Heterofunctional Coordination in German

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Abstract:

Heterofunctional Coordination (HC), in which conjuncts bear different grammatical functions (as in English *What and when to eat to stay healthy*), is assumed to be solely multiclausal in Germanic languages, i.e., to be underlyingly a coordination of clauses. This is supposed to distinguish Germanic from Slavic, where monoclausal HC – direct coordination of surface conjuncts – is also possible. In the case of German, this multiclausality assumption has not been supported by any empirical studies. This paper offers two such studies – based on corpora and on acceptability judgement experiments – which, however, do not confirm the assumption that German HC is strictly multiclausal. In particular, judgement experiments show a great variability of acceptance rates of monoclausal HC in German, depending on the number of obligatory arguments among the conjuncts and on whether HC occurs in the Vorfeld or in the Mittelfeld, among other factors. As this variability does not seem to reflect processing effects, we conclude that a gradient (non-binary) grammaticality approach is needed to model German HC. While the focus of this paper is on deriving the right empirical generalization, we also offer a proof-of-concept sketch of such a gradient grammaticality analysis, which builds on Minimalist Gradient Harmonic Grammar and on ideas from Linear Optimality Theory and the Decathlon Model.

Keywords:

heterofunctional coordination, German, gradient grammaticality, Minimalist Gradient Harmonic Grammar, Linear Optimality Theory, Decathlon Model

Heterofunctional Coordination in German

1. Introduction

The issue of parallelism in coordination – to what extent do conjuncts have to be similar? – is contentious. The (in)famous Law of the Category of Likes (LCL; Williams 1981: §2) states that all conjuncts must bear the same grammatical categories,[1] but counterexamples are known at least since Dik's (1968) seminal monograph on coordination, including the following (his (3)–(4), p. 28):[2]

(1) He felt [[quite happy]$_{AP}$ and [at ease in his new surroundings]$_{PP}$].

(2) I want to emphasize [[this point]$_{NP}$ and also [that you should never forget what your father told you]$_{CP}$].

Many diverse instances of unlike category coordination in English may be found in Sag *et al.* 1985, Bayer 1996, Munn 2000, Peterson 2004, Whitman 2004, Levine 2011, Dalrymple 2017, and, especially, Patejuk and Przepiórkowski 2023, leading to the conclusion that LCL is untenable – and to alternative analyses of its perceived effects.

Much less attention has been devoted to other languages,[3] but violations of LCL in German have also been pointed out in the literature. For example, Hartung (2012: 157, (8)–(9)) offers (3)–(4), Eisenberg (2006: 382, (7b–c)) provides (5)–(6), and Reich (2013: 357, (2c)) – (7), *inter alia*:[4,5]

[1]For earlier statements in the same vein see, e.g., Bloomfield 1933: 195, Chomsky 1957: 36, Tesnière 1959, 2015: 327, §10, Chomsky 1965: 212, n. 9, Gleitman 1965: 273, and Schachter 1977: 90, (12). See also Bruening and Al Khalaf 2020 for a recent attempt to defend LCL, Patejuk and Przepiórkowski 2023 for a rebuttal, and Przepiórkowski 2022b for further counterexamples to and arguments against LCL.

[2]Here and below AP stands for adjectival phrase, PP – for prepositional phrase, NP – for nominal phrase (we do not take a stance on the NP/DP issue), CP – for complementiser phrase, and InfP (not to be confused with InflP – Inflection Phrase) – for an infinitival verbal phrase.

[3]But see, e.g., Patejuk 2015: ch. 4 and Przepiórkowski 2022b for examples from Polish, as well as Dik 1968: 28 for examples from French and Latin.

[4]Sometimes examples involving free relatives are given as illustrating unlike category coordination, e.g., (i)–(ii) (Eisenberg 2006: 382, (7a), Hartung 2012: 157, (10)):

(i) [[Hans]$_{NP}$ und [wer sonst noch Lust hat]$_{CP?}$], soll mitkommen.
Hans.NOM and who.NOM else in.addition desire has should.3SG come.along
'Hans and anyone else who feels like it should come along.'

(ii) Ich lade [[Dich]$_{NP}$ und [wen ich sonst noch treffe]$_{CP?}$], gerne ein.
I invite.1SG you.ACC and who.ACC I else in.addition meet.1SG with.pleasure PART
'I would be happy to invite you and whoever else I meet.'

However, on the analysis of such free relatives as externally NPs (see, e.g., Müller 1999), such examples involve same category coordination of nominals. (In fact, (i) disappears between Eisenberg 2006 and Eisenberg 2020 as an example of unlike category coordination.)

[5]Morphosyntactic annotations follow the Leipzig Glossing Rules. Additionally, PART stands for a separated prefix of a separable verb.

(3) Martin ist [[Jurist]$_{NP}$ und [sehr eitel]$_{AP}$].
Martin is lawyer and very vain
'Martin is a lawyer and very vain.'

(4) Charlotte hat die Impfung [[gut]$_{AP}$ und [ohne Fieber]$_{PP}$] überstanden.
Charlotte AUX.3SG the vaccination well and without fiever got.over
'Charlotte survived the vaccination well and without fever.'

(5) Johanna arbeitet [[diszipliniert]$_{AP}$ und [mit großem Erfolg]$_{PP}$].
Johanna works disciplined and with great success
'Johanna works in a disciplined manner and with great success.'

(6) Paul versprach, [[den Briefkasten zu leeren]$_{INFP}$ und [dass das Haus gereinigt würde]$_{CP}$].
Paul promised the letterbox to empty and that the house cleaned become.SBJV
'Paul promised to empty the letterbox and that the house would be cleaned.'

(7) Er wusste [weder [die Antwort]$_{NP}$, noch [wer sie ihm liefern könnte]$_{CP}$].
he knew neither the answer nor who it him provide could
'He did not know the answer, nor who could provide it for him.'

Apparently, such unlike category coordinations are already produced by children below the age of 4 years; the following example (Hartung 2012: 164, (39)) comes from the Simone corpus of utterances produced by a child aged 3 years and 9.5 months (Miller 1976):

(8) Ich will [[trinken]$_{INFP}$ und [nen Strohhalm]$_{NP}$].
I want drink.INF and a.ACC straw.ACC
'I want to drink and a straw.'

An occasional reaction to examples such as above is that parallelism in coordination holds not necessarily at the level of grammatical categories, but rather at the level of grammatical functions.[6] However, cases of at least apparent heterofunctional coordination (HC)[7] are known since Browne 1972; see, e.g., the following examples from English and Serbo-Croatian (his (1E) and (4SC) on p. 223):[8]

(9) [[When] and [where]] did you see them?

[6] See, e.g., Dik 1968: 25, Huddleston and Pullum 2002: 1323, Peterson 2004: 650, Eisenberg 2020: 220, etc.
[7] This term is based on Grosu's (1987: 426) "heterofunctional coordinate constructions".
[8] In this paper, only examples from languages other than English and German are explicitly marked as such.

(10) [[Ko] i [čime]] je razbio staklo? (Serbo-Croatian)

who.NOM and what.INS AUX.3SG broke glass

'Who broke glass with (= using) what?'

While in the English (9) two adjuncts are coordinated, and it may be questioned whether temporal adjunct and locative adjunct are indeed different grammatical functions, in the case of the Serbo-Croatian (10) the nominative subject is coordinated with an instrumental dependent.[9]

Such constructions were investigated in a number of languages, including English (see §2), the languages of Central and Eastern Europe (CEE), i.e., Slavic languages as well as Hungarian and Romanian (see §3), Chinese (Zhang 2007), Japanese (Ishii 2014, Kasai 2016), Vlach (Merchant 2017), and Greek (Sinopoulou 2011, 2020). It seems that, crosslinguistically and – at least in the case of some languages – intralinguistically, at least two different mechanisms are responsible for HC (see, e.g., Gračanin-Yüksek 2007): some form of conjunction reduction (i.e., coordination of clauses with some lexical material of the first clause not realised phonetically) and direct coordination of phrases bearing unlike grammatical functions.

In the case of English, it is argued (e.g., in Grosu 1987 and Gračanin-Yüksek 2007) that examples such as (9) are underlyingly coordinations of clauses, as shown in (11):

(11) [[When ~~did you see them~~] and [where did you see them]]?

This explains the ungrammaticality of (12) (Browne 1972: 224, (9E)): it is ungrammatical because the first of the underlying clauses in (13) lacks the obligatory locative argument.

(12) *[[When] and [where]] was he situated?

(13) [*[When ~~was he situated~~] and [where was he situated]]?

On the other hand, the Serbo-Croatian equivalent of (12) given in (14) (Browne 1972: 224, (9SC)) is acceptable, even though the locative argument is equally obligatory:[10]

(14) [[Kada] se i [gde]] nalazio? (Serbo-Croatian)

when REFL and where situated.SG.M

'When and where was he situated?'

Here, the two *wh*-words are dependents of the same verb and on most analyses they are as-

[9] In this paper *dependent* is used as a cover term for 'argument or modifier'.

[10] In this example, *se* is the second-position reflexive clitic, part of the verb *nalazio se* 'find oneself, be situated'.

sumed to be coordinated directly. Together with much of the literature, we will call analyses of HC in terms of coordination of clauses, as in (11), "multiclausal",[11] and analyses assuming direct coordination of different grammatical functions, as in (14) – "monoclausal". The dominant view is that English HC is always multiclausal, while HC in CEE languages may be monoclausal, with at least some of these languages, e.g., Croatian, also having the multiclausal construction at their disposal (Gračanin-Yüksek 2007, Citko and Gračanin-Yüksek 2013).

Unfortunately, apart from English and – to a much lesser extent – Dutch, such constructions are only mentioned in passing in the context of Germanic, and the common assumption is that all Germanic languages behave similarly in this respect, i.e., that HC in Germanic is always multiclausal. The main aim of this paper is to present the results of two empirical investigations of German HC that question this view. The first, described in §4, is a corpus study which shows that HC constructions with obligatory arguments are well represented in corpora. This makes it possible to reject the categorical view that only multiclausal HC is available in German. However, the questionnaire study described in §5 shows that speakers do not judge monoclausal HC as either fully acceptable or as fully unacceptable: there are statistically significant differences in acceptability between monoclausal HC on one hand and uncontroversially grammatical and ungrammatical constructions on the other hand. Moreover, there is considerable variability of judgements between speakers, with various factors influencing their judgements; for example, monoclausal HC with just one obligatory argument is more acceptable on average than HC with two obligatory arguments, monoclausal HC in the Mittelfeld is more acceptable on average than in the Vorfeld, and HC with coordinated *wh*-phrases is more acceptable than HC with other kinds of expressions. While a complete account of such facts is well outside this mainly empirical paper, we interpret these findings in §6 as indicating that there are soft – violable – constraints against monoclausal HC in German and, in §7, we sketch a proof-of-concept analysis that builds on Minimalist Gradient Harmonic Grammar (see Müller *et al.* 2022 and references therein). First, however, let us briefly look at previous work on HC in Germanic (in §2) and in the languages of Central and Eastern Europe (in §3).

[11] Often the term "biclausal" is used, but given that more than two items may be coordinated, "multiclausal" is more appropriate.

2. Heterofunctional Coordination in English, Dutch, and German

The basic observation (e.g., in Schachter 1977) is that while normally phrases bearing different grammatical functions or different semantic roles cannot be coordinated (see (15)), they can in the case of *wh*-phrases (see (16)).[12]

(15) *John met Mary [[in my garden] and [in 1980]].

(16) [[Where] and [when]] did John meet Mary?

Independently of Browne (1972), Grosu (1987) notes that obligatoriness is the deciding factor for the acceptability of such coordinated *wh*-phrases. Thus, (17a) is bad because *what* is an obligatory argument of *seen*, so the second clause in the underlying representation (17b) is ill-formed, but (18a) is good because *what* is an optional argument of *eaten*, so both clauses in (18b) are well-formed.

(17) a. *[[What] and [where]] has Bill seen?

b. [[What ~~has Bill seen~~] and *[where has Bill seen]]?

(18) a. [[What] and [where]] has John eaten (in the last five years)?

b. [[What ~~has John eaten~~] and [where has John eaten]]?

The *wh*-phrases do not have to be fronted, as "examination type" questions show, e.g.:

(19) Bob has eaten [[what] and [where]] (so far)?

Moreover, not only *wh*-phrases may take part in HC, but also other kinds of focused constituents, e.g., those involving *only*, *even*, stressed *any* (also as part of *anything* and *anybody*), superlatives, *too*, etc. (the stressed parts are emphasized):

(20) John has eaten [[*only* American food] and [*only* in his mother's house]] (all his life).

(21) John will steal [[*even* worthless objects] and [*even* from defenseless orphans]] (if he is given the chance).

(22) John will drink [[*any*thing] and [with *any*body]].

(23) John can eat [[the *worst* food (in the world)] and [in the *worst* company (imaginable)]].

(24) John eats [[*too* much] and [*too* often]] for his own good.

Grosu (1987) notes that focus is a necessary condition on HC but it is not sufficient. In

[12] All English data in this section come from Grosu 1987, one of the best – even if rarely cited – discussions of the English facts to date. Other work on English HC includes Browne 1972, Grimshaw 1978, Grosu 1985, Whitman 2002, 2004, and Gračanin-Yüksek 2007.

the following two examples, even when all the numerals are stressed, (26) is more acceptable than (25).

(25) *John has written [[*two* pages] and [to *one* girl]] today.

(26) John has written [[*five* books] and [to *fifteen* publishers]] already!

Apparently, there must be some "common core" meaning – a "common integrator" (Lang 1984, 1991: 605–607) – implied by the two conjuncts in HC. In (26) this common core seems to be that John is writing a lot, while in (25) any common message conveyed by the two numeral phrases is not transparent.[13]

It is clear from the discussion in Grosu 1987 that HC is true coordination.[14] First of all, more than two conjuncts may be involved:

(27) [[What], [from whom], and [for whom]] does John steal?

Second, not only the sole *and* may act as the conjunction in HC, but also such discontinuous conjunctions as *both… and* and *neither… nor*:

(28) I want to know [both [what] and [from whom]] Mary steals.

(29) Mary steals [neither [only gold watches] nor [only for the Mafia]].

Apart from Grosu 1985, 1987 and Whitman 2002, 2004, other work on English HC (mentioned in fn. 12) concentrates on the coordination of *wh*-phrases. The same holds for any mentions of HC in other Germanic languages. For example, Lipták 2011: 151 adduces the following Dutch examples, suggesting that – just as in English – HC is not possible when one of the conjuncts is an obligatory argument:

(30) a. *[[Wat] en [aan wie]] heb je gegeven? (Dutch)
what and to who AUX you given
intended: 'What and to whom did you give?'

b. *[[Wat] en [waar]] heeft Jan gerepareerd? (Dutch)
what and where AUX Jan fixed

[13] See also Whitman 2004 on pragmatic effects involved in English HC.

[14] Grosu (1987) himself argues against a parenthetical analysis, but such examples also refute the view that *and* in this construction is not conjunction but rather some discourse marker (as suggested in Merchant 2017 in the context of HC in Vlach).

intended: ‘What and where did Jan fix?’

c. ??[[Wat] en [waar]] heeft Jan gegeten? (Dutch)
what and where AUX Jan eaten
‘What and where did Jan eat?’

d. [[Wanneer] en [waarom]] ben je weggegaan? (Dutch)
when and why AUX you left
‘When and why did you leave?’

Thus, (30a–b) are unacceptable because they involve, respectively, two obligatory arguments and one obligatory argument, (30d) is fine because both conjuncts are optional adjuncts, while the status of (30c), with an optional argument and an adjunct, is intermediate.

Lipták (2011) also provides another argument for the solely multiclausal nature of English and Dutch HC, based on preposition stranding. Consider (31a) (Gračanin-Yüksek 2007: 38, (6a)), well-formed on the multiclausal analysis (see (31b)), and compare it to (32a) (Lipták 2011: 165, (35a)), ill-formed on the multiclausal analysis (see (32b)).

(31) a. [[What] and [where]] did you sing?

b. [[What ~~did you sing~~] and [where did you sing]]?

(32) a. *[[What] and [where]] did you sing about?

b. [[What$_i$ ~~did you sing [about t_i]~~] and *[where did you sing [about t_i]]]?

The problem with (32) here is that, on the multiclausal analysis, the stranded preposition – and the trace of its argument – is a part of both clauses, even thought only one (the first) of these clauses contains the overt NP that binds this trace. Hence, (32a) is correctly predicted to be ungrammatical. On the other hand, on the monoclausal analysis, there would be only one clause from which *what* is extracted, so – assuming a mechanism such as absorption (Higginbotham and May 1981: 49) or index percolation (Haida and Repp 2011: §5) in the analysis of coordinated *wh*-phrases – this extracted phrase would bind the sole trace and there would be no reason for the ungrammaticality of (32a). As we will see in the next section, analogous examples are grammatical in CEE languages.

A similar argument can be made in support of the strict multiclausality of Dutch HC (Lipták 2011: 174, (54a)).

(33) a. *Waar en wanneer heb je je fiets mee gerepareerd? (Dutch)
what and when AUX you your bike with repaired
intended: 'With what and when did you repair your bike?'

b. [Waar$_i$ ~~heb je je fiets [mee t_i] gerepareerd~~] en *[wanneer heb je je fiets [mee t_i] gerepareerd]? (Dutch)

While Lipták (2011) does not provide any German examples, she reports that the three native speakers she consulted do not accept HC with obligatory conjuncts (Lipták 2011: 153). In fact, only occasional mentions of HC in German may be found in the literature and they are, again, limited to the coordination of *wh*-phrases in questions. Perhaps the first such mention is that in Haider 1982: 16, (39), where the following contrast is presented:

(34) [[Wann] und [wo]] hat sie sich mit ihm getroffen?
when and when AUX.3SG she REFL with him met
'When and where did she meet him?'

(35) *[[Wann] und [wer]] hat sich mit ihm getroffen?
when and who.NOM AUX.3SG REFL with him met
intended: 'Who did meet him and when?'

