The Law and Order of Unlike Category Coordination: German DP-CP-coordinations are not sensitive to linear order

Prefinal version
Luise Schwarzer, Uni Konstanz

Abstract

CPs can be coordinated with DPs in positions where only DPs are selected. Recent analyses attribute this either to an effect of linear order or processing. I show experimental data from German that are incompatible with either explanation: speakers prefer the order of conjuncts that is predicted to be bad in both analyses. The results support bottom-up derivations and asymmetric coordination structures.

1 Category mismatches in coordination

Traditionally it was assumed that coordinate structures can only conjoin elements of identical syntactic categories (*Law of the Coordination of Likes*, LCL, Chomsky 1957; Williams 1981). The debate on the validity of the LCL (recently Przepiórkowski 2022; Patejuk & Przepiórkowski 2023; Bruening 2025) seems to have come to the agreement that, when both conjuncts are independently selected, the LCL is too strict and mismatches in category are in fact allowed, (2). Instead, these structures have to obey Wasow's generalization, (1) (see also Huddleston & Pullum 2002). Thus, while *become* in (2) selects both NP and AP, it does not select a PP, and does not allow PPs in coordinations.

(1) *Wasow's generalization* (Pullum & Zwicky 1986:752-753)
If a coordinate structure occurs in some position in a syntactic representation, each of its conjuncts must have syntactic feature values that would allow it individually to occur in that position.

(2) a. Pat became [$_{NP}$ a Republican] and [$_{AP}$ quite conservative].
b. *Tracy became [$_{NP}$ a Republican] and [$_{PP}$ of the opinion that we should get out].
c. Tracy became {a Republican/ quite conservative/ *of the opinion that we should get out}. (Sag et al. 1985:141-143, modified)

But apparently Wasow's generalization is still too strict for structures like (3). A CP that is not independently selected by the predicate, (3-b), can appear in a coordination with a selected nominal, (3-a). The order of the DP- and CP-conjuncts plays a role: reversal of the order leads to ungrammaticality, (3-c).

(3) a. You can depend on [$_{DP}$ my assistant] and [$_{CP}$ that he will be on time].
b. *You can depend on [$_{CP}$ that my assistant will be on time].
c. *You can depend on [$_{CP}$ that my assistant will be on time] and [$_{DP}$ his intelligence]. (Sag et al. 1985:165-166, modified)

These selection-violating coordinations have received analyses either as proper DP&CP coordinations violating (1) (e.g., Munn 1993; Peterson 2004; Zhang 2010), or as structures where a clause may be headed by nominal functional structure, [DP & [DP [CP]]], which technically obey Wasow's generalization, (e.g., Sag et al. 1985; Neeleman et al. 2022). Recently, two new proposals take the analysis in different directions: Al Khalaf 2015; Bruening & Al Khalaf 2020; Bruening 2025 argue that linear adjacency to the selector is crucial in mismatching coordinations and propose a left-to-right derivation for linear order effects. Kim & Lu (2024) argue that selection-violating coordinations are not a real syntactic phenomenon at all, but instead an effect of processing: high processing costs make selection failures harder to detect, which gives rise to high acceptability ratings.

I present observations from German that argue against both the linear adjacency account and the processing account. German is an OV language, where a coordination of objects linearly precedes the selecting verb. Both of these accounts make the prediction that the rightmost conjunct should be the one selected by the verb, because it is linearly or temporally closer to it. Empirical evidence from a forced-choice experiment shows that this is not borne out. Speakers strongly prefer the order of conjuncts in which the selected DP is the leftmost conjunct, and the unselected CP is the rightmost one. The results support bottom-up derivations in which coordinations have an asymmetric structure, and raise questions about cross-linguistic variation.

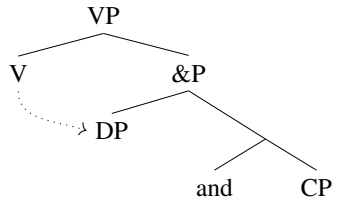
This squib is structured as follows: section 2 gives an overview of the analyses of mismatching coordination. Section 3 presents some background on German and two experiments. Section 4 discusses theoretical implications of the results.

