Condition A Reconstruction in German A′-movement. An empirical investigation*

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1. Introduction

Reconstruction effects, whereby a constituent is not interpreted in its surface position but rather in a lower position, have played an important role in linguistic theory. They are taken to indicate that the filler is linked to the position it is semantically interpreted in by means of a movement dependency (rather than by base-generation, Aoun et al. 2001).

Investigating Principle A in movement dependencies is of particular interest because it can apparently be satisfied at different points of the derivation: in the base position or in intermediate positions (SpecCP) as in (1a) (cf. Barss 1986, 25), and also in the final landing site, cf. (1b), thus providing evidence for successive-cyclic movement:

(1) a. [Which picture of himself i/j] did John i think __ Fred j liked __.
    b. John i wonders [which picture of himself i/j] Bill j likes __.

Another intriguing aspect of Condition A reconstruction is that, while it is apparently optional with DP-arguments as in (1), it has been claimed to be obligatory with predicates (because they contain the trace of the local subject, cf. Huang 1993/because predicates are non-referential, cf. Heycock 1995). This can be seen in the fact that intermediate binding is unavailable with anaphors contained in predicates:

(2) ... but [listen to each other i/j], they i say the kids j won’t __.

Diagnosing reconstruction for Principle A requires some care since there are possible confounds that need to be ruled out: First, some languages, e.g., English, allow for logophoric, *

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viz., non-local binding (across intervening definite, quantificational subjects, even without c-command) by a perspective/attitude holder, see (3) (Pollard & Sag 1992, 272, 278):

(3)  
a. Bill, remembered that the Times had printed a picture of himself, in the Sunday edition.

b. The picture of himself, in Newsweek dominated John,’s thoughts.

Once this is possible, Principle A reconstruction with NP-internal anaphors ceases to be a diagnostic for movement/intermediate landing sites, cf. Pollard & Sag (1992), Reinhart & Reuland (1993, 681–685).

Second, implicit PROs have to be ruled out: Normally, both pronouns and reflexives are possible inside picture NPs, cf. (4a); in some semi-idiomatic expressions, however, only the reflexive is possible, (4b). A possible explanation for this is that these NPs contain an implicit PRO that binds the reflexive, cf. Reinhart & Reuland (1993, 661, 685):

(4)  
a. Lucie, saw a picture of her/herself,

b. Lucie, told a story about *her/herself, → [PRO a story about *her/herself].

With implicit PROs, binding can obtain in the absence of reconstruction so that such data do not represent evidence for movement. One should therefore test nouns where a coreferential PRO is ruled out, either because the PRO would be disjoint, cf. (5) (German), or because the noun is unaccusative and thus lacks an external argument (Bianchi 1999, 118–119, Cecchetto 2005, 16–18), cf. (6) (Italian):

(5)  
Arbeitnehmer, sollten Gerüchte über sich, nicht einfach ignorieren.

‘Workers shouldn’t simply ignore rumours about themselves.’

https://rp-online.de/leben/beruf/wie-man-auf-geruechte-richtig-reagiert_aid-22142659

(6)  
Il poeta descrive il riflesso di se stesso, che Narciso, vide nella fonte.

‘The poet describes the reflection of himself, that Narcissus, saw in the fountain.’

We focus on Condition A in German in this paper because logophoric binding is impossible in the language so that one problematic confound can be avoided (cf. Kiss 2001, 186):

(7)  
a. *Gernot erinnerte sich daran, dass die Zeit ein Bild von sich, publiziert hatte.


‘The picture of himself, in the Zeit dominated Peter,’s thoughts.’
Interestingly, according to the literature, there is no binding in final (8) and intermediate (9) $A'$-positions in German ((8) and (9b) are from Salzmann 2017, 264f.; (9a) is from Kiss 2001, 186, cf. Frey 1993, 136 for a similar example; for a case where intermediate binding is possible after all in German, cf. Frey 1993, 138):

(8) a. Hans$_i$ fragt *sich$_i$/ihn$_i$ ich *mag.
   John$_i$ asks which picture of self/him I like.
   ‘John$_i$ wonders which picture of himself/him I like.’

b. Peter$_i$ denkt, *sich$_i$/ihn$_i$ fände *mag.
   Peter$_i$ thinks this book about self/him I find.
   ‘Peter$_i$ thinks that this book about himself/him, I find interesting.’