Haider (1982) claims that (34) is acceptable because the coordination *wann und wo* 'when and where' corresponds to just one underlying adjunct position, a position that may be filled by, e.g., *gestern am Strand* 'yesterday at the beach'. The situation is different in (35), which involves two positions: adjunct and subject.[15] Note that this contrast is immediately handled by the multiclausal analysis:

(36) [[Wann ~~hat sie sich mit ihm getroffen~~] und [wo hat sie sich mit ihm getroffen]]?

(37) [*[Wann ~~hat sich mit ihm getroffen~~] und [wer hat sich mit ihm getroffen]]?

Müller (2003: 56), in his discussion of Haider 1982, offers the following two judgements, again consistent with a multiclausal analysis:

(38) *[[Was] und [womit]] hat das zu tun?
what.ACC and with.what AUX.3SG this to do
intended: 'What does that have to do with anything and what does that have to do with?'

[15] See Grimshaw 1978 for an attempt at an analysis of HC in English along similar lines.

(39) *[[Was] und [zum wievielten Mal]] errang Clark 1965?
what.ACC and how many times achieved.3SG Clark.NOM 1965
intended: 'What and for which time did Clark win in 1965?'

An explicit argument for a multiclausal analysis is offered in Haida and Repp 2011: 379, based on the following examples:

(40) ?[[Wem] und [was]] hast du gespendet?
who.DAT and what.ACC AUX.2SG you.NOM donated
'What did you donate and to whom?'

(41) *[[Wem] und [was]] hast du vorgestellt?
who.DAT and what.ACC AUX.2SG you.NOM presented
intended: 'What did you present and to whom?'

It is noted there that the greater acceptability of (40) than (41) is correlated with the fact that the direct object of *spenden* 'donate' is optional, and that of *vorstellen* 'present' is obligatory. That is, the judgements in (40)–(41) are a direct consequence of the judgements of the underlying structures (42)–(43).

(42) [?[Wem ~~hast du gespendet~~] und [was hast du gespendet]]?

(43) [*[Wem ~~hast du vorgestellt~~] und [was hast du vorgestellt]]?

In summary, while there is hardly any specific work on HC in German, HC in Germanic languages in general is believed to be strictly multiclausal, i.e., not analysable in terms of direct coordination of the apparent conjuncts. Before we consider (in §4) corpus data that contradict this view, let us have a look at HC in Central and Eastern European languages, which requires monoclausal analysis.

3. Heterofunctional Coordination in CEE Languages

Ever since Sannikov's (1979, 1980) work on Russian, it is clear that not only *wh*-phrases but also heterofunctional constituents based on other series of what might be called "pronominal

quantifiers" may be coordinated.[16,17] This is illustrated with the following examples from the National Corpus of Russian, cited in Paperno 2012: ch. 3:[18]

(44) Vam [[nikto] i [ničego]] ne predlagal eščë. (Russian)
you.DAT nobody.NOM and nothing.ACC NEG offered yet
'Nobody has offered you anything yet.'

(45) Zdes [[vsem] i [vsegda]] kofe podavala ona sama. (Russian)
here all.DAT and always coffee.ACC served.F.SG she.NOM self.NOM
'Here she always served coffee herself to everyone.'

(46) Ponjal li [[kto-nibud'] i [čto-nibud']]? (Russian)
understood Q anyone.NOM and anything.ACC
'Has anyone understood anything?'

(47) Ne xochu [[kogo-to] i [v chem-to]] konkretno uprekat'. (Russian)
not want.1SG someone and in something specifically reproach
'I do not want to reproach anyone for anything specifically.'

Nevertheless, just as in the case of English, much of the literature on HC in CEE languages concentrates on *wh*-phrases.[19]

As noted above, one conspicuous difference between HC in CEE languages and in Germanic languages is that obligatory arguments may take part in HC in CEE languages but apparently not in Germanic. This was illustrated above with the contrast between (12) and (14) from Browne 1972. More generally, while multiclausal analyses are commonly assumed in accounts of Germanic HC, many works on HC in CEE languages explicitly argue against (solely)

[16] Sannikov (1979, 1980) also includes in his considerations examples such as (16) (Sannikov 1979: 416, (19)):
(i) Poet živet [[s narodom] i [dlja naroda]]. (Russian)
poet lives with nation and for nation
'The poet lives with the people and for the people.'
We leave such cases out of the current study.

[17] After Sannikov 1979, 1980 and Mel'čuk 1988: 40, n. 5, HC is often called "lexico-semantic coordination" in Slavic linguistics. Another term, used, e.g., in Chaves and Paperno 2007, is "hybrid coordination".

[18] Such and many other series in Polish are illustrated with corpus examples in Przepiórkowski and Patejuk 2014 and in Patejuk 2015: §§5.2 and 5.8.

[19] For example, Browne 1972, Kazenin 2001, Lipták 2003, 2011, Gračanin-Yüksek 2007, Skrabalova 2007, Gribanova 2009, Gruet-Skrabalova 2011, Raţiu 2011, Lipták 2011, Gazdik 2011, Bîlbîie and Gazdik 2012, Citko 2013, Citko and Gračanin-Yüksek 2013, 2016, Bošković 2022. Notable exceptions are: Sannikov 1979, 1980, Chaves and Paperno 2007, and Paperno 2010, 2012 on Russian, Kallas 1993, Patejuk and Przepiórkowski 2012, Przepiórkowski and Patejuk 2014, Patejuk 2015, and Przepiórkowski 2022c,a on Polish; see also Lipták 2001: 127 for a couple of examples from Hungarian.

multiclausal analyses in these languages.[20]

One argument is the dual of the argument from preposition stranding for the multiclausal character of HC in English and Dutch (see (32) and (33) above). Unlike in these languages, HC is compatible with stranding in CEE languages (Lipták 2011: 165, (36a), (34d)):

(48) [[Kakuju$_i$] i [kto]] prodal [t_i mašinu?] (Russian)
which.ACC and who.NOM sold car.ACC
'Who sold which car?'

(49) [[Kinek$_i$] és [miért]] ettél a [t$_i$ tortájából]? (Hungarian)
who.DAT and why ate.2SG.INDEF the cake.POSS.3SG.FROM
'Whose cake did you eat from and why?'

As CEE languages generally do not allow for preposition stranding, (48)–(49) involve Left-Branch Extraction of a modifier from an NP instead. Unlike the English and Dutch examples involving preposition stranding, these examples are fully acceptable, even though, on the multiclausal analysis, they should be ungrammatical for the same reason as the English and Dutch examples above. That is, their grammaticality is an argument – one of many found in the literature on HC in CEE languages – for the monoclausal analysis and the direct coordination of the relevant *wh*-phrases.

4. HC in German – Corpus Study

A qualitative corpus study was conducted, with the aim to check whether examples of HC involving obligatory arguments among conjuncts may be found in German texts. Given that the availability of such HC constructions is sometimes linked to the availability of multiple *wh*-fronting, corpora were also searched for examples such as (50).

(50) *Wer wann hat sich über ihn aufgeregt?
who.NOM when AUX.3SG REFL on him upset
intended: 'Who got upset with him and when?'

This last search produced no results: no examples of multiple *wh*-fronting were found. On

[20]Many arguments against such analyses may be found, e.g., in Kazenin 2001, Gribanova 2009: 136–137, and Paperno 2012: 99–102 (for Russian), in Lipták 2003, 2011: 163–165 and Bîlbîie and Gazdik 2012: §3.3 (for Hungarian), and in Skrabalova 2007: §§2 and 5 (for Czech). On the other hand, unlike Comorovski (1996), Raţiu (2011) and Bîlbîie and Gazdik (2012) analyse Romanian HC as multiclausal.

the other hand, German corpora contain many examples of almost all types of HC identified by Grosu (1987), as well as some of the types observed in CEE languages: *wh* (see (51)), negative quantifiers (see (52)), universal quantifiers (see (53)), focus *only* and *even* (see (54)–(55)), *any* (see (56)), superlatives (see (57)), *too* (see (58)), etc.[21]

(51) [[Was] und [wo]] drehen Sie gerade? (DeReKo)
what.ACC and where shoot.3PL you.NOM right.now
'What are you shooting right now and where?'

(52) Das kann übrigens [[nie] und [niemandem]] schaden. (deTenTen13)
that.NOM can.3SG by.the.way never and nobody.DAT hurt
'That, by the way, can never hurt anyone.'

(53) Dieses Gemüsecurry gelingt [[immer] und [jedem]]! (deTenTen13)
this.NOM vegetable.curry.NOM succeeds always and all.DAT
'Anyone will succeed preparing this vegetable curry every time.'

(54) Der Eingriff wird [[nur in größeren Geburtskliniken] und [nur von einem Anästhesisten]]
the procedure is only in larger maternity.hospitals and only by an anaesthetist
durchgeführt. (deTenTen13)
performed
'The procedure is only performed in larger maternity hospitals and only by an anaesthetist.'

(55) Vielleicht macht mein Nachfolger [[sogar alles anders] und [sogar
maybe does my.NOM successor.NOM even everything.ACC differently and even
viel besser]]. (DeReKo)
much better
'Maybe my successor will even do everything differently and even much better.'

[21] Results of searching the following corpora are reported in this paper:

- Deutsches Referenzkorpus DeReKo (Kupietz *et al.* 2018): The corpus of modern written German containing 50.6 billion words. Available via COSMAS II portal at `https://cosmas2.ids-mannheim.de/cosmas2-web/`. For this paper, mainly the W4 subcorpus (10.7 billion words) was queried.
- deTenTen13 (Jakubíček *et al.* 2013): 16.5-billion-word corpus of texts collected from the Internet. Available via the SketchEnginge platform at `https://www.SketchEngine.eu/`.

Appendix A also contains a few examples from deTenTen18, another corpus of Internet texts available via SketchEngine, containing 5.3 billion words.

(56) [[Irgendwo] und [irgendwas]] sucht Deutschland immer – jetzt auch noch
somewhere and something.ACC searches Germany.NOM always now also in.addition
den Superfuß. (DeReKo)
the superfoot
'Germany always looks for something somewhere – now for the superfoot.'

(57) "The Fool" ist ein Album, das man [[am besten über Kopfhörer] und [am besten nachts]]
the Fool is an album that one best over headphones and best at.night
genießt. (DeReKo)
enjoys
'"The Fool" is an album to be enjoyed best over headphones and at best at night.'

(58) Immer mehr junge Leute trinken [[zu viel] und [zu oft]] und fangen zudem
more and more young people drink.3PL too much and too often and start.3PL also
immer früher damit an. (DeReKo)
earlier and earlier with.it PART
'More and more young people are drinking too much and too often, and they are also starting to do so earlier and earlier.'

In all of the above examples, conjuncts either clearly are or can be argued to be optional dependents of their respective heads. For example, (51) involves the direct object *was* 'what' and the adjunct *wo* 'where', both optional dependents of the verbal head *drehen* 'film, shoot'.[22] That is, the above examples are compatible with the common assumption that Germanic languages only have the multiclausal HC.

However, many corpus examples contain uncontroversially obligatory arguments, including subjects of finite verbs, e.g.:

(59) Der Händler hat dadurch einen Überblick, [[wer], [was] und [wo]] eingekauft
the merchant has this.way an overview who.NOM what.ACC and where bought
hat. (DeReKo)
AUX.3SG

[22]This is obvious in the case of the adjunct, but also the direct object of the verb DREHEN is optional, as in the attested *Wo drehen Sie lieber?* 'Where do you prefer to shoot?' (`http://www.bayerische-kultserien.de/Interviews/InterviewFischerauer.html`).

'The merchant thus has an overview of who has bought what and where.'

(60) Übertaktet ist auch [[nichts] und [nie]] gewesen. (deTenTen13)
overlocked is also nothing.NOM and never been
'Also nothing has ever been overlocked.'

(61) Das Sakrament des Lebens kann [[jeder] und [immer]] wieder empfangen.
the sacrament of life can.3SG everyone.NOM and always again receive.INF (DeReKo)
'The sacrament of life can again be received by everyone and at any time.'[23]

(62) Für den Fotowettbewerb dürfen [[nur Papierabzüge] und [nur im Format
for the photo.competition may.3PL only paper.prints.NOM and only in.the format
20x30 bis 30x40]] eingesendet werden, pro Teilnehmer maximal drei. (DeReKo)
20x30 to 30x40 submitted become per participant maximum three
'Only paper prints may be submitted for the photo competition only in the format 20x30 to 30x40, with a maximum of three per participant.'

In (59)–(62), the first conjunct is the subject, so – on the multiclausal analysis – non-initial clausal conjuncts would be subjectless and, hence, ill-formed. This is illustrated with the following hypothetical underlying multiclausal structure of (59):

(63) Der Händler hat dadurch einen Überblick, [[wer ~~eingekauft hat~~], *[was
the merchant has this.way an overview who.NOM ~~bought AUX.3SG~~ what.ACC
~~eingekauft hat~~] und *[wo eingekauft hat]].
~~bought AUX.3SG~~ and where bought AUX.3SG

Hence, such examples must be analysed as involving the monoclausal structure of HC, even though it is generally assumed to be unavailable in German.

Note that the acceptability (at least to some speakers) of (59)–(62) cannot be explained by assuming that non-initial clauses contain a phonologically empty subject co-indexed with the overt subject in the initial clause. What speaks against this assumption is not only the fact that standard German is not a *pro*-drop language, but also the ungrammaticality of sentences such as (64), i.e., overt versions of the hypothetical multiclausal structures underlying HC; compare

[23] Earlier context makes it clear that, contrary to first impressions, the structure of this example is as indicated, rather than "…[[jeder] und [immer wieder]]…".

the unacceptable (64) with the acceptable (65), in which the non-initial clausal conjuncts have the overt subject *er* 'he.NOM':

(64) Der Händler hat dadurch einen Überblick, [[wer eingekauft hat], *[was
the merchant has this.way an overview who.NOM bought AUX.3SG what.ACC
eingekauft hat] und *[wo eingekauft hat]].
bought AUX.3SG and where bought AUX.3SG

(65) Der Händler hat dadurch einen Überblick, [[wer eingekauft hat], [was
the merchant has this.way an overview who.NOM bought AUX.3SG what.ACC
er eingekauft hat] und [wo er eingekauft hat]].
he.NOM bought AUX.3SG and where he.NOM bought AUX.3SG

An analysis assuming such covert subjects coreferential with the preceding overt subjects is also not possible in the case of examples such as (60), involving overt subjects expressed by negative quantifiers ($\neg\exists$), as they cannot be referred to by pronouns (whether overt or covert). Moreover, such an analysis is not immediately compatible with examples of HC in which the subject is a non-initial conjunct, as then the hypothetical covert subject in the initial clause would have to cataphorically refer to the overt subject in non-initial conjuncts. A few attested examples of this kind are given below:[24]

(66) Ich bin sehr gespannt [[wann] und [wer]] gewählt werden wird! (deTenTen13)
I am very curious when and who.NOM elected become AUX.3SG
'I am very curious who will be elected and when.'

(67) Denn das, was uns zugefügt wurde, wird [[nie] und [niemand]] wieder
because this.ACC that us inflicted became AUX.3SG never and nobody.NOM again
"gut" machen! (deTenTen13)
good make.INF

[24] In the case of *wh*-HC, as in (66), care must be taken to identify false positives involving sluicing, where the initial conjunct in the apparent HC is really a reduced clause referring to the previous context, as in *John will eventually arrive. But I wonder when and who will witness this*, where *when* is really an ellipsis of *when John will arrive*. (See also fn. 27.) The preceding context of (66) is incompatible with such a sluicing analysis: *Schnell muss die Chemie zwischen der Mannschaft und dem Trainer, zwischen der Vereinleitung und dem Trainer, zwischen den Medien und dem Trainer, zwischen den Fans und dem Trainer... funktionieren. Ein wahre Herkulesaufgabe. Wer wird Nachfolger? Ich bin sehr gespannt wann und wer gewählt werden wird!* 'The chemistry between the team and the coach, between the club management and the coach, between the media and the coach, between the fans and the coach... must work in no time. A truely Herculean task. Who will be the successor? I am very curious who will be elected and when!'

'Because no one will ever make what has been inflicted on us "good" again!'

(68) Zur Wahrheit gehört aber auch anzuerkennen, daß nicht [[immer] und [jede
in.the truth belongs but also recognising that not always and every.NOM
Werbe- und Marketingmaßnahme]] den gewünschten Erfolg bringt.
advertising- and marketing.measure.NOM the.ACC desired success.ACC brings
(deTenTen13)
'But the truth also includes recognising that not every advertising and marketing measure brings always the desired success.'

(69) Aber, [[irgendwo] und [irgendwas]] ist da nicht "koscher" um auf das
but somewhere and something.NOM is there not kosher in.order.to on the
aktuelle Thema zu lenken. (deTenTen13)
current topic to direct
'But something is not "kosher" somewhere in order to draw attention to the current topic.'

Over 150 corpus examples of German HC involving subjects are given in Appendix A.

It should be noted that many examples of HC with obligatory subjects among conjuncts, especially those from the DeReKo corpus, are from edited texts, including newspapers, so they are unlikely to be errors. For example, (59) comes from *Saale-Zeitung*, and there are a dozen other relevant examples – listed in Appendix A – involving the sequence *wer, was und wo* 'who, what and where' in the W4 DeReKo subcorpus, from various newspapers including *Stuttgarter Zeitung*, *Sächsische Zeitung*, *Hamburger Abendblatt*, *Der Tagesspiegel*, etc.

In summary, given the numerous occurrences of monoclausal HC in corpora, including many from edited texts, it cannot be maintained that this construction is absent in German. However, the results of the questionnaire study reported in the next section demonstrate that such constructions are not judged by native speakers as fully acceptable.

5. HC in German – Questionnaire Study

Given the results of the corpus study described above, we predicted that – contrary to the common view in the literature – German HC constructions with obligatory arguments are *not* ungrammatical. We performed three judgement experiments to verify this view. In each of the

three experiments, target items involved HC with three kinds of conjuncts that occurred most frequently in corpora: *wh*-phrases, universal quantifiers, and negative quantifiers.