2 Previous analyses of mismatching coordinations and their predictions

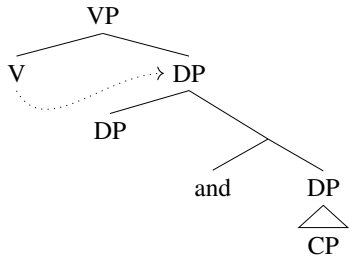
There are three families of analyses for DP-CP coordinations. In one group, sentences such as (3-a) constitute real DP&CP coordinations, i.e., Wasow's generalization can be violated. Grammaticality is attributed to the more prominent position of the initial conjunct: only the higher, c-commanding conjunct is licensed in this position, while the other conjunct is too deeply embedded to be accessible to the verb, as in (4). 'Licensing' here can be understood either in terms of c-selection (Peterson 2004; Zhang 2010) or in terms of case assignment (Munn 1993). These analyses cannot explain why these coordinations are as restricted as they are (CPs can occur in DP-positions; almost no other combination of category mismatch seems to be possible, see Bruening & Al Khalaf 2020). A related

approach posits a nominal shell on top of the CP-conjunct, such that we are actually dealing with a DP&DP structure, (5), e.g., Sag et al. (1985). The challenge for this type of account is to restrict the distribution of null DP shells such that they can derive the ungrammaticality of (3-b). I will discuss both of these analyses under the label *bottom-up group*. They both assume some type of asymmetric structure for coordinations.[1] The possibility of a mismatch in these accounts comes from the structural asymmetry between the conjuncts. The first/left conjunct will always be more prominent for the selecting element than more deeply embedded ones. This group predicts that, all else being equal, mismatching coordinations in an OV-language like German should pattern exactly like in English, i.e., only a non-initial conjunct can be unselected.

(4) *Bottom-up accounts violating (1)*



(5) *Bottom-up accounts obeying (1)*



In the second group of analyses, Bruening & Al Khalaf (2020); Bruening (2025) also postulate an empty noun on top of CPs, but they assume a left-to-right derivation. The motivation for this is their observation that it is not always the final, deeper embedded conjunct that can violate selectional requirements. In (6), the linearly first conjunct is the non-selected one.

(6) a. [$_{CP}$ That he was late all the time] and [$_{DP}$ his constant harassment of coworkers] resulted in his being dismissed.
b. ??[$_{DP}$ His constant harassment of coworkers] and [$_{CP}$ that he was late all the time] resulted in his being dismissed. (Bruening & Al Khalaf 2020:13)

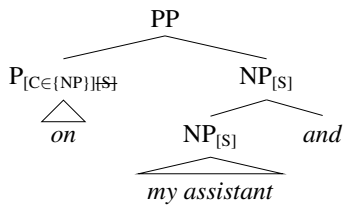
I call this type of approach the *linear closeness group*. Derivations in these analyses proceed not bottom-up but left-to-right (following e.g., Phillips 1996). In this analysis, selection has a syntactic and a semantic component. Only the conjunct that is linearly closest to the selector has to meet both syntactic and semantic selection requirements. Conjuncts further away only have to fit the syntactic requirement. If the noun phrase is closer to the selecting verb, i.e., the first conjunct in (3-a) and the last conjunct in (6), both the syntactic and semantic selection features can be checked, (7). If the closest conjunct is the *that*-clause, the semantic features will be unchecked, leading to a crash. This is derived in a left-to-right derivation by the order of Agree operations that dictate the accessibility of features in the highest projection of the coordination at the point when it merges with the

[1]There are proposals that build on a symmetric structure of coordination, e.g., Neeleman et al. (2022); Przepiórkowski (2024). I will not discuss these here since coordination in German specifically seems to be asymmetric, see Schwarzer & Weisser (2024).