(9) a. [Das Buch über *sich$_i$/ihn$_i$]$_i$ glaubt der Urs$_i$ mag der Ulrich$_i$ *mag.
   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$_i$$_i$ denkt Peter$_i$ immer, dass du *magst.
   self think.3SG Peter always that you like.
   ‘Himself$_i$, Peter$_i$ always thinks that you like.’

The comparison of the German and English data crucially suggests that there is a causal link between binding by matrix and intermediate subjects and logophoricity: Arguably, these binding options are only possible because the reflexive can be bound non-locally, but not because the pronoun is actually interpreted in positions other than the base position. This suggests that reflexives are only interpreted in the base-position of the $A'$-movement chain. If this reasoning is correct, argument-structure-based approaches to binding become an alternative to approaches that rely on c-command. Furthermore, an important diagnostic for intermediate movement steps is no longer valid. It is therefore vital to show that the German data are robust, which so far are exclusively based on introspection. In the rest of the paper we report on the first experimental study on reconstruction for Principle A in German $A'$-movement. We will show that at least with DP-arguments, binding in final landing sites is accepted to a much higher degree than suggested in the literature, thereby providing evidence in favor of c-command based accounts of anaphor binding after all.

2. An experimental investigation of Condition A reconstruction

2.1 Participants and procedure

Methodologically, our study builds upon Bruening & Al Khalaf’s (2019) empirical investigation of Principle C in English. In their study, participants were not directly asked to provide coreference judgments, but answered an alternative question about possible readings of an embedded question involving a pronoun with two potential antecedents (forced choice). We follow the authors’ reasoning that this is a relatively natural task which does
not require explaining terms like \((co)reference\), but we adapt the method slightly: instead of a single alternative question, we ask two separate yes/no questions. We thus obtain explicit information about the coreference possibilities, while also capturing potential optionality. As the following translated example illustrates, in our case the two questions concern potential antecedents for a reflexive, where one R-expression is in the matrix clause and one in the embedded clause. To avoid binding within the answers (such as \(Is\ Mary\ proud\ of\ Mary\?)\(^1\), the subject in the answer is always somebody. We will refer to the question about the matrix subject (\textit{Mary}) as Q1, and to the question about the embedded subject (\textit{Anna}) as Q2.

<table>
<thead>
<tr>
<th>Mary tells us how proud of herself Anna is.</th>
</tr>
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<tbody>
<tr>
<td>\textit{Can this sentence be interpreted such that...}</td>
</tr>
<tr>
<td>(\ldots\text{someone is proud of Mary?}) &amp; (\square\ Yes) &amp; (\square\ No)</td>
</tr>
<tr>
<td>(\ldots\text{someone is proud of Anna?}) &amp; (\square\ Yes) &amp; (\square\ No)</td>
</tr>
</tbody>
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The order of referents in the answers was randomized. We used SoSciSurvey (Leiner 2018) to create online questionnaires. In total, we ran four experiments with 32/48/36/36 native speakers of German, respectively. All of them were recruited at the University of Potsdam and received course credit or payment for participation.

2.2 Design and materials

In all four experiments, we manipulated the factor \textit{MOVEMENT} (\textit{in situ} vs. \textit{moved}; i.e., is the anaphor in situ or within a moved \textit{wh}-phrase) and \textit{DISTANCE} (\textit{short} vs. \textit{coord}; i.e., is the distance between the R-expression and the anaphor short or extended via insertion of a coordination). In experiment 1, we tested this for APs (predicates) and in experiment 2 for DPs (arguments). In experiments 3 and 4, we replicated a part of the first two experiments, and included two additional levels of \textit{DISTANCE} (two different types of embedding in order to test the effect of structural distance).\(^2\) (10) illustrates how \textit{MOVEMENT} was manipulated.

\begin{enumerate}[a.]
\item \textbf{Mary} tells (us) that \textbf{Anna} is very proud of \textbf{herself}. \textit{in situ}
\item \textbf{Mary} tells (us) \[ how proud of \textbf{herself} \] \textbf{Anna} is \_. \textit{moved}
\end{enumerate}

\(^1\)Cf. Featherston (2002), who used sentences like “Martin saw Martin” to enforce the intended reading in their experiment on binding in double objects.

