

On reconstruction in German ATB movement and the optimization of experimental designs

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Outline

- 1 ATB movement and how it could be derived
- 2 Principle C reconstruction
- 3 Experimental investigation
- 4 Closing thoughts
- 5 Appendix

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- **A**cross-**T**he-**B**oard movement: one leftward extracted filler is shared among multiple gaps in a coordinate structure
- (sub-)extraction from all conjuncts 'across the board' (Coordinate Structure Constraint, Ross 1967)

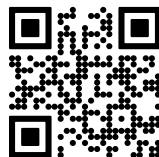
(1) [Which book] did John buy ___ and Mary read ___?

- can be the result of \bar{A} -movement (relativization, topicalization, wh-movement), A-movement (raising) or head movement
- syntactically peculiar **1:many dependency** – standard movement does not allow argument sharing without further assumptions

Derivation of ATB movement

Symmetric approaches: extraction from all gap sites

- *why is only one filler pronounced?*
- PF deletion (Wilder 1994; Biskup 2018)
- fusion (Ross 1967; Williams 1978; Hein & Murphy 2020)
- multidominance (Williams 1978; Citko 2005; Bachrach & Katzir 2009)



Asymmetric approaches: extraction from one of the gap sites

- *why are there multiple gaps?*
- empty OP movement in non-initial conjuncts (Munn 1992, 1993; Franks 1993, 2005; Bošković & Franks 2000)
- *pro* in non-initial conjuncts (Zhang 2010)
- ellipsis in non-initial (Salzmann 2012) or initial conjunct (Ha 2008)

Sideward movement: successive movement from non-initial *through* initial conjunct (Nunes 2001; Hornstein & Nunes 2002)

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Binding Principle C

- regular expressions (*Poirot, Hanna, the gardener*) cannot be bound by pronouns, i.e. they cannot co-refer with pronouns that c-command them

An R-expression is free.

Chomsky (1981, p. 188)

- (2) a. *He_i says that Poirot_i is leaving.
b. *He_i says [_{CP} that Miss Marple thinks [_{CP} that Jeeves claimed [_{CP} that Poirot_i is leaving]]].

Haegeman (1994, pp. 226–227)

- **reconstruction:** \bar{A} -moved constituents need to obey Principle C in their base positions → final and intermediate landing sites do not matter (Nissenbaum 2000, p. 33; Sportiche 2017, p. 31)

- (3) *[Which book about Hanna_i] did she_i like <which book about Hanna_i>?

- (conflicting) study results suggest it is a violable constraint (Adger et al. 2017; Bruening & Al Khalaf 2019; Stockwell et al. 2021, 2022; Salzmann et al. 2022)

Using Principle C to diagnose movement

- Principle C violations can reveal the base position(s) of a constituent
 - if an extracted R-expression cannot co-refer with a pronoun that linearly follows it, its structural base position must be c-commanded by the pronoun
- where is the filler of an ATB construction base generated?
 - in all conjuncts (symmetric + ellipsis approaches)
 - in the initial conjunct (asymmetric approaches)
 - in the non-initial conjunct (sideward movement)
- Principle C seems to reconstruct asymmetrically to the first conjunct (Citko 2005; Salzmann 2012)

- (4) a. *Which picture of John_i did he_i like and Mary dislike?
b. Which picture of John_i did Mary like and he_i dislike?

Citko (2005, p. 494)

→ *How robust is this observation within and across languages?*

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Logic of the argument

- the ATB-dependency is embedded in a matrix clause containing an R-expression (*I asked **Marie**...*)
 - extracted filler contains an R-expression (... *which story about **Laura**...*)
 - gap is preceded by pronoun (... **she** heard ___ and Michael passed on ___.)
 - 2x2 Latin Square, four conditions: filler is subject/object, pronoun precedes initial/non-initial gap
- **reconstruction of the filler** to the gap preceded by the pronoun should yield a **Principle C violation**, i.e. disjoint reference
- c-command relations are **only** reversed under reconstruction **in object conditions**