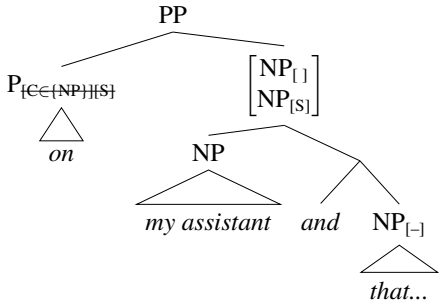
selector. Space restrictions forbid going into further detail, but I refer the reader to Bruening (2025); Bruening & Al Khalaf (2020).

(7) *Left-to-right account (Bruening 2023)*

a.



b.



These analyses have similar problems as the bottom-up group in deriving the distribution of NP-shelled CP: CPs are disallowed in (3-b) because they are semantically empty, i.e., not sentient or animate (Bruening 2025:29,31). This can certainly not be the whole story, since predicates like *depend on* can also combine with inanimate NPs and inanimate non-NPs, like small clauses, (8).

(8) a. I depend on [$_{NP}$ their arrival].
b. I depend on [$_{SC}$ my lottery numbers being right].

Crucially, in the linear closeness accounts the often observed selection of only the initial conjunct as in sentences like (3-a) is an accident due to the verb-initial word order in English: the first conjunct in (3-a) happens to be linearly closer to the verb than the second conjunct. In different contexts, English apparently also allows the reverse order, as in (6). The linear closeness accounts predict that OV languages should show the opposite pattern: the linearly final conjunct should generally be the selected one.

The last group of analyses is the *temporal closeness* one. Kim & Lu (2024) propose a processing-based account of mismatching coordinations in which they are a grammaticality illusion. They are actually ungrammatical, i.e., Wasow's generalization is real and cannot be violated, but are rated as acceptable because the parser gradually 'forgets' the selectional requirements of the predicate as the sentence proceeds (Gibson & Thomas 1999; Futrell et al. 2020). Kim & Lu (2024) argue that the more time passes between parsing of the selector and parsing of the mismatching CP conjunct, the less likely the mismatch is to be detected. The verb is encountered first, and the parser registers its selectional features. When the first conjunct matches the features, parsing proceeds, and with passing time, the parser 'forgets' the verb's requirements. When it encounters the second conjunct, a possible mismatch cannot be detected anymore.[2] Their evidence comes from an acceptability judgment experiment in English that found that the closer a CP-conjunct is to the selecting verb in a three-way coordination, the more acceptability decreases: (9-b) is rated significantly worse than (9-a).

[2]This raises the question how such an account would handle the ungrammaticality of (2-c).

(9) a. The success of the project depends on [$_{DP}$ a good engineering design], [$_{DP}$ the diligence of the workers], and [$_{CP}$ that the contractors will do their part].
b. The success of the project depends on [$_{DP}$ a good engineering design], [$_{CP}$ that the contractors will do their part], and [$_{DP}$ the diligence of the workers].
(Kim & Lu 2024:57)

In an OV language, the selectees are encountered before the selector, but the same logic should hold: increased dependency length (of feature checking) leads to decreased mismatch detection. The first conjunct prompts the parser to expect a selecting predicate. While waiting for the predicate, the representation and features of the conjuncts have to be held in working memory, incurring storage costs. The oldest information is the first conjunct. It will be forgotten first. Thus, when the predicate is encountered, the features of the second conjunct will still be in storage and can be checked against the selectional requirements. The expectation is that a mismatch here is more likely to be detected than mismatch with the first conjunct. This means that speakers should (erroneously) accept structures in which the mismatching conjunct is the leftmost one, i.e., they predict the same pattern as the linear closeness accounts: a non-selected CP should only be able to surface in the position that is further away from the selecting verb, (10-a). This contrasts with the bottom-up group that predict (10-b), where the unselected CP should be the more deeply embedded conjunct.