5.1 Vorfeld Questionnaire

In the first experiment, we tested HC in the Vorfeld position, as in (70)–(72).

(70) Wer und wo hat mit ihm Spaß gehabt?
who.NOM and where AUX with him.DAT fun had
'Who had fun with him and where?'

(71) Jeder und überall hat mit ihm Spaß gehabt.
everybody.NOM and everywhere AUX with him.DAT fun had
'Everyone had fun with him everywhere.'

(72) Niemand und nirgends hat mit ihm Spaß gehabt!
nobody.NOM and nowhere AUX with him.DAT fun had
'Nobody had fun with him anywhere!'

The experiment was split into two subexperiments: in the first, only those verbs (or light verb constructions) were used that had just one obligatory argument – the subject. This is the case in (70)–(72), were the subject of the light verb construction *Spaß haben* 'have fun' is its only obligatory argument. In this subexperiment, both conjuncts could be optional dependents of the verb or – as in (70)–(72) – one of the conjuncts could be the obligatory subject. More complex verbs, with two obligatory arguments, were used in the second subexperiment. In this subexperiment, one of the conjuncts was the obligatory subject and the other was either an optional dependent or the second obligatory argument. The exact design of all experiments reported in this section, as well as detailed statistical analyses, are presented in Appendix B.

The results of the Vorfeld experiment confirmed our prediction only partially. As predicted, HC constructions with one obligatory argument turned out to be more acceptable than ungrammatical fillers, and – again, as predicted – the difference was statistically highly significant ($p < 0.001$), but – contrary to expectations – the effect size was relatively small. As can be seen in Table 1(a), in the subexperiment in which we juxtaposed sentences with 0 obligatory arguments and those with 1 obligatory argument, the average score for those with 1 obligatory

(a)

items	M	SD	MED
GF	1.78	0.24	1.89
0	1.15	0.60	1.22
1	−1.03	0.78	−1.11
UF	−1.83	0.24	−1.89

(b)

items	M	SD	MED
GF	1.78	0.24	1.89
1	−1.28	0.71	−1.50
2	−1.54	0.47	−1.67
UF	−1.83	0.24	−1.89

Table 1: Comparing acceptability of HC in Vorfeld with 0 vs. 1 obligatory dependents (a) and 1 vs. 2 obligatory dependents (b)

argument is −1.03, more readily interpretable as "ungrammatical" than as "grammatical".[25] Similarly, according to the second subexperiment, juxtaposing sentences with 1 and 2 obligatory arguments among conjuncts, average ratings of these groups are −1.28 and −1.54 – see Table 1(b).[26] Again, these numbers suggest "ungrammatical" rather than "grammatical" status of HC with obligatory arguments, despite the fact that all differences between any two adjacent rows in these tables are highly significant ($p < 0.001$). By contrast, the average score of examples of HC without obligatory arguments is 1.15 (see Table 1(a) again), readily interpretable as an indication of "grammaticality", despite the highly significant difference between this average score and that for grammatical fillers (1.78).

These worse-than-expected results reflect the fact that, in this experiment, all target sentences contained HC in the Vorfeld position. This should be contrasted with the fact that a great majority of corpus examples, cited in the previous section and in Appendix A, involve HC in the Mittelfeld. At this stage we hypothesized that HC would be more acceptable in the Mittelfeld and performed experiments that demonstrate this.

5.2 Mittelfeld Questionnaire

The Mittelfeld experiment had the same design as the Vorfeld experiment; the main difference between the Vorfeld experiment and the Mittelfeld experiment is that the target constructions were contained in subordinate clauses, as in (73)–(75).[27]

[25] In this and subsequent tables, GF stands for grammatical fillers, UF – for ungrammatical fillers, M – for mean, SD – for standard deviation, MED – for median.

[26] Both subexperiments were part of the same questionnaire, with a single collection of grammatical and ungrammatical fillers, hence the identical numbers in the GF and UF rows in the two tables.

[27] Note that in both experiments, whenever there is just one obligatory argument (the subject), it is the first conjunct. This is because, in the case of HC involving *wh*-phrases, when the obligatory argument is the second conjunct, the sentence gets a biclausal analysis on the sluicing interpretation (cf. fn. 24). Let us illustrate this with the English example *I am not quite sure when and who laughed at her*, in which the subject is the second conjunct. This sentence is acceptable as an answer to *I heard somebody laughed at her – when was that?*, where it is interpreted as *I am not quite sure when (somebody laughed at her) and I am not quite sure who laughed at her*.

(73) Ich bin mir nicht ganz sicher, wer und wann über sie gelacht hat.
I.NOM am me.DAT not quite sure who.NOM and when over her.ACC laughed AUX
'I am not quite sure who laughed at her and when.'

(74) Ich bin mir nicht ganz sicher, ob jeder und immer über sie
I.NOM am me.DAT not quite sure if everybody.NOM and always over her.ACC
gelacht hat.
laughed AUX
'I am not quite sure whether everybody always laughed at her.'

(75) Ich bin mir ganz sicher, dass niemand und nie über sie gelacht hat.
I.NOM am me.DAT quite sure that nobody.NOM and never over her.ACC laughed AUX
'I am quite sure that nobody ever laughed at her.'

The results of the Mittelfeld experiment comparable to those in Table 1 are presented in Table 2.

(a)

items	M	SD	MED
GF	1.70	0.50	1.83
0	1.23	0.64	1.44
1	−0.50	0.91	−0.56
UF	−1.71	0.51	−1.89

(b)

items	M	SD	MED
GF	1.70	0.50	1.83
1	−0.78	0.79	−0.91
2	−1.24	0.66	−1.33
UF	−1.71	0.51	−1.89

Table 2: Comparing acceptability of HC in Mittelfeld with 0 vs. 1 obligatory dependents (a) and 1 vs. 2 obligatory dependents (b)

As in the case of Table 1, differences between means in any two adjacent rows in Table 2 are statistically highly significant ($p < 0.001$). More importantly, average scores of monoclausal HCs are much higher in Table 2 than in Table 1. For example, in the "0 vs. 1" subexperiment, the average score of items with 1 obligatory conjunct rose from -1.03 in the Vorfeld to -0.50 in the Mittelfeld. All differences between such mean scores of items with obligatory conjuncts in Tables 1 and 2 are statistically highly significant ($p < 0.001$). This is despite the fact that sentences in the Mittelfeld experiment were longer than those in the Vorfeld experiment, and longer sentences are commonly believed to be less acceptable for processing reasons.[28]

This problem does not occur when the subject is the first conjunct, as such a sluicing interpretation is not available then: *I am not quite sure who and when laughed at her* (cf. (73)) cannot be understood as an answer to *I heard that somebody laughed at her at one point – who was that?* because the second hypothetical underlying clause in *I am not quite sure who (laughed at her at some point) and I am not quite when laughed at her* is ungrammatical.

[28] See, e.g., Häussler and Juzek 2021: 100 and Francis 2022: 118.

5.3 Corpus Questionnaire

It has been occasionally observed that constructed sentences used in such formal experiments sound artificial and tend to be rated lower than attested sentences,[29] so – in the third experiment – we also selected 72 sentences from corpora, 4 for each combination of 2 field positions (Vorfeld vs. Mittelfeld), 3 kinds of conjuncts (*wh* vs. universal vs. negative), and 3 types of obligatoriness (0 obligatory arguments vs. 1 obligatory argument: either as the first or as the second conjunct). Results analogous to those in Tables 1 and 2 are presented in Table 3.[30] What is notable about these results is that the mean score of HC with an obligatory conjunct is approximately 0.[31]

items	M	SD	MED
GF	1.67	0.33	1.78
0	1.34	0.42	1.38
1	−0.05	0.71	−0.12
UF	−1.84	0.32	−1.94

Table 3: Comparing acceptability of HC in corpus examples with 0 vs. 1 obligatory dependents

Acceptability ratings of corpus examples confirm the greater acceptability of HC in the Mittelfeld than in the Vorfeld; see Figure 1.[32] In the case of HC examples with an obligatory conjunct, the mean score in the Vorfeld is -0.44 (SD = 0.77, MED = -0.50) but it is positive in the Mittelfeld: 0.34 (SD = 0.74, MED = 0.21); the difference is statistically highly significant ($p < 0.001$).

An interesting effect observed in all the experiments is the dependence of acceptability on the kind of quantificational expressions used in HC: coordination of *wh*-phrases (as in *wer und wann* 'who and when') is rated higher than coordination of universal quantifiers (as in *jeder und immer* 'everybody and always'), which in turn is rated higher than coordination of negative quantifiers (as in *niemand und nie* 'nobody and never'). This effect is shown for the corpus experiment in Figure 2; see Appendix B for the other two experiments and for statistical analyses. This figure compresses three barplots, each comparable to that in Figure 1 but taking

[29] In the words of Roland and Jurafsky (2002: 327), "'test-tube' sentences are not the same as 'wild' sentences".

[30] The same grammatical and ungrammatical fillers were used in all three experiments; differences in means, SDs, and medians in the GF and UF rows of Tables 1–3 reflect the three different groups of participants in these three experiments.

[31] Needless to say, differences between each two adjacent rows are again highly significant.

[32] In this and subsequent figures, error bars indicate 95% confidence intervals.

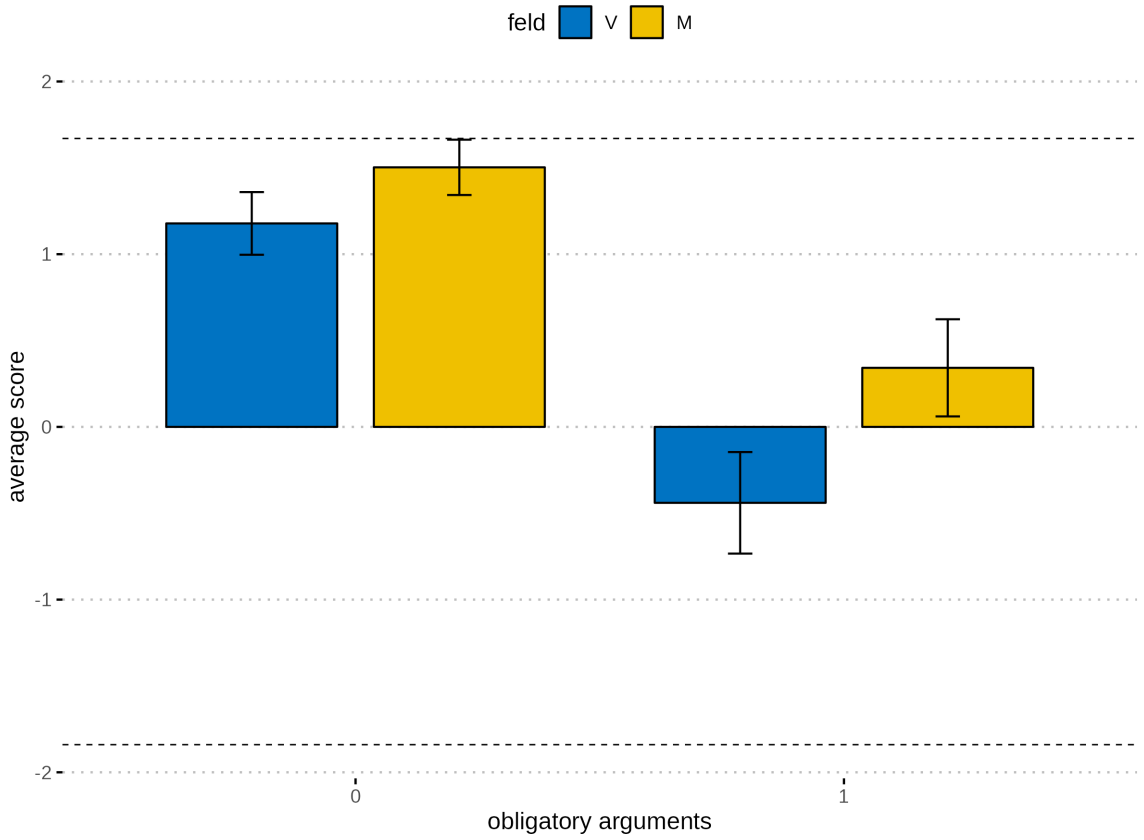


Figure 1: Mean acceptability scores of HC in corpus examples with 0 vs. 1 obligatory dependents in the Vorfeld and in the Mittelfeld; dashed lines are mean scores for grammatical and ungrammatical fillers

into account only one kind of conjuncts. For example, in the case of Mittelfeld examples (see yellow – lighter – bars in Figure 2) with an obligatory argument (the 4th bar in each of the three barplots), HC involving *wh*-phrases (see the first barplot) has the average score of 0.61 (SD = 0.86, MED = 0.63), HC with universal quantifiers (the second barplot) scores 0.27 (SD = 0.71, MED = 0.25), and HC with negative quantifiers (the third barplot) scores 0.15 on average (SD = 0.84, MED = 0.13).

The final observation is that there is a great variability in the acceptance of HC constructions. Figure 3 shows respondents' average scores of corpus examples of Vorfeld HC with an obligatory argument, and Figure 4 shows analogous variability regarding Mittelfeld examples. In the case of Vorfeld HC with an obligatory argument (see Figure 3), average scores of 4 of the 29 respondents are confidently positive, for 14 the scores are confidently negative;[33] overall,

[33]By "confidently positive" ("confidently negative") we mean that the whole confidence intervals are positive (negative).

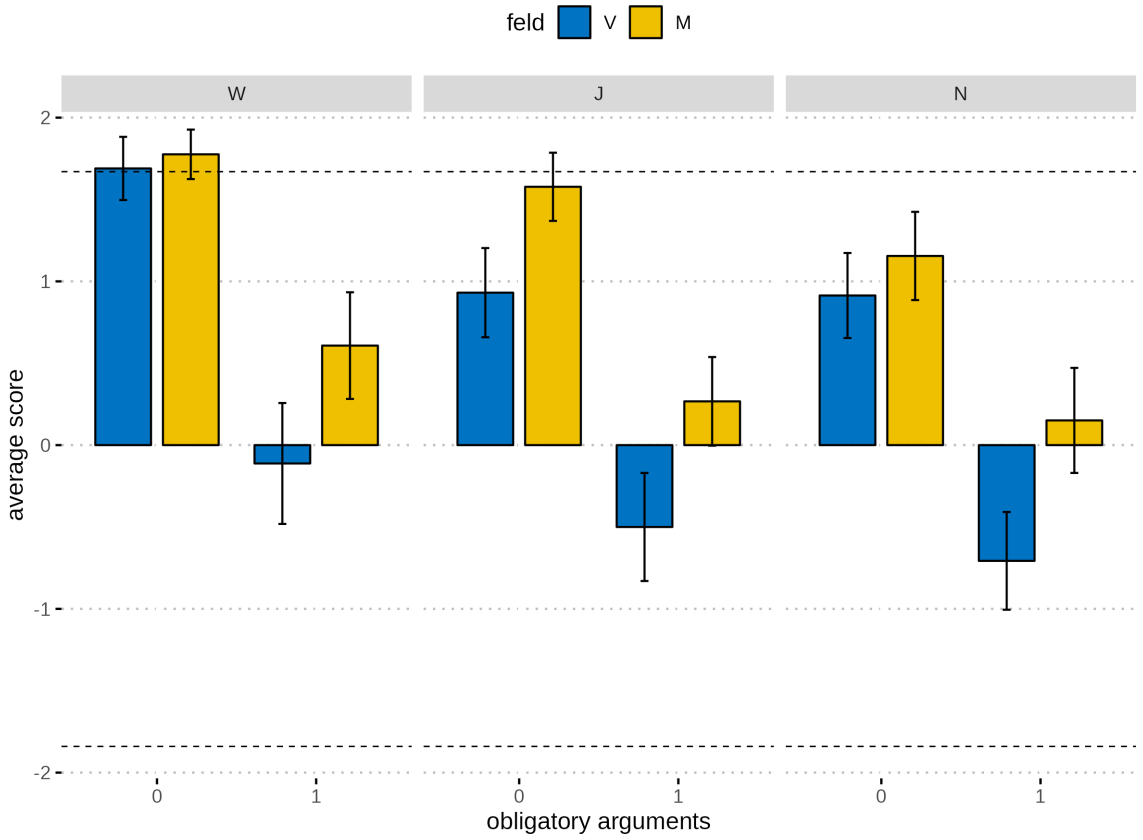


Figure 2: Mean acceptability scores of HC in corpus examples with 0 vs. 1 obligatory dependents in the Vorfeld and in the Mittelfeld, split by the kind of conjuncts (W: *wh*, J: universal, N: negative); dashed lines are mean scores for grammatical and ungrammatical fillers

average scores range from −1.96 to 1.08. In the case of Mittelfeld HC (see Figure 4), this tendency is reversed: average scores of 10 of the 29 respondents are confidently positive, and only for 3 are they confidently negative, with average scores ranging from −1.5 to 1.63.