\(^2\)The results reported here represent a subset of the tested materials. In all experiments, there were further conditions, in which we investigated reconstruction for Principle C, which turned out to be more robust than reconstruction for Principle A and more robust than what was reported in the experiments on English mentioned above. We report on these results in Georgi et al. (2018).

\(^3\)This is a direct translation of one of our German items: \textit{Maria erzählt, dass Anna sehr stolz auf sich ist / wie stolz auf sich Anna ist}. 
Reconstruction in German A′-movement

If Principle A holds in German and our methodology is suitable to detect it, we expect close to 100% positive answers with respect to coreference between *herself* and *Anna* (Q2) in (10a). If there is reconstruction for Principle A, it should be reflected by a lack of an effect of the factor MOVEMENT on Q2: we would expect to see the same pattern in (10b). Given that German does not allow logophoric binding, coreference between *herself* and *Mary* should not be available in (10a): we expect close to 0% positive answers to Q1 in the in situ condition. If the reflexive can be bound in the final landing site, we expect coreference between *herself* and *Mary* to be possible in (10b) (which would suggest the absence of a subject trace), reflected in a significant effect of MOVEMENT on Q2.

(11) illustrates how MOVEMENT was manipulated in our experiments on DPs. If there is reconstruction for Principle A for both predicates and arguments, we would expect the same pattern as described above for APs.

(11) Illustration of the factor MOVEMENT for DPs (arguments), tested in exps 2/4

a. Mary tells (us) that *Anna* saw the statue of [*herself*] in situ
b. Mary tells (us) [which statue of [*herself*]] *Anna* saw __.

The factor DISTANCE has two aspects. On the one hand, we tested the effect of linear distance between the anaphor and the embedded R-expression (*Anna*): In the moved coord(ination) condition it was increased (compared to the moved short condition) by means of NP-coordination, as illustrated in (12):

(12) Illustration of the factor (linear) DISTANCE

a. Mary tells (us) [how proud of [*herself*]] *Anna* is __. short
b. Mary tells (us) [how proud of [*herself*] and the teams)] *Anna* is __. coord

We tested linear distance mainly because Adger et al. (2017) found for Principle C that reconstruction effects become weaker with increasing linear distance between the R-expression and the pronoun. If such a factor is at play in Condition A reconstruction as well, we expect that coreference between *herself* and *Anna* becomes less acceptable in the moved coord condition (interaction between MOVEMENT and DISTANCE).

On the other hand, we also tested structural distance by adding a level of embedding. In the condition emb(eding) 1, R-expression and anaphor are not clausemates under-
ingly, while in the condition *emb(eding)* 2, R-expression and anaphor are clausemates underlyingly, as illustrated in (13):\footnote{In German: *Maria erzählt, welche Statue von sich Anna denkt, dass du gesehen hast / du denkst, dass Anna gesehen hat.*}

(13) Illustration of the factor (structural) DISTANCE

a. Mary tells (us) [which statue of herself] Anna thinks that you saw __, *emb1*
b. Mary tells (us) [which statue of herself] you think that Anna saw __, *emb2*

Structural distance is crucial in various ways. First, the last two conditions can be used to test whether reconstruction to the base position is obligatory or whether binding in intermediate positions is possible as well. If reconstruction to the base position is obligatory, we expect that *Anna* and *herself* can be co-referential only in the condition *emb2*. If binding in intermediate position is possible as well, we expect that *Anna* and *herself* can be coreferential in the condition *emb1*, too (at least with DPs, while with predicates, this may be independently ruled out because of the trace of the lowest subject within the AP). Second, these conditions can be used to test the predictions of an approach that allows vehicle change in A’-movement (cf. Adger et al. 2017 on Principle C), i.e., where the anaphor in the lowest copy of the *wh*-movement chain is optionally replaced by a pronoun (i.e. *herself → her*). Under vehicle change, we expect that coreference between *herself* and *Mary* is generally possible without interpretation of the reflexive in the final landing site (since the pronoun can be bound non-locally). Similarly, *Anna* can be the antecedent for *herself* in *emb1* without interpretation of the intermediate copy. Vehicle change should have the same effect with APs and DPs (w.r.t. matrix and intermediate binding) and should only be relevant in the *moved* but not in the *in-situ* condition (it only applies to movement chains).