(10) a. [CP & DP] V b. [DP & CP] V

3 No linear or temporal order effect in German

3.1 Experiment 1: DP-CP coordinations in German

First, I tested whether mismatching DP-CP coordinations like (11-a), are also possible in German.[3] I tested four predicates that, according to informally collected judgments, select DPs but not CPs: *beenden* 'end', *streichen* 'cancel', (nicht) *übereilen* '(not) rush', and *entwickeln* 'develop'. In this acceptability study, this judgment was confirmed.
Method, material, participants. Experiment 1 investigates the acceptability of selected and non-selected bare CPs compared to a coordination context. The experiment, hosted on SoSciSurvey (Leiner 2025), had a Latin square design with the factors SELECTION (yes/no) x COMPLEMENT (*dass*-clause/DP-CP-coordination). In addition to the four non-selecting predicates above I tested four CP- and DP-selecting counterparts: *veranlassen* 'induce', *vergessen* 'forget', *erwarten* 'expect', and *beschließen* 'decide', as well as 13 fillers of the standard filler set (Featherston 2009). A sample test item is given in (11)–(12). In the coordination condition, the DP is always the first conjunct. Each participant rated one lexicalization per condition and all fillers on a 1–5 Likert scale. 50 participants

[3]Material, scripts, plots for experiments 1 and 2 are available at `https://osf.io/kznyt/?view_only=b733df4fe4fd4fc2b6a4caa8b9c2e339`.

were recruited on Prolific and compensated for their participation. Data of 44 participants entered analysis. All participants were native German speakers and grew up in a German-speaking region. Four bilinguals were included in analysis.

(11) Die Stadt beendet zum Jahreswechsel...
the city ends at.the year.turn

a. ...[$_{CP}$ dass für Neugeborene ein Baum gepflanzt wird].
that for newborns a tree planted AUX.PASS
Intended: 'The city stops its scheme of planting trees for newborn children at the turn of the year.' *dass-clause*

b. ...[[$_{DP}$ die Überarbeitung des Nahverkehrskonzepts] und [$_{CP}$ dass für
the revision of.the public.transport.plan and that for
Neugeborene ein Baum gepflanzt wird]].
newborns a tree planted AUX.PASS
Intended: 'At the turn of the year, the city completes its revision of the local transport plan and stops the scheme of planting a tree for every newborn child.' *coord.*

(12) Die Stadt veranlasst zum Jahreswechsel...
the city starts at.the year.turn

a. ...[$_{CP}$ dass für Neugeborene ein Baum gepflanzt wird].
that for newborns a tree planted AUX.PASS
'The city starts its scheme of planting trees for newborn children at the turn of the year.' *dass-clause*

b. ...[[$_{DP}$ die Überarbeitung des Nahverkehrskonzepts] und [$_{CP}$ dass für
the revision of.the public.transport.plan and that for
Neugeborene ein Baum gepflanzt wird]].
newborns a tree planted AUX.PASS
'At the turn of the year, the city starts its revision of the local transport plan and the scheme of planting a tree for every newborn child.' *coord.*

Results. Figures 1, 2 and table (13) summarize the results. A linear mixed effects model was fit in R (R Core Team 2021) with the lme4 (Bates et al. 2015) and lmerTest packages (Kuznetsova et al. 2017) to investigate the influence of each factor. There was a simple effect of SELECTION (β=0.2, df=11.86, t=3.1, p<0.001): Bare complement clauses are acceptable when paired with a selecting predicate and unacceptable when paired with a non-selecting one. This confirms the baseline assumption that verbs like *beenden* do not select a CP. DP-CP coordinations were also more acceptable with selecting verbs than non-selecting ones, as expected. However, there was also a significant interaction effect (β=0.28, df=11.86, t=2.8, p<0.01). The difference for coordination from selected to unselected contexts is smaller than the difference for *dass*-clauses, see fig. 2. This means that DP-CP-coordinations in unselected contexts are actually more acceptable than we would

expect extrapolating from *dass*-clauses. If the 0.5 points difference between coordinations and bare *dass*-clause complements in a context where the CP is selected carried over the the unselected context, we would expect a median score for coordinations at around -1. But this is not what we find: coordinations are better than expected, with a median score of around -0.25. Something rescues unselected CPs in coordination. I take this to mean that German allows mismatching DP-CP coordinations, similar to English.
The effect size (Cohen's *d*) of unselected vs. selected DP-CP coordinations is d=0.85 (calculated with R's lsr package, Navarro 2015). This is a large effect, for which 44 participants provide more than 80% statistical power (see Sprouse & Almeida 2017).

