

# 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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# ATB movement

- **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)

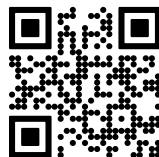
(1) [Which book] did John buy \_\_\_ and Mary read \_\_\_?

- 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

- **Principle C:** an R-expression must be free (Chomsky 1981)

- (2) a. \*He<sub>i</sub> says that Poirot<sub>i</sub> is leaving.  
b. \*He<sub>i</sub> says [<sub>CP</sub> that Miss Marple thinks [<sub>CP</sub> that Jeeves claimed [<sub>CP</sub> that Poirot<sub>i</sub> is leaving]]].  
Haegeman (1994, pp. 226–227)

- pre-requisite of binding: **c-command**

→ referential expressions (*Poirot, Hanna, the gardener*) cannot be bound by pronouns

- **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<sub>i</sub>] did she<sub>i</sub> like <which book about Hanna<sub>i</sub>>?

- (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

*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 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, it reconstructs to a position **c-commanded by the pronoun**

*Principle C reconstructs asymmetrically in ATB (Citko 2005; Salzmann 2012)*

- (4) a. \*Which picture of John<sub>i</sub> did he<sub>i</sub> like and Mary dislike?  
b. Which picture of John<sub>i</sub> did Mary like and he<sub>i</sub> dislike?

Citko (2005, p. 494)

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

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# Experiment

## *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<sub>i</sub> gefragt, [welche Geschichte über **Laura<sub>j</sub>**]. . .  
I have Marie asked which story about Laura

a. *object, initial*

**sie<sub>i/?j</sub>** \_\_\_\_ gehört und Michael \_\_\_\_ weitererzählt hat.  
she \_\_\_\_ heard and Michael \_\_\_\_ passed.on has

b. *object, non-initial*

Michael \_\_\_\_ weitererzählt und **sie<sub>i/?j</sub>** \_\_\_\_ gehört hat.  
Michael \_\_\_\_ passed.on and she \_\_\_\_ heard has

c. *subject, initial*

\_\_\_\_ **sie<sub>i/?j</sub>** entzückt und \_\_\_\_ Michael überrascht hat.  
her delighted and Michael surprised has

d. *subject, non-initial*

\_\_\_\_ Michael überrascht und \_\_\_\_ **sie<sub>i/?j</sub>** 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 (filler 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

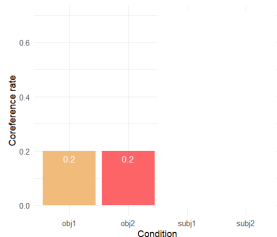
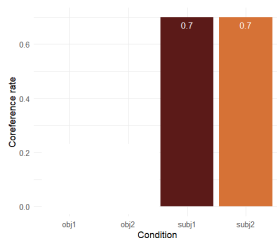
# Predictions

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

- significant effect of PHRASE (subject/object)

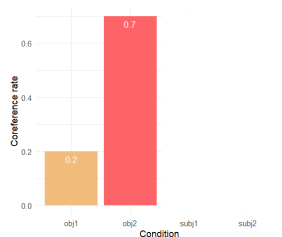
*Does the filler reconstruct to either or both gaps?*

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

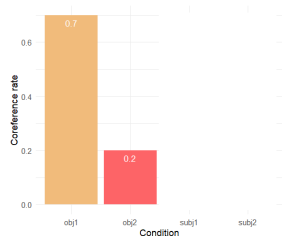


# Predictions II

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



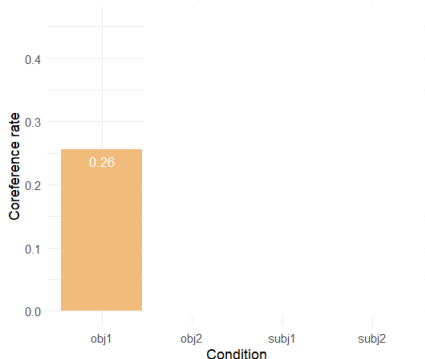
→ **asymmetric reconstruction to non-initial gap:** significant interaction between PHRASE and POSITION, disjoint reference if pronouns precedes the non-initial gap





# Results

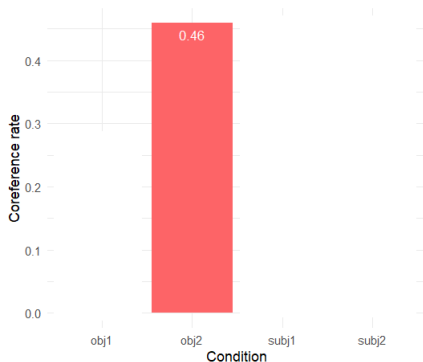
- (6) Ich habe Marie<sub>i</sub> gefragt, [welche Geschichte über **Laura**<sub>j</sub>] sie<sub>i/?j</sub> — gehört  
I have Marie asked which story about Laura she — heard  
und Michael — weitererzählt hat.  
and Michael — passed.on has



