject/object control

   Anja hat Markus versprochen, in der WG die Möbel umzustellen.
   'Anja promised Markus to rearrange the furniture in the shared apartment.'
   → Will Anja/Markus rearrange the furniture?

2. VP coordination (1/3: SVO, 2/4: OVS)

   Die Chefin rief den Assistenten an und machte sich Notizen. *SVO*
   'The boss[NOM] called the assistant[ACC] and took some notes.'
   → Did the boss/assistant take notes?

   Den Kollegen kritisierte die Ingenieurin und ging nach draußen. *OVS*
   'The colleague[ACC] criticized the engineer[NOM] and left.'
   → Did the colleague/engineer leave?

3. Relative clauses (1/3: non-ambiguous, 2/4: ambiguous)

   Peter hat erzählt, dass der Schüler, den er geärgert hat, eine Strafarbeit bekommen hat. *non-amb*
   'Peter told us that the student who he teased got a punishment.'
   → Did Peter/the student tease someone?

   Leyla hat erzählt, dass die Verwandte, die sie besucht hat, in Budapest wohnt. *amb*
   'Leyla told us that the relative {who she visited | who visited her} lives in Budapest.'
   → Did Leyla/the relative visit someone?

4. Case ambiguity

   Die Königin hat die Herzogin eingeladen.
   'The queen[ACC/NOM] invited the duchess[ACC/NOM].'
   → Did the queen invite someone?

5. PP attachment ambiguity

   Linus hat erzählt, dass er den Nachbarn mit dem Teleskop beobachtet.
   'Linus told us that he observes the neighbor with a telescope.'
   → Does the neighbor/Linus have/use a telescope?

6. Long movement

   Welches Bild von sich denkt Paula, dass Isabell hochgeladen hat?
   'Which picture of herself does Paula think that Isabell uploaded?'
   → Is the sentence about a picture of Paula/Isabell?

7. ECM

   Gustav hat erzählt, dass Karl und Jonas ihn Bücher einscannen ließen.
   'Gustav told us that Karl and Jonas had him scan books.'
   → Did Karl/Jonas scan books?

8. Coordinated dative

   Gabriel hat Egon und Lars erzählt, dass er nach München ziehen will.
   'Gabriel told Egon and Lars that he wants to move to Munich.'
   → Did Egon/Lars move to Munich?