6. Analytical Consequences

Let us summarize the empirical findings of the previous two sections. The corpus study shows that monoclausal Heterofunctional Coordination is present in the grammar of German. This conclusion will be qualified below, but the sheer number attested HC examples with obligatory arguments makes it impossible to categorically claim that German does not allow for monoclausal HC.[34]

[34]Cf. "If a particular sentence type is attested in language use, and occurs in contexts that tend to improve its acceptability, we can reasonably conclude that the grammar must license these sentence types. The lower acceptability… must then be explained in terms of additional factors…" (Francis 2022: 106), as well as "While judgment data are inherently ambiguous with respect to grammaticality, corpus data should be somewhat more definitive, since attested examples demonstrate that people are actually using the constraint-violating sentence

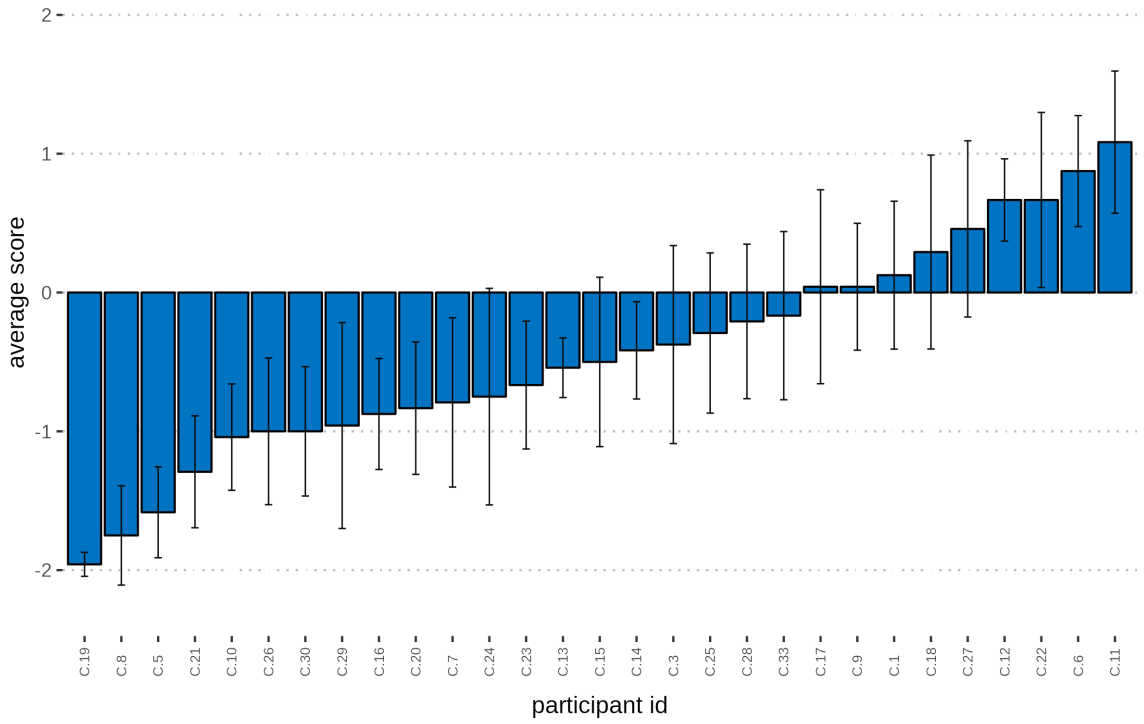


Figure 3: Mean acceptability scores of corpus examples of HC in the Vorfeld with 1 obligatory dependent (by participant)

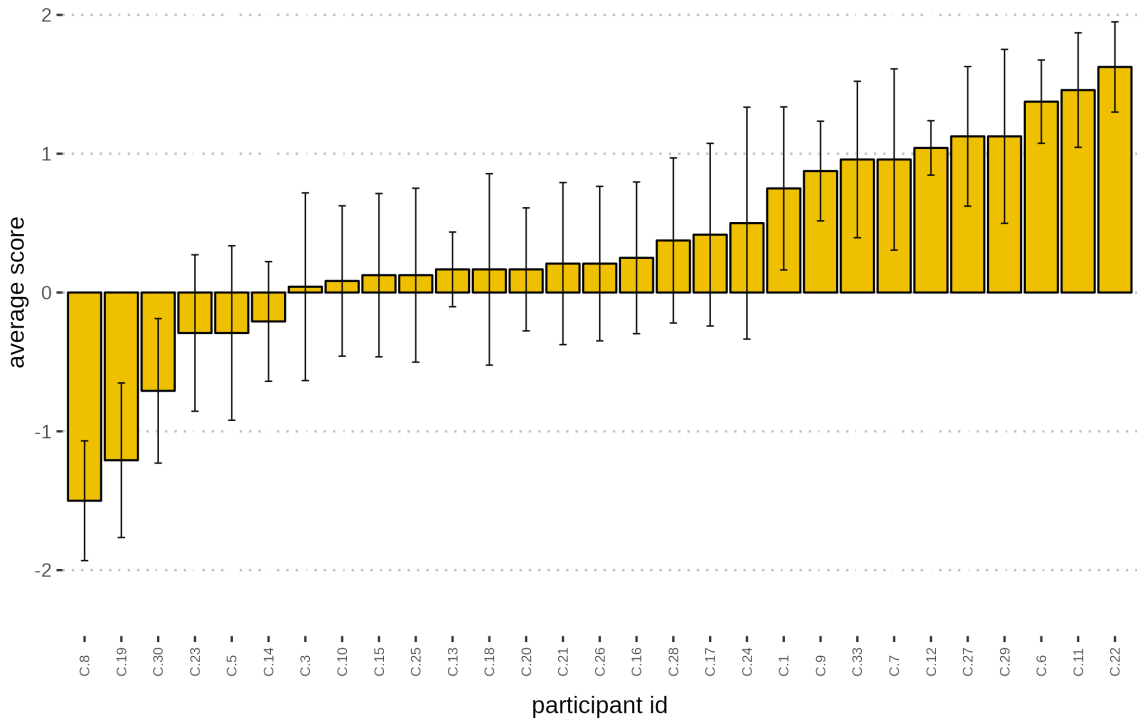


Figure 4: Mean acceptability scores of corpus examples of HC in the Mittelfeld with 1 obligatory dependent (by participant)

However, the questionnaire study shows that monoclausal HC is not judged as fully acceptable. Even the most acceptable group of examples with 1 obligatory conjunct, i.e., attested examples of coordination of *wh*-phrases in the Mittelfeld, only gets the average score of 0.61 on the scale from -2 to 2 (see the 4th bar in the left panel of Figure 2 and Table 37 in Appendix B); this should be contrasted with the corresponding group of attested examples of coordination of *wh*-phrases in the Mittelfeld without any obligatory conjuncts, with the mean score of 1.78 (see the 2nd bar in the same barplot). We also saw that various factors influence the acceptability of monoclausal HC: it is more acceptable in the Mittelfeld than in the Vorfeld, and the coordination of *wh*-phrases is more acceptable than that of universal quantificational expressions, which in turn are more acceptable in HC than negative quantifiers. Moreover, there is considerable variability in how readily different speakers accept monoclausal HC.

6.1 Performance vs. Competence

In general, there are two possible explanations of such graded and variable acceptability scores: with reference to processing (i.e., as a performance phenomenon) and by allowing grammaticality to be gradient rather than binary (i.e., as a competence phenomenon). The processing route must be chosen on the assumption that grammaticality is strictly binary; on this common assumption, the only reason for non-binary acceptability grades must be related to performance. However, in the case of German HC, this explanation is unlikely.

In the two experiments described in §§5.1–5.2, in which participants judged artificially constructed sentences differing in the number of obligatory conjuncts, the complexity of the judged sentences was similar. For example, the Vorfeld experiment contained contrasting sentences such as (76) (with the obligatory subject among conjuncts) and (77) (with no obligatory arguments).

(76) Wer und wann hat mit ihm Verstecken gespielt?
who.NOM and when AUX with him.DAT hide.and.seek played
'Who played hide and seek with him and when?'

(77) Wann und mit wem hat sie Verstecken gespielt?
when and with who.DAT AUX she.NOM hide.and.seek played

type." (Francis 2022: 149).

'When with whom did she play hide and seek?'

In both, the distance between the coordinated dependents and the verb is roughly the same and relatively small, so it is not clear what processing effect could favour (77) over (76). There are also no reasons to assume that the processing of subjects in the Vorfeld position (e.g., *wer* in (76)) is harder than the processing of other dependents (e.g., *mit wem* in (77)); both occur in the Vorfeld frequently. And also the order of conjuncts (*wer und wann* in (76) vs. *wann und mit wem* in (77)) is unlikely to be a processing factor.

Additionally, sentences in the Mittelfeld experiment were longer, as in (78)–(79), but all relevant dependencies were similarly local, within the subordinate clause.

(78) Ich kann mich daran gut erinnern, wer und wann mit ihm Verstecken
I.NOM can me.ACC at.this well recall who.NOM and when with him.DAT hide.and.seek
gespielt hat.
played AUX
'I remember well who played hide and seek with him and when.'

(79) Ich kann mich daran gut erinnern, wann und mit wem sie Verstecken
I.NOM can me.ACC at.this well recall when and with who.DAT she.NOM hide.and.seek
gespielt hat.
played AUX
'I remember well when and with whom she played hide and seek.'

Moreover, such contrasting sentences were built on the same – relatively frequent – verbs, so verb frequency could not have been a processing factor distinguishing HC with 0 vs. 1 obligatory argument (or with 1 vs. 2 obligatory arguments).[35]

It is also not clear how processing could explain the greater acceptability of HC in the Mittelfeld than in the Vorfeld. It is unlikely that the lower acceptability in the Vorfeld could be explained via the minimally greater distance between the verb and its dependents within HC, as this difference consisted of just one word, namely, the auxiliary *hat* (compare (76) with (78) or

[35] As verified in *Digitales Wörterbuch der deutschen Sprache* (DWDS; `https://www.dwds.de/`), almost all verbs had the frequency class of between 4 and 6 on the scale from 1 (very rare) to 7 (very frequent). The two verbs with frequency class 3 used in some of the questionnaires were *beneiden* 'envy' and *ängstigen* 'frighten', and the only verb from class 7 was *haben* 'have', used in the Vorfeld experiment as part of the light verb construction *Spaß haben* 'have fun'.

(77) with (79)). As noted above, given that target sentences in the Mittelfeld experiment were a few words longer than those in the Vorfeld experiment (compare (76)–(77) with (78)–(79) again), the opposite processing effect would rather be expected.

On the other hand, the difference in the acceptability of the three kinds of conjuncts – *wh*-phrases, universal quantifiers, and negative quantifiers – may well be a processing effect. In particular, the lower acceptability of HC with negative phrases is expected, given that quantifiers which are downward monotone on the second (right) position (such as those meaning 'nobody', etc.) are known to be harder to process for humans than other quantifiers (see, e.g., Geurts and Van Der Slik 2005, Deschamps *et al.* 2015, and Agmon *et al.* 2019, as well as Szymanik 2016 for an overview).[36] For this reason, we will not attempt to model the quantificational kinds of conjuncts in the proof-of-concept analysis in §7.

In summary, we see no processing explanation for the difference in acceptability between HC with 0, 1, and 2 obligatory dependents, or for the differences between the Mittelfeld and the Vorfeld. Hence, until a convincing argument is made that these effects are a matter of performance rather than competence, they should be modeled in grammar – a kind of grammar that allows for degrees of grammaticality.

6.2 Previous Analyses

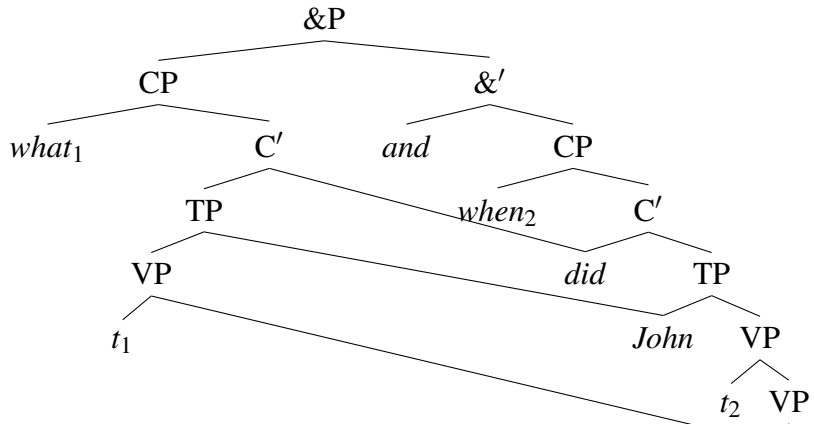
There are currently two approaches to HC taking into account both multiclausal and monoclausal structures: the Minimalist account of Gračanin-Yüksek 2007 and the LFG account of Patejuk 2015. In the remainder of this section we present the Minimalist analysis, as it is the basis of the proof-of-concept sketch in §7.[37]

On this account, both Germanic and CEE languages have at their disposal the multiclausal structure in (80), involving multidominance (nodes with multiple mothers), while CEE languages (at least Slavic and Hungarian) also have the monoclausal structure in (81).

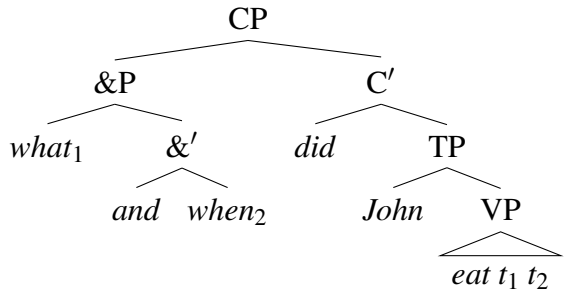
[36] We are not aware of any similar research on processability of quantifiers which are downward monotone only on the first (left) position (such as universal quantifiers), but it is possible that – because of this downward monotone effect – they are also more difficult to process than *wh*-phrases, which are traditionally analysed as existential quantifiers (Karttunen 1977; see also Dayal 2016), i.e., as upward monotone on both positions.

[37] It is left for future research whether the LFG account of Patejuk 2015 may be similarly extended to model gradient grammaticality in German HC. Just as the Minimalist proof of concept in §7 requires reinterpreting harmonies in Minimalist Gradient Harmonic Grammar as reflecting degrees of grammaticality, a similar reinterpretation of harmonies would be required in the extension of LFG proposed in Bresnan *et al.* 2001 and Clark 2004, which incorporates into LFG ideas from Stochastic Optimality Theory (Boersma and Hayes 2001).

(80)



(81)



Citko 2005 and Gračanin-Yüksek 2007 argue that the operation – which they call Parallel Merge and Sharing, respectively – leading to the construction of multidominant structures such as (80) is just an instance of the ordinary Merge and, hence, it is freely available. That is, such structures are predicted to be in principle available in all languages, subject to linearization constraints. What is special is the structure in (81), which – following Zhang 2007 – is often assumed to involve sideward movement (Nunes 2001) of the *wh*-phrases. The proof-of-concept analysis sketched in §7 follows this general reasoning by imposing violable constraints on sideward movement and on multi-rooted structures that such movement engenders.

The availability of such structures is usually linked to the availability of multiple *wh*-fronting (see, e.g., Gribanova 2009: 138; cf. Citko and Gračanin-Yüksek 2013). For example, the acceptability of (82) with the structure in (84) is somehow conditioned on the acceptability of (83) with the structure in (85).[38]

(82) Kto i co jadł? (Polish)
who.NOM and what.ACC ate
'Who ate and what did they eat?' (lit. 'Who and what ate?')

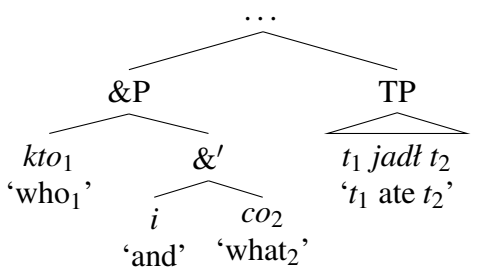
[38]Different analyses assume different attachment sites of the fronted *wh*-phrases, and since the seminal work of Rudin 1988 it is widely assumed that there are at least two subclasses of Slavic languages, differing in such attachment sites, hence the schematic ellipses in (84)–(85).

(83) Kto co jadł? (Polish)

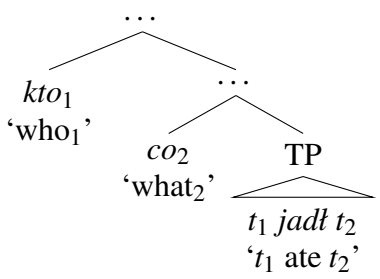
who.NOM what.ACC ate

'Who ate what?'

(84)



(85)



This claim is fully explicated in Haida and Repp 2011, where it is argued that a structure like (85) is a necessary stage in the derivation of a monoclausal HC structure such as (84).

However, there are counterexamples to such a strict correlation, including Chinese and Japanese, which are not multiple *wh*-fronting languages, and yet they allow for obligatory *wh*-dependents in HC (Zhang 2007, Ishii 2014, Kasai 2016). It appears that German is yet another language violating this strict correlation. As confirmed by the absence of sentences such as (86) in corpora, it is not a multiple *wh*-fronting language. And yet many examples of monoclausal HC in the Vorfeld may be found in corpora, e.g., (139), (151), (161), (165), (166), (170), (181) (the relevant part of which is presented as (87) below), (227), (230), (249), (255), (269), (273) in Appendix A, all containing the obligatory subject.[39]

(86) *Wer wo wird gewählt?

who.NOM where AUX elected

intended: 'Who is elected where?'

(87) Wer und wo wird gewählt?

who.NOM and where AUX elected

'Who is elected and where?'

This problem is symptomatic of a more general problem with current Minimalist accounts of HC: they concentrate on – and fine tailor analyses to – instances of HC which involve fronted

[39] See also Bošković 2022, 2023 for recent unpublished work on *wh*-HC which assumes the sideward movement analysis of Zhang 2007 but loosens the dependence of HC on multiple *wh*-fronting, and Citko and Gračanin-Yüksek 2023 for dissent.

wh-phrases.[40] But at least since Grosu 1987 it is clear that HC is not limited to *wh*-phrases and to fronting, and empirical studies reported in this paper paint a similarly broader picture of HC in German.

7. Proof of Concept Analysis

While a fully worked-out account of German HC is outside the scope of this mainly empirical paper, this section sketches a proof-of-concept analysis demonstrating that such a broadly Minimalist account is in principle possible.

7.1 Preliminaries

The main building blocks of this analysis are:

- Zhang's (2007) analysis of HC via sideward movement, as in (81),
- the idea from Legendre *et al.*'s (1990) Harmonic Grammar (a precursor to Optimality Theory) that grammars include violable constraints with specific numeric weights and that the harmony of a structure is the linear combination of weights that the structure violates,
- the idea from Keller's (2000) Linear Optimality Theory that harmony be interpreted as a degree of grammaticality,[41]
- the idea from Featherston's (2005) Decathlon Model that such degrees of grammaticality be comparable across constructions (i.e., not only within a candidate set),
- the idea from Smolensky and Goldrick's (2016) Gradient Harmonic Grammar that not only constraints but also linguistic objects may have gradient strengths,
- Müller *et al.*'s (2022) embedding of Gradient Harmonic Grammar in Minimalism and his reification of dependencies as linguistic objects that may have a specific strength.