### 2.3 Results and discussion

The results are illustrated in Figures 1 and 2.

![Figure 1](image.png)

**Figure 1**: Proportion of positive answers to the question about coreference with the matrix subject (black bars) and the embedded subject (gray bars) in experiments 1 and 3 with APs.
Reconstruction in German A′-movement

Figure 2: Proportion of positive answers to the question about coreference with the matrix subject (black bars) and the embedded subject (gray bars) in experiments 2 and 4 with DPs.

For statistical analysis (using generalized linear mixed models), the factor MOVEMENT was sum-coded and DISTANCE was treatment-coded with short as the baseline.

Recall that full reconstruction would be reflected in a lack of an effect of MOVEMENT. If movement increases the proportion of positive answers to Q1 (coreference with the matrix subject), this suggests that new binding options are created. If movement decreases the proportion of positive answers to Q2 (coreference with the embedded subject), this suggests that the original binding options are lost. For DPs, a robust effect of MOVEMENT on both Q1 and Q2 was found in the short conditions, suggesting that reconstruction for Principle A is not fully obligatory in German with DPs; wh-movement seems to lead to a partial loss of the original binding options and makes new ones available (binding in the final landing site). As for APs, the results are compatible with the view that original binding options are retained. There is a trend towards higher availability of matrix binding in the moved conditions, but less pronounced and robust than for DPs. Overall reconstruction seems to be more stable with APs than with DPs.

Turning to the factor linear DISTANCE (comparison between short and coord), it is of particular interest whether there is an interaction with the factor movement with respect to Q2: this would suggest that reconstruction depends on distance. An interaction was found in both experiment 1 (APs) and experiment 2 (DPs): increasing the distance between the embedded subject and the anaphor within the moved wh-phrase reduced the availability of coreference between the two. This could mean that a larger linear distance between the anaphor and the potential binder makes a binding relation less likely. In experiments 3 and

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8Following the recommendations for identifying parsimonious models by Bates et al. (2015a) and using the R packages lme4 and lmerTest (R Core Team 2016, Bates et al. 2015b, Kuznetsova et al. 2017).

9For this research question, we were interested in potential effects of this factor on both Q1 and Q2. We therefore apply Holm-Bonferroni correction per experiment to account for the increased risk of false positives; i.e., considering the two p-values for Q1/Q2, we set the significance level α to 0.025 (0.05/2) for the smaller p-value and to 0.05 for the greater p-value.

10Significant simple effect of MOVEMENT (under α adjustment) with respect to Q1 (exp2: z = 5.30, p < 0.001, exp4: z = 4.29, p < 0.001) and Q2 (exp2: z = 4.21, p < 0.001, exp4: z = 4.05, p < 0.001).

11No significant simple effect (under α adjustment) of MOVEMENT with respect to Q1 (exp1: z = 2.11, p = 0.03, exp3: z = 1.51, p = 0.13) nor Q2 (exp1: z = 0.83, p = 0.41, exp3: z = 0.16, p = 0.87).

12Significant interaction of MOVEMENT and DISTANCE with respect to Q2 in exp1 (z = 2.61, p = 0.01) and exp2 (z = 2.29, p = 0.02).
4, a trend in the same direction (with a numerically similar effect size) was found for both linear and structural distance (emb2), which did however not reach significance.\textsuperscript{13}

The possibility of binding in intermediate positions was tested in the emb1 structures. The proportion of positive answers to Q2 (coreference with the embedded subject) in the emb1 moved is intended to reflect the availability of intermediate binding. Focusing on the results with APs first, we observe that this proportion is quite high numerically (50%), which argues against the obligatory presence of a trace of the embedded subject within AP. The fact that the proportion is higher than the overall availability of matrix binding across all conditions (with the exception of coord) argues against a vehicle change account because we would then expect matrix and intermediate binding to be equally acceptable. However, an important caveat is that we observe relatively high answer proportions for emb1 in situ (34% for Q2), where binding is not predicted to be possible at all, irrespective of reconstruction. Thus, for clearer conclusions concerning intermediate binding, we would need to better understand what caused the in situ answer pattern. For DPs, an even higher proportion of positive answers to Q2 (69%) was found in the emb1 moved condition. Together with the overall high availability of matrix binding across all conditions, this argues against the presence of a coreferential silent PRO within DP (which should lead to obligatory coreference with the lower R-expression and block it in the emb1 condition).