(13) *Descriptive statistics experiment 1*

COMPLEMENT	SELECTION	# observations	mean z-score	SD	median z-score
coord.	no	44	-0.253	0.735	-0.244
coord.	yes	44	0.369	0.723	0.495
dass	no	44	-0.526	0.669	-0.684
dass	yes	44	0.891	0.631	1.08

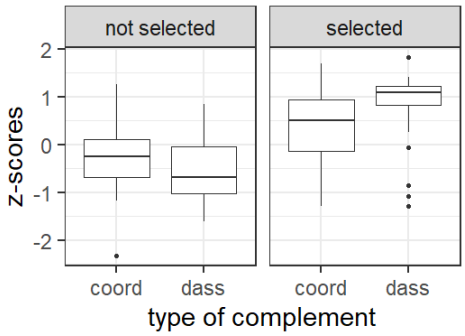


Figure 1: Results of exp. 1

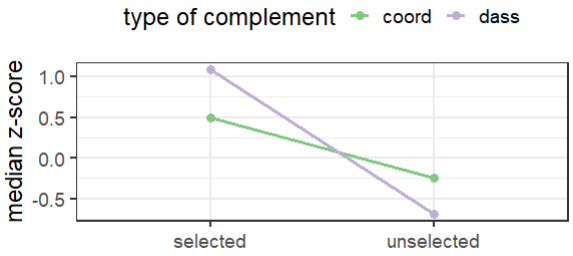


Figure 2: Median scores of exp. 1

3.2 Experiment 2: order of DP and CP

The linear and temporal closeness analyses predict that in OV word order, the DP should be the rightmost conjunct, as in (14-a), repeated from above, since it would be closer to the selecting verb there. The bottom-up approaches expect a universal DP-first preference: The selected conjunct should be the one that is structurally closer to the selecting verb, even if it is linearly further away, i.e., (14-b). An OV language like German thus makes the perfect test case since it allows linear adjacency to be teased apart from hierarchical relations.

(14) a. [CP & DP] V b. [DP & CP] V

To test the predictions of the temporal and linear closeness accounts, a complement clause must precede the verb, i.e., a CP must occur in the middle field as in (15).

(15) ?Ich habe [$_{CP}$ dass man Reis einfrieren kann] schon gehört.
I have that one rice freeze can already heard
'I have already heard that you can freeze rice.'

The status of middle field complement clauses in German is debated. It is clear that they are preferably extraposed. In the middle field, they are judged as acceptable (but marked) in e.g., Von Stechow & Sternefeld (1988:392), Bayer (1995:53), Müller (1996:231), Reis (1997:129), and as unacceptable in e.g., Büring & Hartmann (1997:29), Bader et al. (2013:64). Since the preference for extraposition is quite strong, a Likert scale judgment task is unlikely to detect a difference between selected and unselected preverbal CPs, should there be any.[4, 5] Instead, binary comparative judgments as in two-alternatives-forced-choice tasks (2AFC) are considered to be appropriate for finer grained differences between conditions (see e.g. Sprouse & Almeida 2017; Stadthagen-González et al. 2018). The idea is that the penalty for putting *dass*-CPs in preverbal position that would show up in Likert scale tasks disappears in 2AFC tasks because speakers don't compare a test sentence to a hypothesized grammatical ideal, but to another sentence that also has a preverbal CP.

Method, material, participants. Thus, experiment 2 is designed as a 2AFC task. Participants were presented with two sentences that differed only in the order of the conjuncts, as in (16)-(17), and were asked to select the sentence that 'sounded better to [them]'. The sentences were presented in preverbal and postverbal position, as (16) illustrates. The sentences within a pair (as well as test pairs overall) were presented in random order.