[40] By contrast, the LFG analysis of Patejuk 2015 is not limited to the coordination of *wh*-phrases or to left-peripheral positions.

[41] All other works based on Harmonic Grammar cited here assume binary grammaticality: the structure with the highest harmony is grammatical, and all other competing structures are ungrammatical.

We first briefly present the analysis of Müller *et al.* 2022, and then we show how to extend the main ideas of this analysis to gradient grammaticality in a way that seems promising for the analysis of German HC.

The empirical scope of Müller *et al.* 2022 is extraction of PPs from NPs in German, as in the following examples (Müller *et al.* 2022: 1623, (7a–b)):

(88) [$_{PP}$ Worüber]$_1$ hat der Fritz [$_{NP}$ ein Buch t_1] gelesen?
about.what has the Fritz.NOM a book.ACC read
'What was the book about that Fritz read?' (lit.: 'About what did Fritz read a book?')

(89) *[$_{PP}$ Worüber]$_1$ hat der Fritz [$_{NP}$ ein Buch t_1] gestohlen?
about.what has the Fritz.NOM a book.ACC stolen
intended: 'What was the book that Fritz stole about?'

Assuming binary grammaticality, the challenge is to explain why some combinations of a verb and its nominal object (e.g., *Buch lesen* in (88)) allow for such an extraction, but others (e.g., *Buch stehlen* in (89)) do not. Müller *et al.* (2022) note that this seems to depend on the strength of the dependency between the noun N and the verb V, as given by a certain corpus-based measure, $\Delta P_{V|N}$. The threshold value of normalized $\Delta P_{V|N}$ seems to be about 0.14: extraction is possible in the case of V–N combinations with values above this threshold (as in (88); normalized $\Delta P_{lesen|Buch} = 0.6272$), but not when it is below this threshold (as in (89); normalized $\Delta P_{stehlen|Buch} = 0.1253$).

Müller *et al.* (2022) assume three violable weighted constraints:

(90) MERGE CONDITION (MC):
For all features [•F•], [•F•] triggers Merge of an XP with a matching [F].

(91) ECONOMY CONDITION (EC):
Merge is prohibited.

(92) CONDITION ON EXTRACTION DOMAIN (CED):
For all X–Y dependencies, if X–Y intervenes between two adjacent members of a movement chain, X is a sister of the phrase headed by Y.

Each constraint k has a certain weight w_k (as in standard Harmonic Grammar), its violation or satisfaction is associated with a certain score s_k, and the value of harmony (H) is the linear sum

of weights multiplied by scores over all K constraints:

(93) $$H = \sum_{k=1}^{K} s_k w_k$$

In the simplest case, $s_k = 0$ when the constraint k is satisfied, $s_k = -1$ when it is violated once, and $s_k = -n$ when it is violated n times.[42]

MC in (90) says that if there is a feature attracting movement, such movement (i.e., Internal Merge) must occur; the weight of MC is 4.0. EC in (91) says that Merge (including Internal Merge) must be avoided; the weight of EC is 5.0. Hence, if nothing else is said, when movement occurs (violating EC) to meet the requirement of some trigger (thus satisfying MC), the cost is: $(-1 \times 5.0) + (0 \times 4.0) = -5.0$, and when it does not occur (satisfying EC, but violating MC), the cost is: $(0 \times 5.0) + (-1 \times 4.0) = -4.0$. This alone predicts that movement never occurs, as then the value of harmony is higher than when it occurs ($-4.0 > -5.0$). However, CED in (92), which is assumed to have weight 7.5, adds a positive value when movement occurs across an X–Y dependency such that X is a sister of a projection of Y, and this may tip the scales in favour of movement. Importantly, the score of CED is not some constant value (e.g., 1.0), but it is the normalized $\Delta P_{\mathrm{Y|X}}$. This is in consonance with Gradient Harmonic Grammar, where linguistic objects – here, the dependency between Y and X (see Müller *et al.* 2022: 1637 for the idea that dependencies be treated as syntactic objects) – may have different strengths, which may enter into the harmonic equation (93). So, in the case of extraction across an N–V combination with normalized $\Delta P_{\mathrm{V|N}} = 0.12$, harmony increases by $7.5 \times 0.12 = 0.9$, which does not suffice for movement to win (see (94); cells in columns MC, EC, and CED contain scores, empty cells correspond to score 0). However, with normalized $\Delta P_{\mathrm{V|N}} = 0.16$, harmony increases by $7.5 \times 0.16 = 1.2$, which makes movement more harmonic than lack thereof (see (95); both tables based on Müller *et al.* 2022: 1644, (34)–(35)).

(94)

(assuming normalized $\Delta P_{\mathrm{V|N}} = 0.12$)	MC	EC	CED	H
I: [$_{\mathrm{vP}}$ [$_{\mathrm{vP}}$ [$_{\mathrm{NP}}$ … [$_{\mathrm{N'}}$ N … XP_1]] V] $\mathrm{v}_{[\bullet \mathrm{X} \bullet]}$]	$w = 4.0$	$w = 5.0$	$w = 7.5$	
O_1: [$_{\mathrm{vP}}$ XP_1 [$_{\mathrm{v'}}$ [$_{\mathrm{vP}}$ [$_{\mathrm{NP}}$ … [$_{\mathrm{N'}}$ N … t_1]] V] v]]		-1	0.12	-4.1
☞ O_2: [$_{\mathrm{vP}}$ [$_{\mathrm{vP}}$ [$_{\mathrm{NP}}$ … [$_{\mathrm{N'}}$ N … XP_1]] V] $\mathrm{v}_{[\bullet \mathrm{X} \bullet]}$]	-1			-4.0

[42] See, e.g., Keller 2000 and the literature overviewed in Francis 2022 on the cumulative effect of multiple violations of a single constraint.

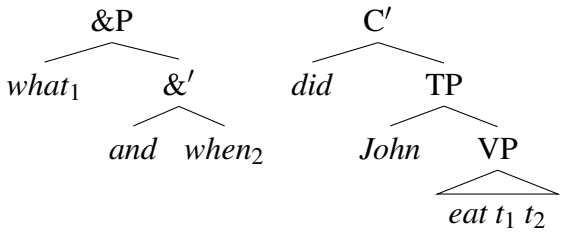
(95)	(assuming normalized $\Delta P_{V\|N} = 0.16$)	MC	EC	CED	H
	I: [$_{vP}$ [$_{VP}$ [$_{NP}$ … [$_{N'}$ N … XP$_1$]] V] v$_{[\bullet X \bullet]}$]	$w = 4.0$	$w = 5.0$	$w = 7.5$	
☞	O$_1$: [$_{vP}$ XP$_1$ [$_{v'}$ [$_{VP}$ [$_{NP}$ … [$_{N'}$ N … t_1]] V] v]]		-1	0.16	-3.8
	O$_2$: [$_{vP}$ [$_{VP}$ [$_{NP}$ … [$_{N'}$ N … XP$_1$]] V] v$_{[\bullet X \bullet]}$]	-1			-4.0

7.2 Analysis

In order to model acceptability judgements in German HC, we extend Müller *et al.*'s (2022) Minimalist Gradient Harmonic Grammar to gradient grammaticality: we assume that, as in Keller's (2000) Linear Optimality Theory, values of harmony, H, are proportional to grammaticality.[43]

Without going into technical details, the basic analysis of monoclausal HC that we assume is as in Zhang 2007: HC is created via multiple sideward movement. (For simplicity, we assume that dependents sideward-move immediately after they satisfy selectional restrictions of appropriate verbal heads.) On this account, there are stages in the derivation in which the workspace contains a multi-rooted structure, as in (96), which illustrates the stage just before the coordination is merged with the C′.

(96)



These two trees in the workspace constitute a single multi-rooted structure in the sense that there are active dependencies between elements of these two separate trees. On the traditional approach to movement, illustrated in (96), these dependencies are expressed via co-indexation between the moved elements *what*$_1$ and *when*$_2$ and their traces t_1 and t_2. On the multidominance approach to movement, this dependency would be even more clear: the *wh*-phrases would simultaneously be parts of the two trees, creating a truly multi-rooted structure. But also on various formalisations of the copy approach to movement, the dependency between the two

[43] This assumes that all constraint violations result in a decrease of harmony, unlike in Müller *et al.* 2022 (and in Harmonic Grammar in general), where constraints may increase harmony (as CED does). It is easy to reformulate Müller *et al.*'s (2022) model so that this assumption is satisfied.

trees in (96) is explicit; for example, on the approach of Chomsky 2021: 17, the corresponding copies in the two trees would have to stand in the interarboreal relation *Copy*. The sketch of the analysis presented below is based on the assumption that maintaining such multi-rooted structures in the workspace is costly.

We also make the uncontroversial assumption that building a matrix V2 clause with a non-empty Vorfeld involves more derivational steps (including verb movement) than building a subordinate verb-final clause. This means that the coordinate structure created via sideward movement is present in the workspace "longer" (during a larger number of derivational steps) when it is ultimately placed in the Vorfeld position than in the case of its placement in the Mittelfeld.

We assume the following violable weighted constraints, among the constraints that influence the acceptability of monoclausal HC in German:

(97) NO SIDEWARD MOVEMENT (NSM)

Sideward movement is prohibited.

(98) SINGLE-ROOTED STRUCTURES (SRS)

All structures in the workspace are single-rooted.[44]

Both constraints have weights and possibly non-trivial scores; for simplicity, we assume that all weights are 1, and the magnitude of constraint violation will be encoded directly in scores.

In the case of NSM in (97), the score corresponds to the strength of the dependency that is broken when sideward movement occurs, as measured by the obligatoriness. In the simplest case, sufficient for our purposes, the score may be discrete: some negative number when an obligatory argument is moved and 0 when an optional dependent is moved. However, this assumes the binary argument–adjunct dichotomy, whose status is controversial.[45] A more interesting alternative, left for future research, would be to assume continuous scores in NSM violations, reflecting the continuous value of obligatoriness, as modelled within Gradient Harmonic Grammar in Kim *et al.* 2019. This alternative approach would be analogous to Müller *et al.*'s (2022) analysis of continuous CED scores reflecting the strength of N–V dependencies.

In the case of SRS in (98), the score is some monotonic function of the number of steps in

[44] Note that lexical items are trivially single-rooted.

[45] See, e.g., Przepiórkowski 2016 and references therein.

the derivation during which the costly multi-rooted structures must be maintained.[46] That is, the penalty is higher in the case of Vorfeld HC than in the case of Mittelfeld HC.

The sum effect of this analysis is that there is a penalty associated with monoclausal HC (as it involves multi-rooted structures), this penalty is higher in the case of HC in the Vorfeld (as multi-rooted structures persist longer), and it depends on the number of obligatory arguments (as each sideward movement of an obligatory argument incurs a penalty). This directly reflects the findings of our questionnaire study.

The specific scores that give results similar to those in the Vorfeld and Mittelfeld questionnaire studies are, for example, these:

(99)

	score
NSM	optional dependent: 0.00
	obligatory dependent: -0.35
SRS	Mittelfeld: -1.90
	Vorfeld: -2.45

We also assume that using the more complex verbs (i.e., verbs with two obligatory arguments) in the second subexperiments of these questionnaires, i.e., in the subexperiments that compared constructions with 1 and 2 obligatory conjuncts, incurs the penalty of -0.25: this is the difference between the acceptability of HC with 1 obligatory conjunct in the two subexperiments in the Vorfeld questionnaire (see Table 1), while the analogous difference in the Mittelfeld questionnaire is -0.28 (see Table 2).

Given these numbers, the harmony H – i.e., the predicted drop in acceptability – of, say, HC with two obligatory arguments in the Vorfeld with respect to the acceptability of grammatical fillers in the same questionnaire (i.e., with respect to 1.78; see Table 1) is: $-0.35 \times 2 = -0.70$ (2 violations of NSM, each with score -0.35) plus $-2.45 \times 1 = -2.45$ (1 violation of SRS in the Vorfeld construction, i.e., with score -2.45) plus $-0.25 \times 1 = -0.25$ (1 penalty for the more complex – two-argument – verb) equals -3.40. This compares to the observed drop of $-1.54 - 1.78 = -3.32$ (cf. Table 1); in this case, the absolute difference between prediction (-3.40) and observation (-3.32) is $|\Delta| = 0.08$. As shown in Table 4, all other differences

[46] The number of roots in a single structure and the number of such multi-rooted structures may also influence the score, but we do not model this here.

between the predictions of this grammar and the observations of the Vorfeld and Mittelfeld experiments are similar or smaller – always smaller than 0.1.[47,48]

Feld	# oblig	subexperiment	NSM	SRS	Val	H	observation	$\lvert\Delta\rvert$
VF	1	0 vs. 1	−0.35	−2.45		−2.80	−2.81	0.01
VF	1	1 vs. 2	−0.35	−2.45	−0.25	−3.05	−3.06	0.01
VF	2	1 vs. 2	−0.70	−2.45	−0.25	−3.40	−3.32	0.08
MF	1	0 vs. 1	−0.35	−1.90		−2.25	−2.20	0.05
MF	1	1 vs. 2	−0.35	−1.90	−0.25	−2.50	−2.48	0.02
MF	2	1 vs. 2	−0.70	−1.90	−0.25	−2.85	−2.94	0.09

Table 4: The drop in acceptability with respect to grammatical fillers as predicted by the grammar and as observed in the Vorfeld and Mittelfeld experiments

7.3 Questionnaires vs. Corpora

The above gradient grammar successfully models the average acceptability scores of the questionnaire study, but does not explain why structures with such relatively low acceptability scores are relatively frequently produced, as shown in the corpus study. We believe that the Decathlon Model (Featherston 2005, 2019) may provide an answer.

In Harmonic Grammar and most of its derivatives, including Optimality Theory (OT), Linear Optimality Theory (LOT), and Gradient Harmonic Grammar (GHG), comparisons of harmonies of different constructions only make sense within the same candidate set. A candidate set is the set of constructions satisfying certain input requirements, e.g., expressing a certain meaning. The structure with the highest harmony within a candidate set wins the competition, so it is assumed to be fully grammatical and it may be produced (and found in corpora). On the other hand, constructions which lose the competition are ungrammatical (in OT and GHG) or less grammatical (in LOT), and are not produced or found in corpora. The Decathlon Model (DM) agrees with these theories on the matter of production: only the best candidates within a candidate set are produced and found in corpora. However, DM does not assume that the best

[47] In this table, Val stands for the penalty for verbs with two obligatory arguments (as compared to verbs with a single obligatory argument – the subject).

[48] The above reasoning treats scores from judgement experiments as if they were placed on the interval – rather than ordinal – scale. While this is a common simplification in experimental syntax (see, e.g., Gibson *et al.* 2011), the results of more appropriate ordinal modelling are presented in Appendix B. Also note that the drop is measured with respect to uncontroversially grammatical and relatively simple fillers (with the average acceptability of 1.78 in the Vorfeld questionnaire and 1.70 in the Mittelfeld questionnaire) and not with respect to HC with 0 obligatory conjuncts, as the acceptability of the latter (1.15 and 1.23, respectively) probably reflects the cost of the underlying ellipsis in multiclausal HC.

candidate is necessarily fully grammatical. Instead of understanding harmony values as relative to given candidate sets, DM treats them as absolute indicators of grammaticality. Hence, it is possible for the winning construction in some candidate set to be judged as not fully grammatical and, in particular, to be less grammatical than a losing construction in some other candidate set. This is illustrated in Figure 5 from Featherston 2005: 201 (his Figure 6). The details of the

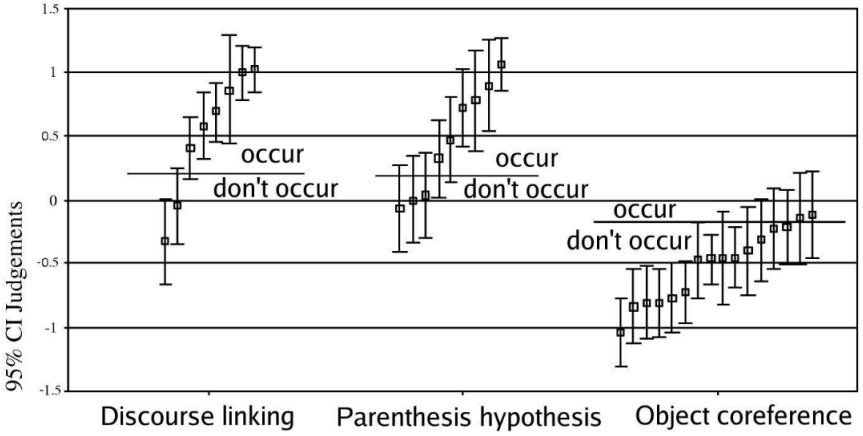


Figure 5: The mismatch of well-formedness and occurrence: Production is competitive (from Featherston 2005: 201)

three phenomena – and three candidate sets – that this figure refers to are not important. What is important is that the best constructions in the last candidate set, the ones that are produced and found in corpora, are judged as less acceptable than some of the worst constructions in the other two candidate sets, ones that are not produced or found in corpora.

We believe that German HC illustrates the same phenomenon. In languages with uncontroversially monoclausal HC, meanings expressed by questions with coordinated *wh*-phrases are known to differ from meanings expressed via vanilla multiple *wh*-fronting; this is sometimes taken to be the difference between single pair readings referring to single events versus pair-list readings referring to possibly multiple events (see, e.g., Gribanova 2009). More generally, Przepiórkowski 2022c argues that monoclausal HC unambiguously expresses cumulative meanings, while analogous constructions without coordination are potentially ambiguous but more readily understood as expressing iterative meanings. If so, then monoclausal HC constructions may be optimal in a set of candidates expressing such an unambiguous cumulative meaning, even if they flout violable constraints such as NO SIDEWARD MOVEMENT and

SINGLE-ROOTED STRUCTURES in (97)–(98). Hence, if the Decathlon Model is right, then the problem of discrepancy between non-negligible corpus presence and relatively low acceptability disappears.