However, again, there is the caveat that an unexpectedly high proportion (63%) is also observed for Q2 in emb1 in situ.

2.4 Open issues

An important observation is that our premise about the short in situ conditions is not fully supported by the results: acceptance of coreference of the anaphor with the embedded subject does not approach 100\% in the short in situ condition in experiment 1 (79\%) nor in experiment 2 (83\%). Additionally, in experiment 2 (with DPs), the proportion of cases in which coreference with the matrix subject is accepted is not close to zero, but surprisingly high (short in situ: 33\%).\textsuperscript{14} This either suggests that our assumptions about Principle A in German need to be revised (i.e., that some residual logophoric anaphor binding in German is possible after all), or that there was a methodological issue. A possibility is that our phrasing of the yes/no-question introduced a confound: to avoid the circularity of using anaphors in the questions (e.g., Is Anna proud of herself?), we resorted to indefinite pronouns (e.g., Is someone proud of Anna?). Coreference between someone and Anna might be dispreferred here for independent reasons, which could explain the lower than expected proportion of positive answers concerning the embedded subject. However, this does not explain the higher than expected proportion of positive answers concerning the matrix subject (especially with DPs). The fact that very similar patterns were found in experiments 3 and 4 supports the view that this is not random noise but something that should be inves-

\textsuperscript{13}Non-sign. interaction of mvt and linear distance (coord vs. short) in exp3 (z = 1.49, p = 0.14) and exp4 (z = 1.90, p = 0.06); same for structural distance (emb2 vs. short) in exp3 (z = −0.02, p = 0.98) and exp4 (z = 1.38, p = 0.17). Note: less data points per condition were collected in exps 3/4 (108) than in exps 1/2 (144).

\textsuperscript{14}For comparison, the proportions were much closer to ceiling/floor in the short in situ Principle C conditions (2%/98% with APs, 8%/98% with DPs); see Georgi et al. (2018).
Reconstruction in German A'-movement

tigated further, e.g., by testing alternative methods. Another expectation that was not met concerns the emb1 in situ conditions: based on standard assumptions about the locality of Principle A, we would not expect any of the potential antecedents to be able to corefer with the anaphor (*Mary tells us that Anna thinks that you saw a statue of herself*); but we find a surprisingly high proportion of positive answers. This complicates the interpretation of the emb1 moved conditions. The final unexpected (post-hoc) observation is that for APs, inserting a coordination generally increased the availability of matrix binding,\(^{15}\) even though this manipulation did not affect the distance between the anaphor and the matrix subject.

3. Conclusion

Our experimental results on reconstruction for Principle A in German wh-movement call for a partial reassessment of our views on anaphor binding in German. While the consistent trend towards more reconstruction with adjectival predicates than with nouns is in line with previous claims in the literature on both English and German, the results with respect to binding in the final landing site challenge previous (introspection-based) claims: At least with DPs, binding in the final landing site is accepted to a rather high degree. Our results thus suggest that binding in German cannot be reduced to argument structure (in that in binding in the final landing site, the reflexive is not bound by a co-argument). Rather, binding takes place under c-command. The results also indicate that binding in intermediate positions is accepted to a remarkable extent. However, since similar patterns were unexpectedly found in the absence of movement, further investigation is required. The same applies to the high acceptability of matrix binding in the absence of movement in some conditions, which may point towards residual logophoric binding after all.

Our results also provide tentative evidence against a vehicle change-based approach where the reflexive in the lowest copy of the A'-movement chain is replaced by a pronoun and which is generally an alternative to account for binding in final and intermediate landing sites. We observe an asymmetry between arguments (DPs) and predicates (APs) w.r.t. binding in intermediate and final landing sites, which such an approach would fail to account for. Given that the pronoun can be bound non-locally, such binding should be equally available with both types of phrases, contrary to what we find: binding in final and intermediate positions seems to be generally more available with DPs. The same is suggested by the asymmetry within APs, where binding in intermediate positions is more acceptable than in final landing sites. To test how robust these differences between APs and DPs are they should be directly compared within an experiment in future research.

References


\(^{15}\)Main effect of distance on Q1 in exp1: \(z = 6.10, p < 0.001\), exp2: \(z = 5.92, p < 0.001\).