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

# Results II

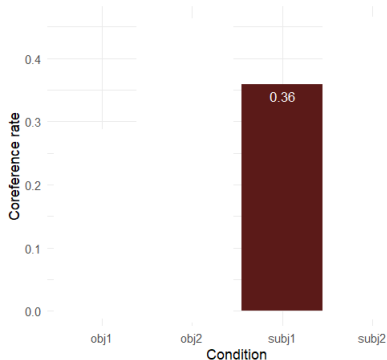
- (7) Ich habe Marie<sub>i</sub> gefragt, [welche Geschichte über **Laura**<sub>j</sub>] Michael \_\_\_\_  
I have Marie asked which story about Laura Michael \_\_\_\_  
weitererzählt und sie<sub>i/?j</sub> \_\_\_\_ gehört hat.  
passed.on and she \_\_\_\_ heard has



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

# Results III

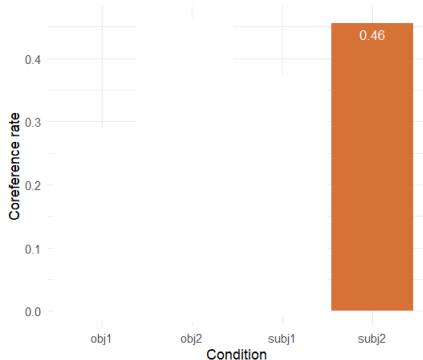
- (8) Ich habe Marie<sub>i</sub> gefragt, [welche Geschichte über **Laura**<sub>j</sub>] — sie<sub>i/?j</sub> entzückt.  
I have Marie asked which story about Laura — her delighted  
und — Michael überrascht hat.  
and — Michael surprised has



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

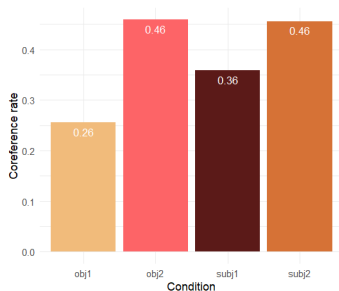
# Results IV

- (9) Ich habe Marie<sub>i</sub> gefragt, [welche Geschichte über **Laura**<sub>j</sub>] — Michael  
I have Marie asked which story about Laura — Michael  
überrascht und — **sie**<sub>i/?j</sub> 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; Cunnings 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<sub>i</sub> did Mary file \_\_ without showing him<sub>?i</sub> pg?  
b. Which paper by John<sub>i</sub>, without showing him<sub>?i</sub> pg, did Mary file \_\_?

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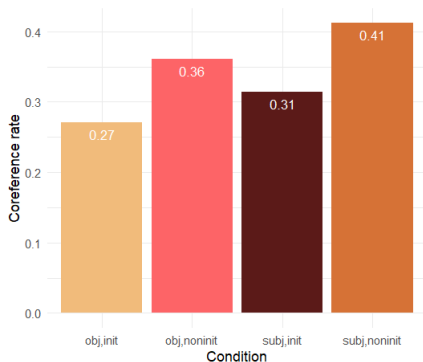
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# Appendix

## *Pilot 1: Principle C reconstruction in ATB*

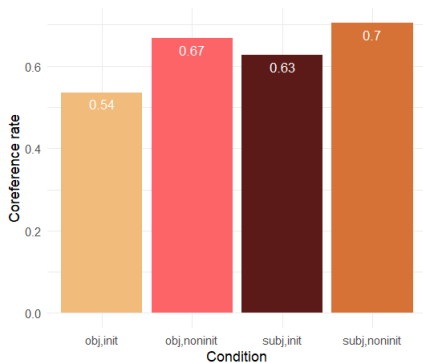


- n = 61, 12 original items + 12 more
- verbs adjusted to match across conditions
- one task per item: can the R-expression in the filler and the pronoun co-refer? yes/no
- significant effect of POSITION, no significant effect of PHRASE, no significant interaction

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

# Appendix II

## *Pilot 2: Principle C reconstruction in ATB*



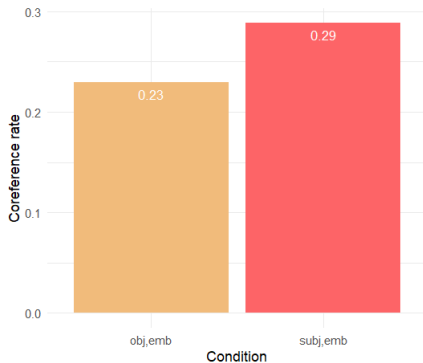
- $n = 60$ , 12 original items + 12 more
- verbs adjusted to match across conditions
- one task per item: who does the pronoun refer to? R-expression in filler/someone else (no embedding, no context)
- significant effect of PHRASE and POSITION, no significant interaction

■ 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)*

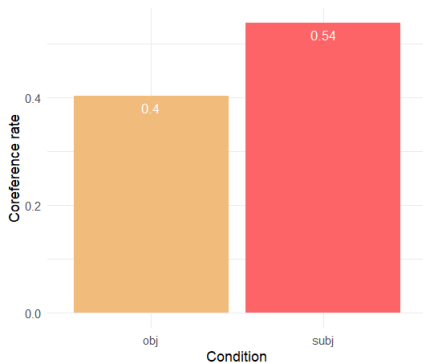


- $n = 61, 32$  items
- one task per item: can the R-expression in the filler and the pronoun co-refer? yes/no
- no significant effect of PHRASE

■ original results: obj 0.36, subj 0.5

# 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 inconclusive
- they depict preferences, not possibilities (cf. Adger et al. 2017; Bruening & Al Khalaf 2019)
  - difference between designs seems to have 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)