In summary, the troublesome German HC data may be successfully modelled within Minimalist Gradient Harmonic Grammar, on the assumption made in Linear Optimality Theory that harmony reflects degrees of grammaticality and on the assumption made in the Decathlon Model that structures relatively low on the grammatical–ungrammatical continuum may still be produced if they are optimal for expressing a certain meaning.

8. Conclusion

This paper describes the results of a comprehensive empirical investigation of Heterofunctional Coordination in German – apparently the first such an investigation of HC in any language. The corpus study demonstrates that, contrary to the common view, monoclausal HC is present in German. However, the questionnaire study shows that there are violable constraints against it and that the acceptability of HC in German depends on the number of obligatory arguments among the conjuncts and on the position of HC (Vorfeld vs. Mittelfed), among other factors. As an account of this variability in terms of processing (i.e., performance) is not forthcoming, we assume that it reflects gradient grammaticality (i.e., competence). Hence, this study adds to the growing literature – recently overviewed in Francis 2022 – on the gradient grammaticality of natural languages.

While the main aim of this paper is purely empirical, we also offered a proof-of-concept analysis of German monoclausal HC, which follows Zhang 2007, Haida and Repp 2011, and others in assuming sideward movement as the crucial operation leading to monoclausal HC, and which otherwise builds on the Minimalist Gradient Harmonic Grammar, with harmony values reinterpreted as reflecting degrees of grammaticality. With appropriate penalties for the sideward movement of obligatory arguments and for maintaining multi-rooted structures in the workspace, this analysis predicts the results of the two questionnaire studies described above which used controlled data and tested HC in the Vorfeld and in the Mittelfeld.

On this analysis, interspeaker variation (reported above for the corpus questionnaire but also observed in the other two questionnaires) may be modelled via the assumption that differ-

ent speakers may have different weights and scores attached to particular constraints.[49] This opens an interesting possibility that crosslinguistic variation in HC also reflects different average penalties associated with the same constraints. For example, if it is indeed the case that monoclausal HC in English is much rarer than in German, this might reflect higher weights of the relevant constraints in English. On the other hand, given that monoclausal HC constructions are frequent in CEE languages and apparently more acceptable than in German, this may be a reflex of correspondingly much lower weights of such constraints in CEE languages. Thus, the results of the current study are compatible with the view that soft(er) constraints in one language may mirror hard(er) constraints in another language (Bresnan *et al.* 2001). However, comprehensive empirical studies of HC in other languages, similar to the study of German HC offered here, are needed to verify this hypothesis.

[49] Moreover, any *intra*speaker variation, not examined in this study, may be modelled by incorporating into the analysis ideas from Stochastic Optimality Theory (Boersma and Hayes 2001) and, thus, allowing weights (and possibly scores) to be generated by a normal distribution (with a given mean and a given – relatively small – standard deviation) each time a constraint is violated.

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A. Corpus Study

This section provides selected examples of HC sentences with at least one obligatory argument among the conjuncts. The majority of them were found in the W4 newspaper subcorpus of DeReKo, searched with the COSMAS II tool (`https://cosmas2.ids-mannheim.de/cosmas2-web/`), but the list also includes some examples from the opportunistic Internet corpora deTenTen13 and deTenTen18, searched via SketchEngine (`https://www.sketchengine.eu/`).

DeReKo (Deutsches Referenzkorpus; German Reference Corpus) is a large corpus (more than 50 billion words) that is meant to be a representative sample of contemporary German. It is compiled mostly of a diverse range of written sources, including newspapers, magazines, literature, academic texts and popular science books. The samples are drawn from sources that come from all regions of Germany, Austria and the German-speaking regions of Switzerland. A part of the corpus is annotated with part of speech information.

The deTenTen13 and deTenTen18 corpora include Internet written content such as forums, blogs and web pages. Both corpora are annotated and they contain 16.5 billion and 5.3 billion words, respectively.

Searching DeReKo was mostly carried out with simple queries, e.g., examples in §A.1 were found with the help of the following COSMAS II query:

(100) `wer was "und" wo`

A slightly more complex query was used to find the example presented in §A.34:

(101) `fast /w1:2 "und" fast`

This query finds strings beginning with *fast*, followed by one or two words of any kind, then followed by the conjunction *und*, and ending with *fast*.

SketchEngine offers a more expressive – and complex – query language. For example, sequences such as *irgendjemand und irgendwo* (see §A.30) may be found with query (102), and sequences such as *sogar ich und sogar in Handschuhen* (see §A.33) – with (103).

(102)
```
[word="irgendwer" | word="irgendjemand"]
    [tag="CONJ.Coord"] [word="irgend.*"]
```

(103) `[word="sogar"] []{0,2} [tag="CONJ.Coord"] [word="sogar"]`

Specifically, (102) matches sequences of three tokens, where the first is either *irgendwer* or *irgendjemand*, the second – any coordinating conjunction, and the third – any word starting with *irgend-*. Similarly, (103) finds *sogar*, followed by up to two tokens, followed by a coordinating conjunction, followed by another *sogar*.

Every resulting concordance was evaluated by hand. In cases of a very large number of results, random sampling was applied. Hence, these corpora most probably contain many other sentences involving hypothetically monoclausal HC.

Corpus examples are divided into subsections by query and corpus. The specific source is given in brackets next to each example.

A.1 Examples involving wer, was und wo *found in W4 DeReKo*

Here are all relevant examples found with query (100):

(104) Der Händler hat dadurch einen Überblick, wer, was und wo eingekauft hat. (Saale-Zeitung)

(105) Um in der Anfangszeit Überschneidungen der drei Gemeinden zu verhindern, stimmen Moos, Gaienhofen und Öhningen zurzeit untereinander ab, wer was und wo veröffentlicht. (Südkurier)

(106) Die Verantwortung, wer, was und wo einsparen will, tragen die Regionen selbst, so Propst Kasch. (Hamburger Abendblatt)

(107) Vom Ackersalat über die Zwiebel bis zu Lauch, Obstwasser und Bullenlende: hof-frisch.de zeigt, wer was und wo produziert. (Stuttgarter Zeitung)

(108) Nach einer Föderalismusreform müsse deutlich werden "wer was und wo verantwortet". (Stuttgarter Zeitung)

(109) Bevor sich bei den Bewohnern der Eindruck verfestigt, dass die Größe des Geldbeutels bestimmt, wer was und wo bauen darf, sollten sich die Verantwortlichen mit ihnen an einen Tisch setzen. (Sächsische Zeitung)

(110) Er nutzt eine Interessentendatenbank, wo er festhält, wer was und wo sucht. (Sächsische Zeitung)

(111) Ende des Jahres soll dann feststehen, wer was und wo baut. (Der Tagesspiegel)

(112) Volker Roth (Stadtentwicklung) geht mit seiner Gruppe auf Spurensuche wer, was und

wo konsumiert wird... (Wormser Zeitung)

(113) Gut zwei Wochen vor einem Blutspendetermin beginnt die gebürtige Laichingerin, die ehrenamtlichen Helfer anzufragen, wer was und wo an Aufgaben übernehmen kann. (Schwäbische Zeitung)

(114) Als Vorarbeit für die Potenzialanalyse hat die ISN die telekommunikationstechnische Netzstruktur der verschiedenen Versorgungsträger erfasst, also die Frage geklärt, wer was und wo in Neuss liegen hat. (Westdeutsche Zeitung)

(115) Verwaltungsratschef Federico erklärte, dass "heute bereits 84 Prozent unserer Lebensmittel-Basis-Produkte aus italienischer Produktion stammen und wir genau nachweisen können, wer was und wo für uns herstellt". (Schwäbische Zeitung)

(116) Hier hilft der direkte Kontakt zu den DRK Ortsverbänden, denn die wissen noch viel besser, wer, was und wo benötigt. (Südkurier)

A.2 Examples involving wer und wann *found in W4 DeReKo*

Below is a sample of relevant examples (true positives) out of 140 results of query (117).

(117) `wer "und" wann`

(118) Konkret geht es am Montag vor allem um die scheinbar belanglose Frage, wer und wann die 100000-DM-Spende des Waffenhändlers Karl-Heinz Schreiber an Schäuble übergeben hat. (Saarbrücker Zeitung)

(119) Auch die Frage, wer und wann das Streusalz wieder entsorgt, wird mit Spannung verfolgt. (Saarbrücker Zeitung)

(120) In alten Schulbüchern konnte nachgeschlagen werden, wer und wann in die Schule ging. (Südkurier)

(121) Es seien noch viele Abklärungen notwendig. Bohrende Nachfragen, wer und wann die Polizei informiert hat, beantwortet Schneider mit dem Hinweis, dass die Landespolizeidirektion am heutigen Freitag eine entsprechende Mitteilung veröffentlichen werde. (Südkurier)

(122) So ist noch immer offen, wer und wann eigentlich darüber entschieden wird, welche Region das Rennen macht. (Südkurier)

(123) Für Heimbewohner ist ihr Zimmer das Zuhause. Insofern haben sie das Selbstbestimmungsrecht, wer und wann Zutritt haben darf. (Südkurier)

(124) Knapp 40 Jahre später taucht nun der Name Flaig zum zweiten Mal auf dem Brett auf, das nahezu lückenlos dokumentiert, wer und wann seit der Wiedergründung der Bürgerzunft in den Dreißiger Jahren des vorigen Jahrhunderts als Zunftrat in die Zunft eingetreten ist; (Südkurier)

(125) Natürlich gelten in so einer Gemeinschaft auch feste Regeln. Da wird besprochen, wer und wann Küchendienst zu leisten hat, wie sich der Morgen nach dem Wecken um halb acht Uhr gestaltet. (Südkurier)

(126) Sie schreibt in einer E-Mail: "Ich habe erfahren, dass Sie in der SVZ einen Aufruf gestartet haben, um herauszufinden, wer und wann in dem Grab auf dem Friedhof in Schwaan beerdigt wurde. (Schweriner Volkszeitung)

(127) Bislang ist nicht mal ein Hinweis auf die Geschäftseröffnung angebracht. "Wir sind alle gespannt, wer und wann da aufmacht", sagt Backwarenverkäuferin Luise Gubsch. (Sächsische Zeitung)

(128) Unterdessen widersprach der Präsident des Bundeskriminalamtes Jörg Ziercke, in Teilen einer Darstellung von SPD-Fraktionschef Thomas Oppermann. Dieser hatte zuvor öffentlich gemacht, wer und wann bei den Sozialdemokraten über den Verdacht gegen Edathy im Bilde gewesen sein soll. (Taunus Zeitung)

(129) "Je spezialisierter die Leistung, desto mehr an Qualifikation ist zu fordern." Nicht der Markt dürfe entscheiden, wer und wann operiert werde, sondern Qualitätskriterien. (Trierischer Volksfreund)

(130) Als Betreiber der Sportanlage und als Vertragspartner der Stadt verfügt der Wuppertaler SV zwar bis 2030 über die Schlüsselgewalt, doch bei Entscheidungen, wer und wann die Anlage nutzen darf, behält sich die Stadt das letzte Wort vor. (Westdeutsche Zeitung)

(131) Jeder erzählt dieselbe Geschichte von den Eselsohren, aber niemand weiß genau, wo sie eigentlich ihren Ursprung hat. Alle Jahre wieder wird darum am Gründonnerstag gerätselt, wer und wann diese Verschwörungs-Theorie für Brezel-Muffel in die Welt gesetzt hat. (Thüringer Allgemeine)

(132) Dort hatten sie nämlich den Büroleiter Eberhard Warncke-Seithe einige Fragen gestellt, die sicher auch ältere Winzerlaer interessieren wird. Zum Beispiel danach, wer und wann das Stadtteilbüro besuchen kann und was man dort überhaupt so alles erfährt.

(Ostthüringer Zeitung)

(133) Charme hat aber auch die Idee, die Menschen über WhatsApp mobil zu halten. „Über den Internet-Messenger könnten Menschen ohne Auto anfragen, wer und wann mit einem Auto in die Stadt fährt und dann einfach mitfahren." (Südkurier)

(134) Bei der Stadtverwaltung fühlt sich allerdings niemand zuständig für den Steinberg. Auch nach einer Woche gibt es keine Antwort auf die Frage, was denn nun mit den kaputten Mauern werden soll, wer und wann sie repariert werden sollen. (Sächsische Zeitung)

(135) Unter Berufung auf Snowden-Papiere heißt es, zwischen den Rechenzentren von Google und Yahoo seien binnen 30 Tagen mehr als 180 Millionen Datensätze abgezweigt worden. Darunter seien Informationen, wer und wann E-Mails abgeschickt oder erhalten habe - aber auch Inhalte wie Texte und Videos. (Freie Presse)

(136) Fast waren ja schon alle Fragen rund um das sogenannte Schredder-Gate beantwortet worden. Man wusste, wer und wann der Firma Reisswolf einen Besuch abstattete, wie viele Festplatten da geschreddert wurden und sogar wie oft, nämlich dreimal.

(Wiener Zeitung)

A.3 Examples involving wann und wer *from W4 DeReKo*

Below is a sample of relevant examples out of 174 results of query (137).

(137) `wann "und" wer`

(138) So war es auch im Fall der verschuldeten Fischers. Sie kündigten alle Einzugsermächtigungen, "damit wir den Überblick haben, wann und wer wie viel Geld bekommt".

(Saale-Zeitung)

(139) Wann und wer soll eine Grippe-Schutzimpfung machen? Diese und andere Fragen beantwortete Dr. Thomas Lamberty, Leiter des Gesundheitsamtes St. Wendel, beim Telefon-Ratgeber der "SZ". (Saarbrücker Zeitung)

(140) "Ich darf keine Details nennen. Es ist ausgemacht worden, wie, was, wo, wann und wer

da federführend ist, wer Listenführer ist." (Oberösterreichische Nachrichten)

(141) "Ist die nicht schön?", fragt ein Großvater seinen Enkelsohn. Ein Schutzengel-Symbol, ein kleines Gebet und der Nachweis, wann und wer die Glocke erschaffen hat, sind darauf zu finden. (Saarbrücker Zeitung)

(142) "Verkehrsminister Hering schwächte durch Schuldzuweisungen an das Saarland den Sachverhalt ab und ließ im Grunde offen, wann und wer denn nun den nächsten Schritt tun müsse", befindet Kretzschmar. (Saarbrücker Zeitung)

(143) Ich habe dort festgestellt, dass die Geschäfte und die Cafés zu unterschiedlichen Zeiten schließen, so dass man nicht weiß, wann und wer zu welcher Zeit schließt, und ich somit kein Geld ausgeben kann. (Saarbrücker Zeitung)

(144) Fest steht laut Gaschott, dass alle Beteiligten wissen, dass das Kriegerdenkmal nicht mehr so solitär wie zuvor dastehen wird. Wann und wer diesbezüglich handeln wird, kann der Pressesprecher noch nicht sagen. (Saarbrücker Zeitung)

(145) Namens der demokratisch-patriotischen Deutschen Liga für Volk und Heimat (DLVH) wird hiermit förmlich vorbehaltlich der Einleitung rechtsaufsichtlicher Schritte vorsorglich angefragt, warum Sie zu obigem Vorgang den Gemeinderat oder Teile desselben pflichtwidrig nicht unterrichtet haben? Falls aber doch, dann bitte eine Antwort darüber, wann und wer eine entsprechende Unterrichtung durch Sie erfahren durfte? (Südkurier)

(146) Bei der diesjährigen Generalversammlung verabschiedet wurde erstmals eine Ehrenordnung, die regelt, wann und wer für wie viele Jahre bei der Gugge-Brass-Band zu Ehren kommt. (Südkurier)

(147) Die Räte zeigten sich grundsätzlich gegenüber der Idee aufgeschlossen. Wo, wann und wer ausstellen wird, steht allerdings noch nicht fest. (Südkurier)

(148) Dann können alle, die Hilfe brauchen oder den Kontakt zur Jugend wünschen, immer dienstags und donnerstags zwischen 10 und 11 Uhr bei Gabi Knöpfle ihre Wünsche anmelden. Spätestens bis 14.30 Uhr sollen die Senioren dann erfahren, wann und wer Hilfe bringt. (Südkurier)

(149) "Das wird individuell an der jeweiligen Schule abgeklärt", sagt Claus Boldt. Wie oft, wann und wer an eine Schule als Lesepate kommt, liegt also in erster Linie an den

Schulen. (Südkurier)

(150) Die Antwort auf die Fragen, wie, wo, wann und wer in die künftige – wohlgemerkt: gesunde – Wirtschaftsentwicklung investieren soll, ist aber äußerst diffus. (Der Standard)

(151) Die SPD hat dies nicht verdient. Wann und wer kommt endlich auf die Idee, diese Person aus der Partei rauszuwerfen? (Stuttgarter Nachrichten)

(152) Auch wenn die Technik die Flaschen abgelöst hat, so wird das Meer seinen Job als Postbote nicht los: Es ist zu spannend, einen Brief zu versenden – ohne zu wissen, wann und wer ihn lesen wird. (Stuttgarter Nachrichten)

(153) Stuttgarts Oberbürgermeister Fritz Kuhn (Grüne) will den Fernsehturm wieder zugänglich machen, kann aber noch nicht sagen, wann und wer die Kosten für die Fluchtwege zahlt. (Stuttgarter Nachrichten)

(154) Es wird jedoch noch Jahre dauern, ehe die ersten wichtigen Arzneimittel zur Verfügung stehen werden. Es handelt sich um eine Revolution im Pharmabereich, doch ist bisher nicht sicher, wann und wer am meisten davon profitieren wird. (Stuttgarter Zeitung)

(155) In der zum Orden gehörenden Urkunde wurde festgelegt, wann und wer ihn tragen durfte. Unterschrieben ist das Dokument von der Großherzogin von Mecklenburg-Schwerin, Auguste Wilhelmine. (Schweriner Volkszeitung)

(156) Wann und wer schießen darf, zeigt eine Ampel an. (Südwest Presse)

(157) Unter dem riesigen Wurzelstock fanden die Arbeiter zwischen zwei Ziegelsteinen eine verschlossene Bierflasche, die einen handschriftlichen Brief beinhaltete. Dieses Schreiben gab darüber Auskunft, wann und wer die Kastanie in den Schulhof gepflanzt hat. (Sächsische Zeitung)

(158) Und tatsächlich verbergen die Mülltonnen im Heidenauer Wohngebiet Mügeln auch ein Geheimnis. Sie denken mit und wissen genau, wann und wer seinen Müll in den Tonnen entleert hat. (Sächsische Zeitung)

(159) Darin befindet sich neben kleinen Gegenständen auch das Logbuch. Hier tragen die Sucher ein, wann und wer den Schatz gefunden hat. (Sächsische Zeitung)

(160) In den nächsten Tagen müssen wir mit dem Innenministerium die weiteren Schritte besprechen. Unklar ist noch, was genau von Görlitz nun erwartet wird, wann und wer

entscheidet, ob Görlitz auf Platz Zwei vorrücken kann. (Sächsische Zeitung)

(161) Der Zaun muss auch noch erneuert werden", so kann er nicht mehr bleiben. Darin waren wir uns einig, aber wann und wer soll das denn wieder machen. (Sächsische Zeitung)

(162) Nach wie vor gebe es hohe Flüchtlingszahlen aus den Balkanländern, aber auch aus Syrien, Afghanistan, Iran, Irak und Pakistan. Wann und wer wirklich komme, werde dem Landkreis sehr kurzfristig per Fax mitgeteilt, bestätigte die Kreissprecherin.