(16) Die Stadt hat zum Jahreswechsel ... *OV*
the city has at.the year.turn

a. ...[$_{DP}$ die Überarbeitung des Nahverkehrskonzepts] und [$_{CP}$ dass für
the revision of.the public.transport.plan and that for
Neugeborene ein Baum gepflanzt wird] beendet.
newborns a tree planted AUX.PASS ended

[4]While processing difficulties of center-embedding structures likely play a role, the degradedness of middle field CPs must have a grammatical source, too, since CPs in the middle field that are adjuncts or complements to nouns are perfectly acceptable, (i), see also Bader et al. (2013).

(i) Ich habe [das Gerücht [dass man Reis einfrieren kann]] schon gehört.
I have the rumor that one rice freeze can already heard
'I have already heard the rumor that you can freeze rice.'

[5]There is a related construction in which an extraposed CP is correlated with a pronoun *es* in the middle field, (i).

(i) Ich habe es schon gehört [dass man Reis einfrieren kann].
I have it already heard that one rice freeze can
'I have already heard that you can freeze rice.'

Bennis (1986); Vikner (1995) argue that the pronoun is the selected complement, and the CP an apposition. Thus, these structures are orthogonal to the issues investigated here.

b. ...[$_{CP}$ dass für Neugeborene ein Baum gepflanzt wird] und [$_{DP}$ die
that for newborns a tree planted AUX.PASS and the
Überarbeitung des Nahverkehrskonzepts] beendet.
revision of.the public.transport.plan ended

(17) Die Stadt beendet zum Jahreswechsel... *VO*
the city ends at.the year.turn

a. ...[$_{DP}$ die Überarbeitung des Nahverkehrskonzepts] und [$_{CP}$ dass für
the revision of.the public.transport.plan and that for
Neugeborene ein Baum gepflanzt wird].
newborns a tree planted AUX.PASS

b. ...[$_{CP}$ dass für Neugeborene ein Baum gepflanzt wird] und [$_{DP}$ die
that for newborns a tree planted AUX.PASS and the
Überarbeitung des Nahverkehrskonzepts].
revision of.the public.transport.plan

all: 'At the turn of the year, the city completes its revision of the local transport plan and stops the scheme of planting a tree for every newborn child.'

Experiment 2 used the same predicates as experiment 1. Since weight plays a role in the ordering of the conjuncts (e.g., Lohmann & Takada 2014), the conjuncts were designed to be equal in weight in terms of syllables (maximal difference: two syllables). Each participant saw four test sentence pairs and twenty control pairs. Ten of the controls (control group 1) had choices that are both ungrammatical because they either contained a Left Branch extraction or a word order violation. Control group 2 had one clearly grammatical and one clearly ungrammatical choice. The control items also contained coordinations and were of similar lengths as the test items.

48 participants were recruited on Prolific. One participant from a non-German-speaking country was excluded. 17 participants were excluded for selecting the ungrammatical option over the grammatical one in control group 2 at least twice. Thus, 30 participants entered analysis, including five bilinguals.

Predictions. The control items serve as a measure for the interpretation of the test items. Since participants were forced to make a choice, control group 1 should have a random distribution of answers. If preverbal CPs are outright ungrammatical, we expect them to pattern like control group 1: no matter where the CP is, it should be unacceptable. If preverbal CPs can be acceptable, we expect a non-random distribution. The three groups of accounts predict different patterns for the two contexts. The linear/temporal closeness accounts expect the CP-DP order to be more acceptable, therefore chosen more frequently, than the DP-CP order in preverbal position only. In postverbal position, DP-CP should be the preferred order. A bottom-up approach predicts the DP-CP-order to be preferred in both contexts.

