

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_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.

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_i saw a picture of her_i/herself_i.
 b. Lucie_i told a story about *her_i/herself_i. → [PRO_i a story about *her_i/herself_i].

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_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://tp-online.de/leben/beruf/wie-man-auf-geruechte-richtig-reagiert.aid-22142659>

- (6) Il poeta descrive il [riflesso di se stesso_i] [che Narciso_i vide — nella fonte]
 the poet describes the reflect. of himself which N. saw in.the fountain
 'The poet describes the reflection of himself_i that Narcissus_i 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_i erinnerte sich daran, dass *die Zeit* ein Bild von sich_i
 Gernot remember.PST.3SG self there.on that the Zeit a picture of self
 veröffentlicht hatte.
 publish.PTCP have.PST.3SG
 'Gernot_i remembered that *the Zeit* published a picture of himself_i.'
 b. *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 Zeit* dominated Peter_i's thoughts.' *German*

Reconstruction in German A'-movement

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, [CP [welches Foto von *sich_i/ihm_i]₁ ich _{—1} mag].
John ask.3SG self which picture of self/him I like.1SG
'John_i wonders which picture of himself_i/him_i I like.'
- 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.'
- (9) 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.'

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 (*Mary*) as Q1, and to the question about the embedded subject (*Anna*) as Q2.

Mary tells us how proud of herself Anna is.		
<i>Can this sentence be interpreted such that...</i>		
<i>...someone is proud of Mary?</i>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<i>...someone is proud of Anna?</i>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

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 MOVEMENT (*in situ* vs. *moved*; i.e., is the anaphor in situ or within a moved *wh*-phrase) and DISTANCE (*short* vs. *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 DISTANCE (two different types of embedding in order to test the effect of structural distance).² (10) illustrates how MOVEMENT was manipulated.

(10) Illustration of the factor MOVEMENT for APs (predicates), tested in exps 1/3³

- a. **Mary** tells (us) that **Anna** is very proud of herself. *in situ*
- b. **Mary** tells (us) [how proud of herself] **Anna** is _____. *moved*

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

²The 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).

³This is a direct translation of one of our German items: *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)⁴, tested in exps 2/4⁵
- a. **Mary** tells (us) that **Anna** saw the statue of herself. *in situ*
 - b. **Mary** tells (us) [which statue of herself] **Anna** saw _____. *moved*

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):⁶

- (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(edding) 1*, R-expression and anaphor are not clausemates underlyingly

⁴Roughly 50% of the nouns were event nominals (*ung*-derivations), while about 50% were underived (e.g. ‘statue’, ‘portrait’, ‘rumor’) or verb-related (‘anger’, ‘hate’, ‘attack’). While the former are more likely to take proper arguments, the different types of nouns did not end up behaving differently in the experiments. To avoid a coreferential implicit PRO (recall the discussion in the introduction) the nouns we used were either unaccusative or such that a potential implicit agent would be disjoint as, e.g., with ‘rumor.’

⁵In German: *Maria erzählt, dass Anna die Statue von sich gesehen hat / welche Statue von sich Anna gesehen hat.*

⁶In German: *Maria erzählt, wie stolz auf sich (und die Mannschaften) Anna ist.*

ingly, while in the condition *emb(edding) 2*, R-expression and anaphor are clausemates underlyingly, as illustrated in (13):⁷

(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.

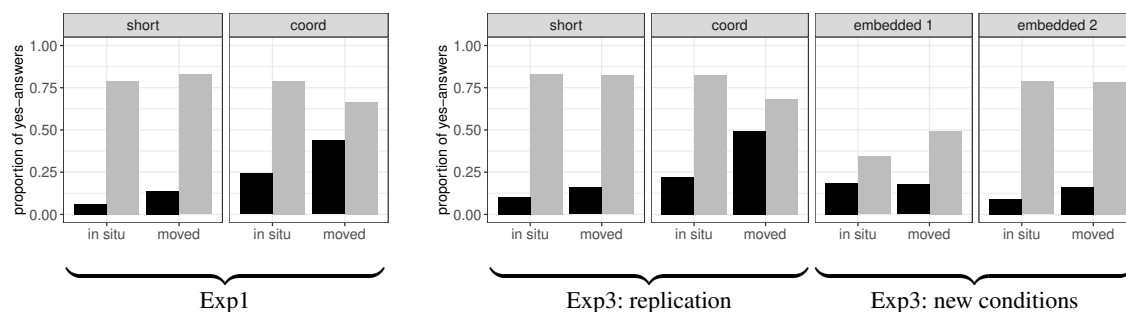


Figure 1: Proportion of positive answers to the question about coreference with the matrix subject (black bars) and the embedded subject (gray bars) in experiments 1 and 3 with APs.

⁷In German: *Maria erzählt, welche Statue von sich Anna denkt, dass du gesehen hast / du denkst, dass Anna gesehen hat.*

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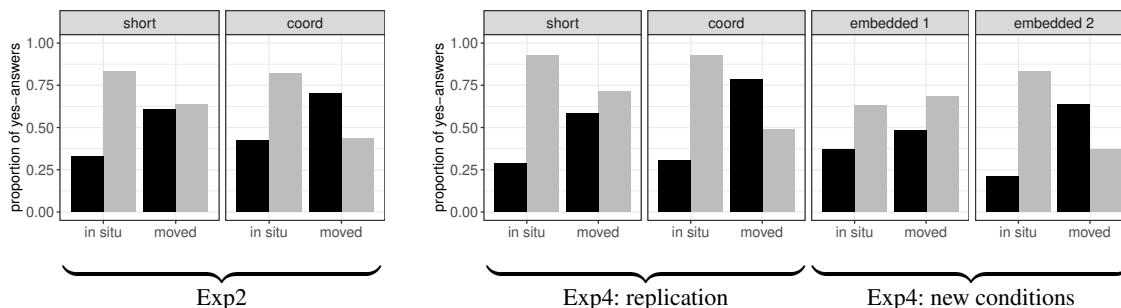


Figure 2: Proportion of positive answers to the question about coreference with the matrix subject (black bars) and the embedded subject (gray bars) in experiments 2 and 4 with DPs.

For statistical analysis (using generalized linear mixed models⁸), 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.⁹ For DPs, a robust effect of MOVEMENT on both Q1 and Q2 was found in the *short* conditions,¹⁰ 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,¹¹ 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.¹² 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

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.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%).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-

¹³Non-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).

¹⁴For 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).

tigated further, e.g., by testing alternative methods. Another expectation that was not met concerns the *embl 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 *embl 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.

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¹⁵Main effect of distance on Q1 in exp1: $z = 6.10$, $p < 0.001$, exp2: $z = 5.92$, $p < 0.001$.

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