(Sächsische Zeitung)

(163) Jedes Zimmer hat einen anderen Farbton gehabt. Wann und wer zuletzt das Geländer in seinen Originalfarben gesehen hat, das wird wohl nicht mehr herauszubekommen sein.

(Sächsische Zeitung)

(164) Das Theater für den denkenden Menschen ist augenblicklich tot. Wie, wann und wer es wieder aufwecken wird, kann nicht gesagt werden. (Der Tagesspiegel)

(165) Auch in der innerparteilich heiß diskutierten Frage, ob die PDS im Einzelfall auch UN-Militäreinsätze billigen sollte – ein Parteitag 2000 in Münster hatte das abgelehnt -, betont Bisky: "Wie und wann und wer aus der PDS hat einer Kriegspolitik die Hand gereicht? (Der Tagesspiegel)

(166) "Wann und wer wurde von der Stadt gefragt, ob die Laufbahn am Eisring dem Schulsport gerecht wird, und ob die Wurfanlage in Arzl geht?", beklagt Herbert Mark, Ex-Trainer der Volleyball-Damennationalmannschaft und jetzt an der Waldorfschule.

(Tiroler Tageszeitung)

(167) Reichlich diskutiert wurde an dieser Stelle ja das Thema "Mann und Sandale" mit dem Unterthem "bloß keine Socken". Noch nicht ganz fertig ist die Diskussion um die Frage, wann und wer welche kurze Hosen tragen darf – oder besser nicht tragen sollte.

(Usinger Anzeiger)

(168) Tödlich verunglückte Kadettin hatte über Übermüdung geklagt In einer eigenen Bewertung stellt Vizeadmiral Axel Schimpf fest, der Kommandant habe durch sein Führungsverhalten "nicht für widerspruchsfreie, verlässliche und klare Vorgaben an Bord gesorgt". So habe es keine klare Weisung gegeben, wann und wer Rückmeldungen über das Verhalten von Lehrgangsteilnehmern bei Angst oder Unsicherheit an die Verantwort-

lichen weiterleitet. (Westdeutsche Zeitung)

A.4 Examples involving wer und wo *from W4 DeReKo*

Below is a sample of relevant examples out of 290 results of query (169).

(169) `wer "und" wo`

(170) Wer und wo hätte zum Beispiel die unfallchirurgischen Patienten aus der Raumschaft Donaueschingen versorgt? (Südkurier)

(171) Der Förster weist dem Interessenten ein Waldstück zu, aus dem er das so genannte Restholz entnehmen darf. Die Zuweisung erfolgt, weil der Förster wissen will, wer und wo in seinem Wald tätig ist, außerdem sollen so auch Streitereien zwischen den Leuten vermieden werden. (Südkurier)

(172) Beteiligt an der Leistungswochenschau sind in erster Linie viele Betriebe, Gastronomie, Schulen, Kindergärten, soziale und kulturelle Einrichtungen, Vereine und die Landwirtschaft. „Die Einwohner aus dem Bodenseeraum sollen entdecken, wer und wo in der Raumschaft Überlingen alles produziert, plant, aufzieht und gestaltet", sagt Schwarz. (Südkurier)

(173) In allen sechs Olympiastädten lässt sie eine Art von öffentlicher Preisüberwachung organisieren mit Bürgertelefonen, die anzeigen sollen, wer und wo die Preise plötzlich erhöht und damit Volkszorn schüren könnte. (Der Standard)

(174) So tobte in den USA in den 40er und 50er Jahren ein Streit über die Loyalität amerikanischer Kommunisten. Zudem rang Washington darüber, wer und wo der wahre Feind steht - Mao Tsetungs China oder Joseph Stalins Sowjetunion? (Stuttgarter Nachrichten)

(175) In besonderen Fällen müsse nachvollziehbar sein, wer und wo im Netz unterwegs war. (Schweriner Volkszeitung)

(176) Wer und wo sein Geld investiert, in Kindergärten oder Ähnliches, sei jedem überlassen. (Usinger Anzeiger)

(177) Schön wäre es, könnte der Bürgermeister so einfach festlegen, wer und wo als Arzt zu praktizieren hätte. (Thüringer Allgemeine)

(178) Ziel ist es, den Mädchen und Jungen Grundlagen zu vermitteln bzw. zu wiederholen,

was eigentlich Klima ist, wer und wo Kohlendioxid ausstößt und wie man selbst etwas gegen den Treibhauseffekt tun kann, umschreibt Projektleiter Frank Bremme das weite Feld für den Vormittag. (Thüringer Allgemeine)

(179) Egal, wer und wo Waffen hergestellt und exportiert hat. Es ist ein Verbrechen, sich selbst damit ein sicheres und gutes Leben zu schaffen. (Thüringer Allgemeine)

(180) Gleich am Eingang war ein Stadtplan aufgehängt, auf dem mit Stickern markiert war, wer und wo etwas anbietet. (Thüringische Landeszeitung)

(181) Wer und wo wird gewählt? Die zur Wahl stehenden Kandidatinnen und Kandidaten werden ebenso wie die Wahltermine der kommenden Wochen auf Plakaten in den jeweiligen Stadtbezirken veröffentlicht. (Stuttgarter Zeitung)

(182) Ja, es gibt Wichtigeres als die Frage, wer und wo nun Möbelspenden für Asylbewerber annimmt und lagert. (Sächsische Zeitung)

A.5 Examples involving wo und wer *from W4 DeReKo*

Below is a sample of relevant examples out of 297 results of query (183).

(183) `wo "und" wer`

(184) Rätselhaft bleibt der mysteriöse Vorfall, da in den vergangenen Wochen wiederholt Gewehrschüsse in Emmingen vernommen wurden. Ungeklärt ist, wo und wer diese Schüsse abgefeuert hat. (Südkurier)

(185) Auch die Gemeinde Murg will sich an dieser Aktion beteiligen und gemäß Auftrag des Gemeinderates in der jüngsten Sitzung entsprechende Fördermittel beantragen. Wo und wer in der Gemeinde in Genuss eines solchen immergrünen Kunstrasens mit Rundumbande und integrierten Toren kommt, ist noch auszudiskutieren. (Südkurier)

(186) Diese liegen in den Läden, im Rathaus, im Solemar und im Haus des Gastes aus und bieten eine gute Übersicht, wann, wo und wer eine vorweihnachtliche Freude vorbereitet hat. (Südkurier)

(187) Bei der Einweihung der Georgskirche in Kleinbottwar im Jahre 1500 war der Flügelaltar noch nicht fertig. In all den Jahren wurde viel gerätselt, wo und wer dieses Werk erstellt hat. (Stuttgarter Nachrichten)

(188) Kündigungen hat es nie gegeben. Dies wird sich ändern. 15 000 Stellen sollen gestrichen werden – dies steht seit Monaten fest. Unklar ist, wo und wer betroffen sein wird. (Stuttgarter Zeitung)

(189) Duell In der Bundesliga ist neuerdings alles ein Derby. Es ist dabei völlig egal, wo und wer gegeneinander spielt. (Stuttgarter Zeitung)

(190) Herr Semrau bleibt bis dato schuldig, wie, wo und wer als Bürger konkret in seiner Wahlentscheidung beeinflusst wurde. (Schweriner Volkszeitung)

(191) Egal wo und wer auch immer helfen kann, Stadtväter und -mütter, Sparkasse, Banken, Vermieter, Radebeulerinnen und Männer, fühlt euch angesprochen und bitte helft. (Sächsische Zeitung)

(192) Die Regional- und die Flächennutzungsplanung geben der Politik ein wirksames Instrument in die Hand, die Bedingungen für die Windkraft in Creglingen aktiv zu gestalten. Wenn man das nicht nutzt, wird man aufgrund des dann geltenden Baurechts kaum noch Einfluss darauf haben, wo und wer – auch auf Creglinger Gemarkung – Windräder errichtet und betreibt. (Tauber-Zeitung)

(193) Derzeit läuft die Suche nach einem neuen Partner, der die Voraussetzungen erfüllt." Das heißt? "Zentrale Lage, Parkplätze, behindertengerecht." Wo und wer die neue Filiale führen wird, stehe noch nicht fest. (Saarbrücker Zeitung)

(194) Sie wollen mitmachen? So einfach geht's: Schicken Sie uns Ihr schönstes, lustigstes oder österlichstes Hasen-Foto mit ein paar Sätzen, wo und wer das Tier abgelichtet hat, bis Mittwoch, 23. März, 12 Uhr, zu. (Wiesbadener Kurier)

A.6 Examples involving jeder und immer *from W4 DeReKo*

Query (195) gave six results, three of which turned out to be false positives. Two relevant examples are given below, and another example of this kind is (61) in the main text.

(195) `jeder "und" immer`

(196) Im Zeitalter des Handys werden Telefonzellen immer mehr zu Auslaufmodellen. In Göppingen ist das nicht anders als anderswo. Weil aber dennoch nicht jeder und immer ein Mobiltelefon mit sich herumträgt, hat die Stadtverwaltung eine Lücke in der Notfall-

Alarmierung ausgemacht – und diese geschlossen. (Stuttgarter Zeitung)

(197) Weitere Serien widmen sich kuriosen Doppelhaushälften in Belgien und Frankreich oder einem Neubaugebiet in Deutschland, das völlig gesichtslos wirkt in seinem Schwanken zwischen vielen Bauvorschriften, wenig Individualität und dem Vorbild des Nachbarn, dem aber nicht jeder und immer nacheifern will. (Taunus Zeitung)

A.7 Examples involving immer und jeder *from W4 DeReKo*

Query (198) gave 21 results, but all turned out to be false positives.

(198) `immer "und" jeder`

A.8 Examples involving jeder und immer *from deTenTen13*

Query (199) gave 59 results. Below is the list of all true positives (minus a few less comprehensible potential true positives).

(199) `[word="jeder"][tag="CONJ.Coord"][word="immer"]`

(200) Eine weitere Unterscheidungsmöglichkeit ist die Zahl der verfügbaren Anteile. So können bei offenen Fonds unbegrenzt Anteile erworben werden. Somit kann sich jeder und immer an dieser Anlageform beteiligen.

(http://doncato.de/fonds-als-attraktive-geldanlage-in-wertpapieren/)

(201) Schlüssel hat jeder und immer bei sich.

(http://www.kinderzeugs.de/20130421/kinder-basteln-fuer-den-muttertag/)

(202) Regenponcho. Eigentlich mit das wichtigste und daher sollte den jeder und immer dabei haben.

(http://www.amazonasreisen.de/landes-reiseinformationen/was-nehme-ich-mit.html)

(203) Auch fühlt sich nicht jeder und immer als Tier.

(http://community.netdoktor.at/forum/sexualitaet/maenner-am-fkk-strand-466,1266261.html)

(204) Nachteil bei der Sache ist auf jeden Fall, dass du bei der klassischen Variante irgendwann

kleine Löcher in der Wand haben wirst, weil ich garnatier dir, dass nicht jeder und immer die Dartscheibe treffen wird.

(http://www.studenten-frage.de/studenten-wgs/dartscheiben-fur-die-wg/)

(205) Das gilt auch für den Wettbewerb der Nationen – wenn jeder und immer nur an sich selber denkt und seinen Nutzen maximiert, dann ist grundsätzlich allen am besten gedient.

(http://www.wiesaussieht.de/2012/06/04/symbolisches-versagen/)

(206) na ja, irgendwie auch logisch, bei knapp 150 Mitgliedern die mit ihrer Vergangenheit hadern, dass da nicht jeder und immer den Drang verspürt sich mitzuteilen.

(http://www.hab-keine-angst.de/phpBB3_m/viewtopic.php?p=7657&sid=5f4411a06b92c7bc2e2bc12ebe5079fa)

(207) Seinen Mitbürgern freundlich gegenüberzutreten ist etwas, dass absolut jeder und immer tun kann.

(http://www.hauptsache-magazin.de/the-importance-of-being-happy/)

(208) Aber ich lehne die sozialdarwinistische Sicht ab, nach der jeder und immer seines eigenen Glückes Schmied ist.

(http://www.kassandrus.de/blog/coaching-in-der-sekte)

(209) Die längere Anreise wird sicherlich auch nicht jeder und immer auf sich nehmen wollen.

(http://forum.mechalle04.de/index.php?page=Thread&threadID=2664&s=0e367cda336d2e4e7db6acfd58920c44e5f533c3)

(210) mit diesem Begriff wußte jeder und immer, welche Währung gerade gemeint ist, und unsereiner hat dieses Vokabel für "jeweils aktuelle Landeswährung" in den aktiven Wortschatz übernommen

(http://www.oecc.at/entenreisen/Narizin-Daenemark00-1.php)

(211) Ok, nicht besser als das gute alte Telefon, aber dort kann zumindest jeder und immer nachschauen.

(http://wobbmbobbm.de/blog/2006/10/neues-konzept-fur-den-biertest/)

(212) Weil bei der Mitfreude ist es doch auch wohl so, dass nicht jeder und immer positiv auf die Freude des Mitmenschen reagiert.

(http://www.symptome.ch/vbboard/nachdenken/23844-schuldgefuehle-mitleid-zuhoeren-koennen-besserwissen-3.html)

(213) Wir wollen die deutsche Bloglandschaft voran treiben und unser Wissen und Erfahrung teilen - in Wochenend-Workshops, aber dann auch als Online-Kurs, damit jeder und immer darauf Zugriff haben kann.

(http://www.youpodia.de/magazin/themen/reiseblog-interviews-conni-biesalski)

(214) Habt Ihr mal überlegt, dass eben nicht jeder und immer einen Zugang zu Onlinemedien hat und genau diese Personen den Podcast liebgewonnen haben, da man diese auch in Bus und Bahn jederzeit "nachholen" konnte - also spart Euch diesen Hinweis auf die Angebote online!

(http://www.nowblog.de/archives/24-RTL-Podcasts-werden-weitestgehend-eingestellt.html)

(215) Die (generell positive) Wirkung einer Preisreduktion verfliegt, wenn jeder und immer auf 'Sale' geschaltet ist.

(http://www.iphoneblog.de/2009/02/23/schlussverkauf-for-a-limited-time-only/)

(216) Und, um noch einmal auf die Freundschaftsanfragen zurückzukommen – wieso kann mir jeder und immer eine Anfrage senden?

(http://gametomorrow.de/384/diablo-3-auch-patch-1-0-7-behebt-das-spamproblem-nicht)

(217) Hélio konnte 70 Paar Flipflops organisieren (hier trägt jeder und immer und überall Flip-flops) es gab Unterwäsche und Shampoo und die Kinder waren echt glücklich.

(http://pater-beda.de.www83.your-server.de/index.php?mact=Printing,m5,printpage,1&m5showbutton=1&m5script=1&m5returnid=240&page=240)

(218) Daher sollte jeder und immer beim Gewähren von Subventionen aufhorchen.

(http://www.investment-alternativen.de/strommarkt-schluss-mit-den-subventionen/)

(219) Verantwortung trägt jeder und immer, besonders wenns um Kinder geht.
(http://www.mandyimnet.de/gb.php)

(220) Recht haben will schließlich jeder und immer und nicht wenige Familienstreits sind aus einer Mischung aus Sturheit und Rechthaberei entstanden.
(http://www.ratgeber-und-tipps.de/kategorie/allgemein/page/36/)

(221) Wenn ich kein Papier zur Hand habe, bleibt immer noch das Handy - das Gerät hat mittlerweile doch jeder und immer bei sich.
(http://www.allesgelingt.de/lernen/lernmethoden/lernenmitplantolearnliste/lernenmitplantolearnliste.php)

(222) Und das diese auch jeder und immer für sein Geld erhalten möchte und diese auch zusteht scheint wohl auch selbstverständlich. (http://www.advalux.de/news)

(223) Essen muss jeder und immer, also liegt nichts näher, als mit der Veränderung der Essgewohnheiten auch das gesamte Leben zu verändern.
(http://literarischegedanken.de/miniaturen/weltendreher/)

(224) Was auch auffaellt ist, das hier jeder und immer spuckt!
(http://www.umdiewelt.de/Asien/Ostasien/China/Reisebericht-1764/Kapitel-8.html)

(225) Ja, aber es ist kein Job sondern eine Berufung, Musik hört jeder und immer, ob es zum Tanzen, zum Lachen oder Weinen ist.
(http://www.dein-freund-paul.de/2008/11/26/2elements/)

A.9 Examples involving immer und jeder *from deTenTen13*

Query (226) gave 168 results, including many false positives (e.g., with the dative *jeder* – possibly not an obligatory argument, or in the expression *immer und jeder Zeit* – not HC). Below is the list of all true positives (minus a couple less comprehensible potential true positives).