Experiment II

- (5) Ich habe Marie_i gefragt, [welche Geschichte über **Laura_j**]. . .
I have Marie asked which story about Laura

a. *object, initial*

sie_{i/?j} ____ gehört und Michael ____ weitererzählt hat.
she ____ heard and Michael ____ passed.on has

b. *object, non-initial*

Michael ____ weitererzählt und **sie_{i/?j}** ____ gehört hat.
Michael ____ passed.on and she ____ heard has

c. *subject, initial*

____ **sie_{i/?j}** entzückt und ____ Michael überrascht hat.
her delighted and Michael surprised has

d. *subject, non-initial*

____ Michael überrascht und ____ **sie_{i/?j}** entzückt hat.
Michael surprised and her delighted has.

Experiment III

Can the sentence be understood such that...

- Marie heard a story? yes/no (matrix referent)
- Laura heard a story? yes/no (embedded referent)
Salzmann et al. (2022)
- 300 German native speakers were tested, $n = 277$ after exclusions
- 12 experimental items in 4 conditions, 24 distractors
- questions presented in random order to avoid bias
- generalized linear mixed effects model using R
 - fixed effects PHRASE, POSITION, PHRASE \times POSITION
 - random effects for PHRASE and POSITION for both participants and items

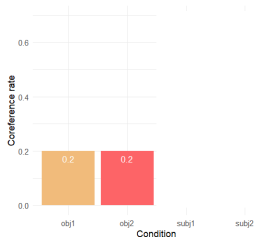
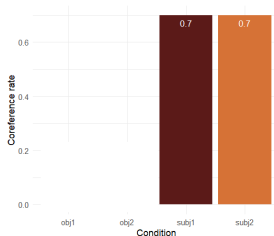
Predictions

Does the experiment measure what it should, i.e. c-command relations?

- significant effect of PHRASE (subject/object)

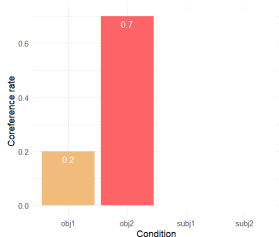
Does the filler reconstruct to either or both gaps?

- **symmetric reconstruction**: no significant interaction between PHRASE and POSITION

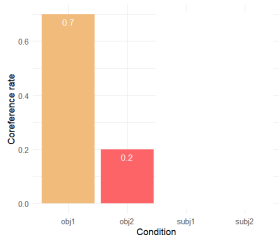


Predictions II

→ **asymmetric reconstruction to initial gap:** significant interaction between PHRASE and POSITION, disjoint reference if pronoun precedes initial gap

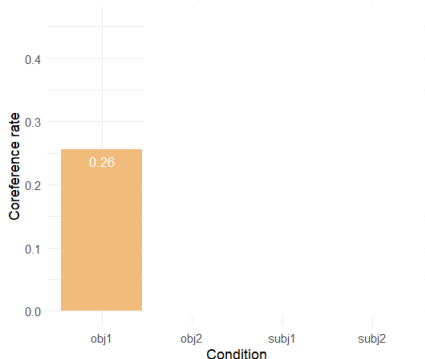


→ **asymmetric reconstruction to non-initial gap:** significant interaction between PHRASE and POSITION, disjoint reference if pronouns precedes the non-initial gap



Results

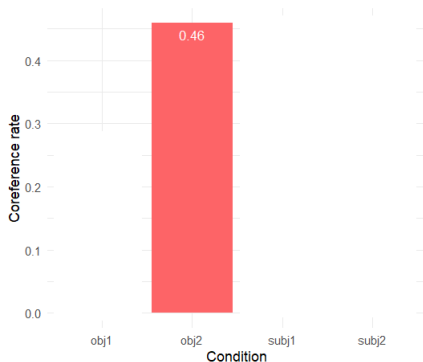
- (6) Ich habe Marie_i gefragt, [welche Geschichte über **Laura**_j] sie_{i/?j} — gehört
I have Marie asked which story about Laura she — heard
und Michael — weitererzählt hat.
and Michael — passed.on has



- in 26% of the observations in the condition *object, initial*, the pronoun and the R-expression can co-refer