Results. In control group 2 there is a clear preference for the grammatical choice, indicating that the task was performed correctly. The responses for control group 1 had a

near chance distribution, fig. 3. In the test condition, the preferences had the exact same distribution in preverbal and postverbal position: DP-first was chosen 23 times, CP-first was chosen seven times in both contexts. A logistic regression analysis confirms that the choice between DP-first and CP-first is not random; the probability of observing a DP-first answer (in both contexts) was 0.76 (logit difference to control group 1: +0.894, SE = 0.327, z = 2.74, p< 0.0001). Position had no effect on the choice of conjunct order. The participants' preference for one order indicates that at least in coordination with DPs, CPs in the middle field are not unacceptable. The participants strongly preferred DP-first order even in preverbal position, i.e., the order which is predicted to be worse than its alternative in linear/temporal closeness accounts, fig. 4.

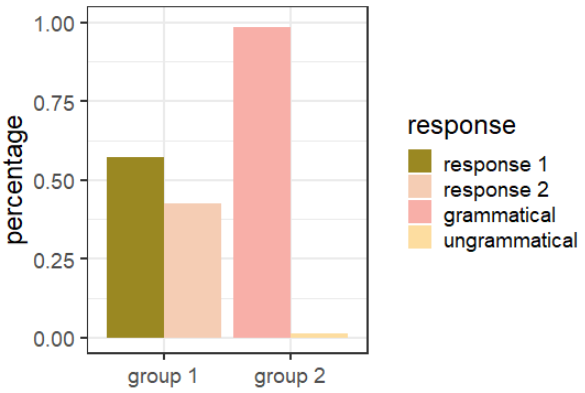


Figure 3: Control groups

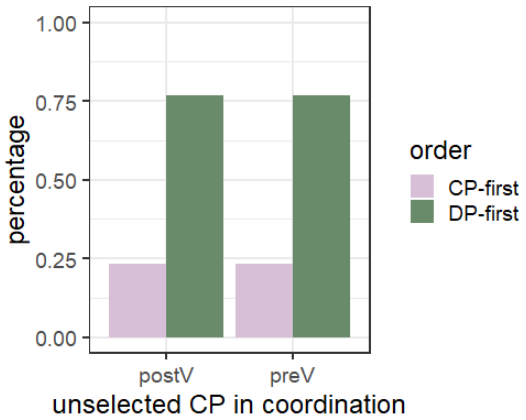


Figure 4: Preference for DP-CP order.

Discussion. The results of this experiment align with the prediction of the bottom-up analyses and are exactly the opposite of those of the temporal/ linear closeness accounts They pose serious problems for the left-to-right derivational model since it is designed to rule out the structure favored by German speakers.

A processing account like Kim & Lu (2024) cannot explain the German pattern, either. The parser seems to be able to detect the selectional failure incurred by mismatching features on the conjunct that was encountered first, i.e., the features do not fade in memory. Otherwise, the strong dispreference of CP-first conjuncts cannot be explained. Thus, I conclude that DP-CP coordinations in German cannot be analyzed in a left-to-right derivation or as grammaticality illusions.

4 Theoretical implications & conclusion

The temporal and linear closeness accounts of DP-CP coordinations make wrong predictions in OV languages like German. The effect of linear adjacency in (6), the motivation for the linear closeness accounts, cannot be observed in German. As far as I know, the order effect has never been demonstrated experimentally in English. (See also Patejuk & Przepiórkowski (2023) for criticism of the generality of data like (6)). Similarly, there was

no effect of temporal adjacency such that greater distance between mismatching conjunct and selector leads to greater acceptability.

The results suggests that adjacency, either in terms of linear order or temporal sequence, does not play a role for selection-violating coordinations in German. Instead, they support analyses based on a hierarchical asymmetry between the conjuncts, i.e., they are an argument for asymmetric coordination structures.

The German pattern is compatible with bottom-up analyses that exploit the asymmetry between conjuncts illustrated in (4) and (5) above. The linear closeness analyses could also derive this pattern if applied bottom-up. However, a full analysis of mismatching coordinations that overcomes the shortcomings of the bottom-up approaches is beyond the scope of this squib.

At the least, we can conclude that the data described for English mismatching coordinations do not constitute a general pattern. If there is a real difference between English and German, this raises the question of how a system looks like that is flexible enough to derive both types of patterns, or alternatively, whether the direction of derivation is something that could be parameterized.

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