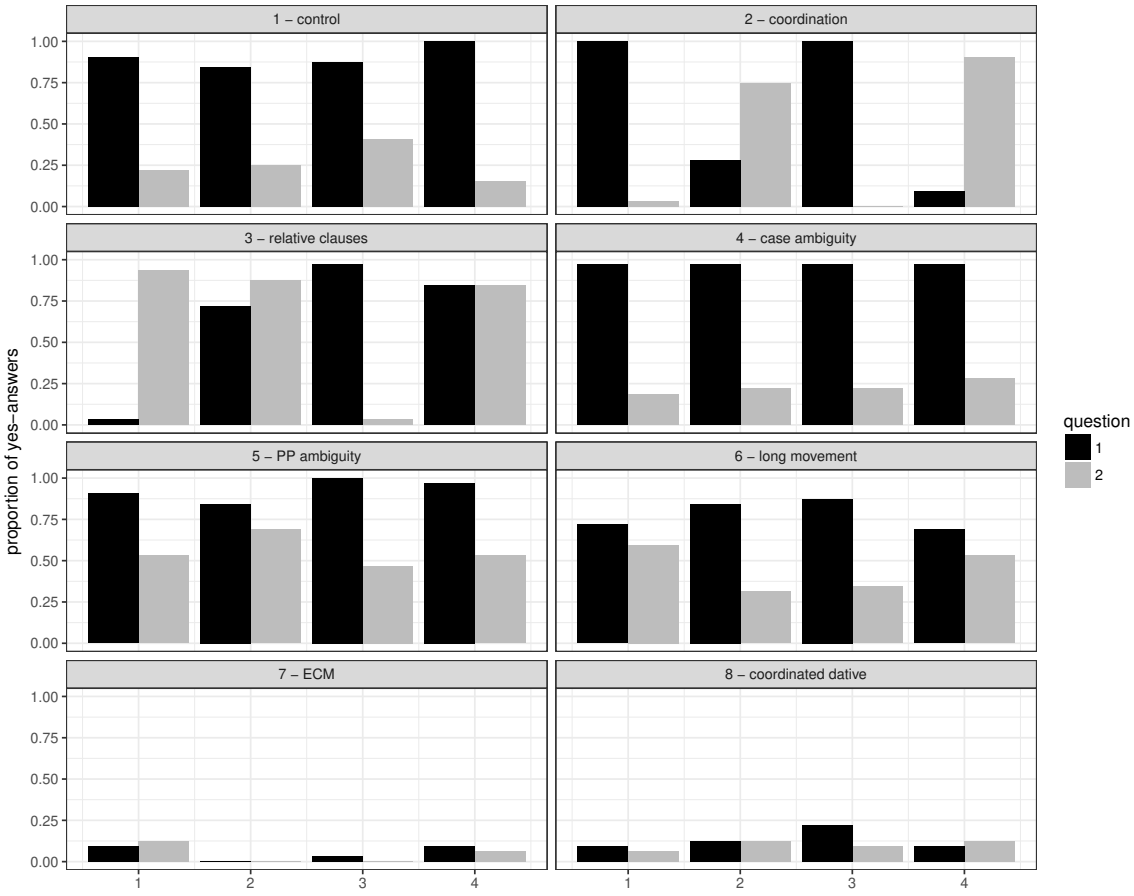


Figure 1: Results for the fillers (in experiment 1)

7 Appendix 3: Experimental work on Principle C in English

7.1 Adger et al. (2017)

7.1.1 Method

- Participants were explicitly asked for coreference judgments (forced-choice task):

> "To assess the availability of coreference, participants were presented with a sentence containing a pronoun and proper name. The pronoun and proper name were then highlighted. Participants were asked whether they could use the sentence when the two highlighted expressions referred to the same individual. They were given the option of answering Yes or No."

How proud of **Elizabeth** is **she**?
Could you use this sentence when the two highlighted expressions refer to the same individual?
☐ Yes ☐ No

7.1.2 Results

- predicates vs. arguments (R-expression inside PP-complemens):
  - predicates: robust reconstruction; coreference becomes slightly more acceptable under increasing distance between R-expression and pronoun (*pace* Huang 1993, who only observes this effect for arguments), but non-coreference remains preferred
  - arguments: weak Principle C effect under local extraction; coreference becomes even preferred once a clause-boundary is crossed (unlike with predicates), disconfirming the claims in the literature
- argument-/adjunct-asymmetries (R-expression inside complement clause vs. relative clause):
  - DP-arguments: Coreference is preferred with both arguments and adjuncts (contrary to claims in the literature); weak Condition C effect with complement clauses (more non-coreference answers than with adjuncts)
  - predicates: coreference preferred with both arguments and adjuncts; weak Condition C effect with complement clauses (more non-coreference answers than with adjuncts)
- distance effect: Condition C effect is weakest when the coreferential pronoun is in the embedded clause; scale: local mvt ≻ pronoun in matrix clause ≻ pronoun in embedded clause (evidence for linear distance: adding material in local extraction between R-expression and pronoun leads to same results as (37-b)):

(37) a. Which picture of John does **he** like?
b. Which picture of John does **he** think that Sue likes?
c. Which picture of John does Sue think that **he** likes?

7.2 Bruening and Al Khalaf (to appear)

7.2.1 Method

- Participants were not asked directly for coreference judgments but had to choose between two potential referents for a pronoun.

> A female staffer told everyone which of the announcements that Hillary Clinton was running for president she had actually authorized.
>
> *Who authorized the announcement?*
>
> ☐ the staffer ☐ Hillary Clinton

7.2.2 Results

- distance not investigated/not controlled for
- arguments vs. adjuncts (complement clauses/relative clauses to N): no significant contrast:
  - arguments: 42.7% accept coreference (only 57% Condition C)
  - adjuncts: 56% accept coreference (only 44% Condition C)
- arguments vs. adjuncts (PP-complements/PP-adjuncts to N): no significant contrast
  - arguments: 22% accept coreference (78% Condition C)
  - adjuncts: 30.7% accept coreference (69.3% Condition C)

7.3 Possible shortcomings of previous experiments

- Adger et al. (2017):
  - The task may be unnatural (for non-linguists) and may lead subjects to engage in metalinguistic analysis.
  - Remarkable differences between experiments that test for (non-)co-reference in local extraction: In Exp1, non-co-reference is clearly preferred, in Exp2, co-reference is preferred
- Bruening and Al Khalaf (to appear):
  - Since speakers can choose only one referent, coreference with the other referent cannot be ruled out with certainty; cannot diagnose optionality.
  - definiteness/prominence of R-expressions not controlled for: R-expression inside wh-phrase always definite, R-expression in matrix sometimes indefinite; R-expression inside wh-phrase often much more prominent than matrix R-expression (Hillary Clinton, Putin, president, Queen vs. reporter, secret service agent, literature professor, female aide)