Results II

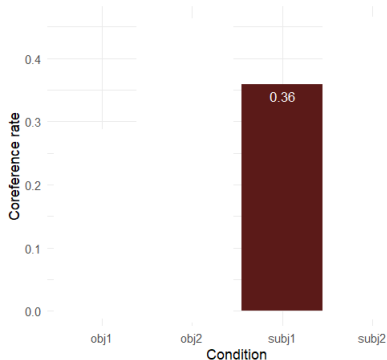
- (7) Ich habe Marie_i gefragt, [welche Geschichte über **Laura**_j] Michael ____
I have Marie asked which story about Laura Michael ____
weitererzählt und sie_{i/?j} ____ gehört hat.
passed.on and she ____ heard has



- in 46% of the observations in the condition *object, non-initial*, the pronoun and the R-expression can co-refer

Results III

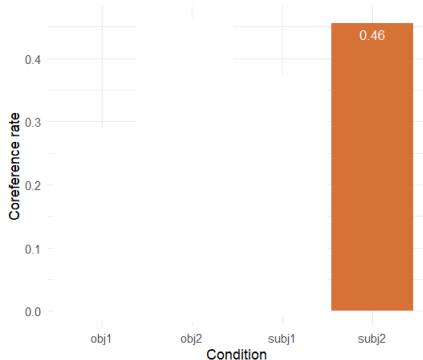
- (8) Ich habe Marie_i gefragt, [welche Geschichte über **Laura**_j] — **sie**_{i/?j} entzückt.
I have Marie asked which story about Laura her delighted
und — Michael überrascht hat.
and — Michael surprised has



- in 36% of the observations in the condition *subject, initial*, the pronoun and the R-expression can co-refer

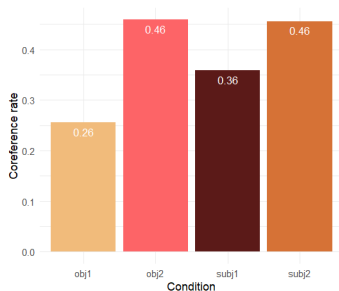
Results IV

- (9) Ich habe Marie_i gefragt, [welche Geschichte über **Laura**_j] — Michael
I have Marie asked which story about Laura — Michael
überrascht und — **sie**_{i/?j} entzückt hat.
surprised and — her delighted has.



- in 46% of the observations in the condition *subject, non-initial*, the pronoun and the subject can co-refer

Results V



GLMM			
(Intercept)	0.94***	(0.15)	
phrase	0.69***	(0.18)	
position	-0.61***	(0.15)	
phrase:position	-0.72***	(0.18)	

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

- significant main effect of PHRASE
- experiment is valid ✓
- significant interaction of PHRASE and POSITION
- **support for asymmetric extraction from initial gap ✓**
- significant main effect of POSITION! ✗
- unexpected under purely syntactic account
- contrast between subject vs. object conditions is present, but quite weak

Further ideas and possible improvements

How can the validity of the experiment be improved?

- matrix referent (or question about it) could be distracting
- complexity of task
- entirely different verbs in subject vs. object conditions

Solution: pilot studies addressing these methodological issues

- pilot 1: matrix referent is present, but not assessed for co-reference
- pilot 2: no matrix referent, no embedding, no context, forced choice between referent in filler or 'someone else' (similar to Stockwell et al. 2021, 2022)
- *X surprised Y* (subject) vs. *Y found X surprising* (object) (Salzmann et al. 2022)

There may be inter-individual variability

- some participants may show reconstruction effects more reliably than others
- maybe it is not the robustness of the effect overall, but a matter of different speaker profiles

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Closing thoughts

- support for **asymmetric extraction** approach targeting the **initial gap**
- syntax is seen as absolute – a c-command relation holds or not, a configuration either violates a principle or not
- in reality, things are much more nuanced and subject to **non-syntactic influences** (Gordon & Hendrick 1998; Järvikivi et al. 2005; Cowles et al. 2007; Kaiser 2011; Cummings et al. 2014, 2015; Kush et al. 2015)
 - further topic: effect of POSITION due to proximity effect
- in ATB constructions, linear and structural distance overlap
- distinguish linear vs. structural distance in parasitic gap constructions by manipulating position of the adjunct clause

- (10) a. Which paper by John_i did Mary file __ **without showing him_i pg?**
b. Which paper by John_i, **without showing him_i pg**, did Mary file __?

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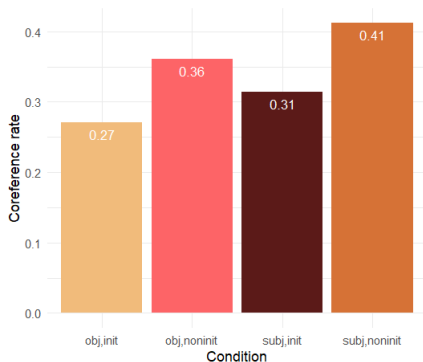
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Appendix

Pilot 1: Principle C reconstruction in ATB

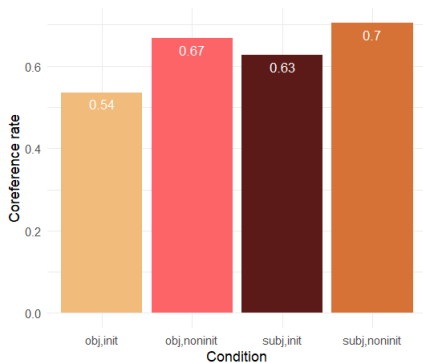


- n = 61, 12 original items + 12 more
- verbs adjusted to match across conditions
- one task per item: can the R-expression in the filler and the pronoun co-refer? yes/no
- significant effect of POSITION, no significant effect of PHRASE, no significant interaction

■ original results: obj1 0.26, obj2 0.46, subj1 0.36, subj2 0.46

Appendix II

Pilot 2: Principle C reconstruction in ATB

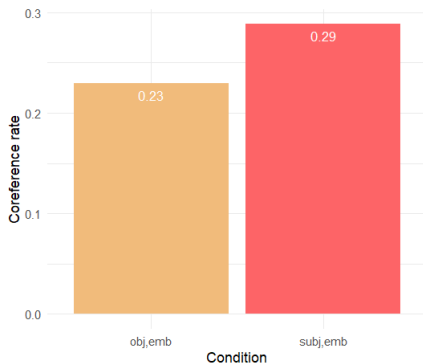


- $n = 60$, 12 original items + 12 more
- verbs adjusted to match across conditions
- one task per item: who does the pronoun refer to? R-expression in filler/someone else (no embedding, no context)
- significant effect of PHRASE and POSITION, no significant interaction

■ original results: obj1 0.26, obj2 0.46, subj1 0.36, subj2 0.46

Appendix III

Replication of experiment 2 from Salzmann et al. (2022)

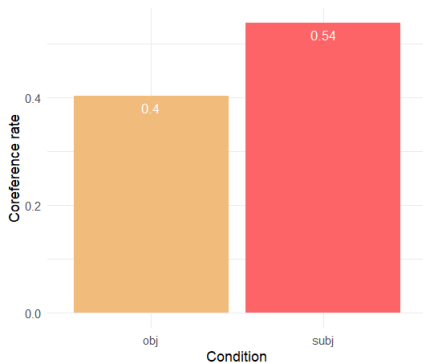


- $n = 61, 32$ items
- one task per item: can the R-expression in the filler and the pronoun co-refer? yes/no
- no significant effect of PHRASE

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Appendix IV

Replication of experiment 2 from Salzmann et al. (2022)



- $n = 60$, 32 items
- one task per item: who does the pronoun refer to? R-expression in filler/someone else (no embedding, no context)
- significant effect of PHRASE

■ original results: obj 0.36, subj 0.5

Is there Principle C reconstruction?

- depends on the design of the study
 - omission of matrix referent increases co-reference rate with embedded referent regardless of syntactic configuration
- bias to resolve pronominal reference (Gordon & Hendrick 1998)
 - forced choice tasks between two referents are bound to be inconclusive
- they depict preferences, not possibilities (cf. Adger et al. 2017; Bruening & Al Khalaf 2019)
 - difference between designs has greater impact in more complex structures, i.e. ATB movement
- could it be that once the syntactic structure is (too) complex, pragmatic cues are weighted even higher? (weighted retrieval cues, for an overview see Yadav et al. 2022)