(226) `[word="immer"][tag="CONJ.Coord"][word="jeder"]`

(227) Jessica auch ich trauer mit dir über diese Entwicklung aber muß man da den Kopf in den

Sand stecken? bestimmt nicht immer oder jeder muß für sich entscheiden, ob es weiter Sinn macht.
(http://www.forum.beziehungsdoktor.de/index.php?forum-showposts-564-p10)

(228) Pokerspieler reden ja gerne über ihr Spiel und wie sie welche Hände spielen. Allerdings ist nicht immer und jeder interessiert wie denn der Jeweilige, die eine oder andere Hand spielt, nicht mal jemand der selber pokert – die wahrscheinlich noch am aller wenigsten.
(http://royalflush.de/news/gartenbach-werthan-telephonat-vol-20-%e2%80%9edas-ist-das-langweiligste-der-welt%e2%80%9c/689)

(229) Heute habe ich es einmal in Worten gefast was immer und jeder mit sich selbst aus machen mußt. (http://www.nettephila.de/?cat=6)

(230) Warum muss immer und jeder, welcher sich mit diesen Themen und Thesen auseinandersetzt, im Gegenzug selbst stets mit Bibel oder Christentum als Teilantwort oder Zitate aufwarten? (http://www.nworesist.de/gerogia-guidestones/)

(231) Zudem simuliert es reale Rennbedingungen in Kurven, da auch nicht immer und jeder in Kurven überholt werden kann. (http://ra-do-raceway.de/makingof.htm)

A.10 Examples involving jeder und überall *from W4 DeReKo*

Below is the list of all relevant examples from the 13 results of query (232).

(232) `jeder "und" überall`

(233) Und man schließlich nicht auf Kreta leben muss, um gesund alt zu werden! Herzfreundlich kochen und essen kann heute jeder und überall. (Südkurier)

(234) "Dies ist enorm wichtig, denn Erste Hilfe kann jeder und überall brauchen", betont DRK-Bereitschaftsleiter Bernhard Tröndle. (Südkurier)

(235) Nun muss keinesfalls jeder und überall aktiv werden, aber gerade in Richtung der Sprachausbildung verfügen die Beziehungen zu Rotherham und zu Sandy City sicher über ausreichend Potenzial. (Sächsische Zeitung)

(236) Rund um den Globus hat man sich mittlerweile die bittere Erkenntnis zu eigen gemacht, dass jeder und überall Opfer des Terrors werden kann. (Tiroler Tageszeitung)

(237) "Wir wollen den Menschen zeigen, dass sich jeder und überall sportlich betätigen kann, und das ohne großen Aufwand", sagt sie. (Wiesbadener Kurier)

(238) Warum eigentlich wurden vor Jahren abhörsichere Mobiltelefone gefordert, wenn jeder und überall lauthals seine intimsten Dinge preisgibt? (Thüringer Allgemeine)

(239) Ist das nicht schlimm, dass heute jeder und überall eine Kamera zückt, und los geht's? (Hamburger Abendblatt)

(240) "Ich persönlich sehe in Facebook, Twitter und Co. deutlich mehr Chancen als Gefahren sowohl im privaten als auch im beruflichen Bereich", erklärt Thorsten Ising. "Schließlich kann jeder und überall daran teilnehmen und das in einer unglaublichen Geschwindigkeit." (Westfalen-Blatt)

A.11 Examples involving überall und jeder *from W4 DeReKo*

Below are the two relevant examples from the 41 results of query (241).

(241) `überall "und" jeder`

(242) Nicht überall und jeder hatte eine so dufte Schulzeit wie wir, auch viele unserer Eltern und zum Teil Großeltern gingen in diese Schule. (Thüringer Allgemeine)

(243) Denn "Big Brother ist watching you"-immer und überall und jeder noch so banale jugendliche Fehltritt könnte, so krank ist mitunter die Welt, dem Vater vorgeworfen werden. (Tiroler Tageszeitung)

A.12 Examples involving niemand und nirgendwo *from W4 DeReKo*

Below are the two results of query (244).

(244) `niemand "und" nirgendwo`

(245) Der Selbstmord-Bomber vom ägyptischen Museum und die verschleierten Heckenschützinnen auf der Zitadelle von Kairo mahnen daran, dass heute niemand und nirgendwo vor plötzlichem Hinterhalt sicher ist. (Vorarlberger Nachrichten)

(246) Wir müssen erkennen, dass niemand dem internationalen Terrorismus entkommen kann, niemand und nirgendwo", (Trierischer Volksfreund)

A.13 Examples involving nirgendwo und niemand *from W4 DeReKo*

Query (247) gave four results, all false positives.

(247) `nirgendwo "und" niemand`

A.14 Examples involving niemand und nirgendwo *from deTenTen13 and deTenTen18*

Query (248) gave 13 results including two relevant examples in the case of deTenTen13.

(248) `[word="niemand"][tag="CONJ.Coord"][word="nirgendwo"]`

(249) Denn niemand und nirgendwo wird mit dem Glauben missioniert.

(http://travel.tele.ch/zermatt/)

(250) Ich finde es richtig wenn dafür niemand und nirgendwo eine Plattform zur Verfügung stellt.

(http://m.maclife.de/panorama/kultur/manhattan-declaration-20-apple-lehnt-christen-app-erneut-ab)

It also gave seven results including one true positive in the case of deTenTen18.

(251) Darum wird niemand und nirgendwo die Aufgewühlten zähmen.

(https://ukraine-nachrichten.de/kinder-narnia_3978)

A.15 Examples involving nirgendwo und niemand *from deTenTen18 and deTenTen13*

Query (252) gave three results but no true positives in the case of deTenTen13 and no results in the case of deTenTen18.

(252) `[word="niemand"][tag="CONJ.Coord"][word="niemand"]`

A.16 Examples involving niemand und nirgends *from W4 DeReKo*

Query (253) gave no results.

(253) `niemand "und" nirgends`

A.17 Examples involving nirgends und niemand *from W4 DeReKo*

Query (254) gave six results, but just one true positive.

(254) `nirgends "und" niemand`

(255) Mark Twain, der literarische Vater von Tom Sawyer und Huckleberry Finn, war ein begeisterter Vielfahrer, heißt es in der Pressemitteilung. Nirgends und niemand sei vor seiner satirischen Feder sicher gewesen. (Schwäbische Zeitung)

A.18 Examples involving niemand und nirgends *from deTenTen13 and deTenTen18*

Query (256) gave eight results including three relevant examples in the case of deTenTen13.

(256) `[word="niemand"][tag="CONJ.Coord"][word="nirgends"]`

(257) Garantien über "ewiges Leben" der Temp.-Quelle gibt Dir sowieso niemand und nirgends.

(http://www.niedrigenergieforum.de/qual-der-heizungswahl-fuer-neubau-t1739.html)

(258) In der DDR waren die Verbrechen des 3. Reiches, die Rolle der NSDAP und iher Gliederungen, der Wehrmacht und SS und überhaupt alles ein ganz wichtiges Thema an dem niemand und nirgends vorbei kam.

(http://www.pharus-forum.de/t2350f110-Gauck-18.html)

(259) Aber uns erwartete niemand und nirgends, wir versteckten uns in den Wäldern, wo wir tagsüber irgendwelche Kost aus den Dörfern auftrieben, [...]

(http://www.gelsenzentrum.de/zwangsarbeit_ukraine_brief.htm)

It only gave one false positive in the case of deTenTen18.

A.19 Examples involving nirgends und niemand *from deTenTen13 and deTenTen18*

Query (260) gave two results including one relevant example in the case of deTenTen13.

(260) `[word="nirgends"][tag="CONJ.Coord"][word="niemand"]`

(261) Laut seiner Meinung ist insbesondere die Behauptung, dass die durch Bioenergie verursachte Knappheit in erster Linie daran schuld sei, unsinn, denn dann wäre z.B. Reis nicht betroffen, da auf diesen Anbauflächen nie, nirgends und niemand Energielieferanten angebaut hat. (http://www.brainworker.ch/WAP/profitwald.htm)

It only gave one false positive in the case of deTenTen18.

A.20 Examples involving niemand und nie *from W4 DeReKo*

Query (262) gave no results.

(262) `niemand "und" nie`

A.21 Examples involving nie und niemand *from W4 DeReKo*

Query (263) gave five results, all false positives.

(263) `nie "und" niemand`

A.22 Examples involving niemand und nie *from deTenTen13 and deTenTen18*

Query (264) gave five results including three relevant examples in the case of deTenTen13.

(264) `[word="niemand"][tag="CONJ.Coord"][word="nie"]`

(265) Niemand und nie trennt die Russen und die Ukrainer. Wie niemand und nie die Preußen und die Sachsen trennt.

(http://www.matrjoschka-online.de/_private/hahaha.htm)

(266) Glaubt mir..., niemand und nie geht in irgendeine konkrete Schule, nimmt ein bestimmtes Hotelzimmer, kauft einen Ticket "gerade für diesen" Flug, Zug oder Autobusfahrt, fährt zu einem Einkaufszentrum oder einem Markt ohne die dafür ernsthaften karmischen Gründe [...]

(http://www.ayfaar-buchverlag.de/raumzeit-theorie.htm)

(267) Außer Oris war noch niemand und nie auf der Erde mittels solch sorgfältiger mentaler Auslegungen die Niveaus der Wahrnehmung und Manifestation dessen beschrieb, was man durchaus das Kosmische Weltallbewusstsein nennen kann.

(http://www.ayfaar-buchverlag.de/geometrie-raumzeit.htm)

In the case of deTenTen18, it produced no new relevant examples above those already found in deTenTen13.

A.23 Examples involving nie und niemand *from deTenTen13 and deTenTen18*

Query (268) gave 19 results including three relevant examples in the case of deTenTen13 – the two below and (67) in the main text.

(268) `[word="nie"][tag="CONJ.Coord"][word="niemand"]`

(269) Viele werden hierdurch wohl verleitet einmal zu Klicken, denn man weiss ja nie und niemand möchte Nacktfotos von sich im Internet sehen.

(http://www.derehrlichebetrueger.de/blog/20080609/nacktcommunity-com-und-online-girlies-com/)

(270) Buhli, ich muß doch aber nicht nach oft Jahrzehnten ruhigen Lebens, in denen nie und niemand an der Straße gerüttelt hat, damit rechnen, das fast aus heiterem Himmel eine neue Straße her muß.

(http://www.ossiforum.de/t2974f68-Deutschland-und-deine-Politiker-Wo-sind-die-extrem-guten-geblieben-42.html)

In the case of deTenTen18, it gave three results, but the only true positive was (67) in the main text.

A.24 Examples involving irgendjemand und irgendwann *from W4 DeReKo*

Query (271) gave one result – a false positive.

(271) `irgendjemand "und" irgendwann`

A.25 Examples involving irgendwann und irgendjemand *from W4 DeReKo*

Query (272) gave one result – a true positive.

(272) `irgendwann "und" irgendjemand`

(273) Allerdings: Irgendwann und irgendjemand hat diesen Gremien ihre formalen Grundlagen, ihre Spielregeln, gegeben. (Usinger Anzeiger)

A.26 Examples involving irgendjemand und irgendwann *from deTenTen13 and deTenTen18*

Query (274) gave only one false positive in the case of deTenTen13 and no results in the case of deTenTen18.

(274) `[word="irgendjemand"][tag="CONJ.Coord"][word="irgendwann"]`

A.27 Examples involving irgendwann und irgendjemand *from deTenTen13 and deTenTen18*

Query (275) gave four results in the case of deTenTen13, including the two fully comprehensible true positives below.

(275) `[word="irgendwann"][tag="CONJ.Coord"][word="irgendjemand"]`

(276) Vielleicht hat ja in den Hochzeiten des Kalten Krieges und des Antikommunismus irgendwo, irgendwann und irgendjemand damit gedroht, das " Kapital " von Karl Marx, " Was tun?

(http://c1.hbs.boell-net.de/internationalepolitik/aussensicherheit/aussen-sicherheit-zwischenruf-joscha-schmierer-globalismus-wahn-10173.html)

(277) Wir sind uns da sicher einig, dass irgendwann und irgendjemand die Lange Zählung erfunden haben muss. (http://faszination2012.de/blog/?p=130)

It is also gave one result in the case of deTenTen18, the following true positive:

(278) Es gibt Menschen, die GLAUBEN an etwas, dass irgendwann und irgendjemand mal in ein dickes Maerchenbuch geschrieben hat.

(http://www.humanist.de/humanist/gbgds-20.html)

A.28 Examples involving irgendjemand und irgendwo *from W4 DeReKo*

Query (279) gave no results.

(279) `irgendjemand "und" irgendwo`

A.29 Examples involving irgendwo und irgendjemand *from W4 DeReKo*

Query (280) gave no results.

(280) `irgendwo "und" irgendjemand`

A.30 Examples involving irgendjemand und irgendwo *from deTenTen13 and deTenTen18*

Query (281) gave two results including one true positive in the case of deTenTen13.

(281) `[word="irgendjemand"][tag="CONJ.Coord"][word="irgendwo"]`

(282) Alles was man mühsam in den Archiven von Zeitungen als auch von Regierungen verschwinden lies, ist jetzt frei für alle zugänglich, da weltweit irgendjemand und irgendwo darüber im Internetz berichtet.

(http://www.terraner.de/Politik/Terror-Demokratie.htm)

It also gave one result in the case of deTenTen18, but it was a false positive.

A.31 Examples involving irgendwo und irgendjemand *from deTenTen13 and deTenTen18*

Query (283) gave only two false positives in the case of deTenTen13 and no results in the case of deTenTen18.

(283) `[word="irgendwo"][tag="CONJ.Coord"][word="irgendjemand"]`

A.32 Examples involving nur ... und nur ... *from W4 DeReKo*

Query (284) gave 1228 results, including many HC examples with only optional dependents among conjuncts, but also a couple of examples with an obligatory argument.

(284) `nur /w1:2 "und" nur`

(285) "Sie sollten nur jenen und nur so lange zugeteilt werden, als es keine alternativen Möglichkeiten gibt", sagte er. (Der Standard)

(286) Zum Bezirksmonopol: Stellen Sie sich mal vor, der Bäcker Hommen bekäme einen Bezirk zugeteilt, in dem nur er und nur dort seine Waren verkaufen darf, etwa in Neuendorf. (Rhein-Zeitung)

A.33 Examples involving sogar ... und sogar ... *from W4 DeReKo and deTenTen18*

Query (287) only gave 17 false positive in the case of W4 DeReKo, but query (103) – repeated below as (288) – resulted in at least one true positive among the 159 results in deTenTen18.

(287) `sogar /w1:2 "und" sogar`

(288) `[word="sogar"] []{0,2} [tag="CONJ.Coord"] [word="sogar"]`

(289) Es ist aber auch möglich, sie ohne zauberische Feinmotorik aus der waffenlosen Karambit-Haltung einzunehmen, indem man daraus den Schaft um 90 Grad nach vorn drehen läßt. Das bekomme sogar ich und sogar in Handschuhen ohne große Konzentration und Artistik hin. (tacticalforum.de)

A.34 Examples involving fast ... und fast ... *from W4 DeReKo*

Query (101) – repeated below as (290) – gave 183 results, only one of which turned out to be an uncontroversial example of HC with an obligatory argument.

(290) `fast /w1:2 "und" fast`

(291) Heutzutage hat fast jeder und fast immer sein Smartphone dabei. (Wormser Zeitung)

B. Questionnaire Study

The questionnaire study reported in this paper consisted of three questionnaires: one testing HC in the Vorfeld (described in §B.1 below), another testing HC in the Mittelfeld (§B.2), and another testing examples of HC found in corpora (§B.3)

B.1 Vorfeld Questionnaire

Target sentences in this questionnaire contained examples of German HC in the Vorfeld position. They involved 0, 1, or 2 obligatory arguments among conjuncts, and the conjuncts were either *wh*-phrases, or phrases expressing universal or negative quantification.

This experiment was conceptually split into two subexperiments. One involved verbs whose only obligatory argument was the subject, and the other involved verbs taking two obligatory arguments (including the subject). In the first subexperiment, HC contained 0 or 1 obligatory argument, and in the second experiment – 1 or 2 obligatory arguments. Hence, the design of each of the two subexperiments in the Vorfeld questionnaire was 2 (number of obligatory conjuncts: 0 vs. 1 or 1 vs. 2) $\times$ 3 (kinds of conjuncts: *wh*, universal, negative). Kinds of conjuncts were limited to three in order to avoid a significant expansion of the survey. These particular kinds of phrases were selected because of their relatively high frequency in German HC found in corpora, compared to the other types. The dependent variable in both subexperiments was a numerical variable storing the participants' rating of a given sentence.

The study material consisted of a database of 48 token sets, each consisting of 6 target HC sentences. 24 token sets involved HC sentences with 0 or 1 obligatory argument, and the other 24 involved HC sentences with 1 or 2 obligatory arguments. An example of a token set (used in the 0 vs. 1 subexperiment) is given in Table 5.

No. of obl.	Kind of conjuncts	Sentence
0	*wh*	Wo und an wem hat er sich gerächt?
0	universal	Überall und an jedem hat er sich gerächt.
0	negative	Nirgends und an niemandem hat er sich gerächt!
1	*wh*	Wer und wo hat sich an ihr gerächt?
1	universal	Jeder und überall hat sich an ihr gerächt.
1	negative	Niemand und nirgends hat sich an ihr gerächt!

Table 5: Example of a token set with 0 and 1 obligatory conjuncts

In total, there were 288 target HC sentences in the Vorfeld questionnaire. On the assumption that German HC is always multiclausal, this corresponds to 2 $\times$ 288 = 576 hypothetical underlying clauses – 12 for each token set. For example, the underlying clauses for the token set in Table 5 are shown in Table 6.

No. of obl.	Kind of conjuncts	Sentence
0	*wh*	Wo hat er sich gerächt?
		An wem hat er sich gerächt?
0	universal	Überall hat er sich gerächt.
		An jedem hat er sich gerächt.
0	negative	Nirgends hat er sich gerächt!
		An niemandem hat er sich gerächt!
1	*wh*	Wer hat sich an ihr gerächt?
		Wo hat sich an ihr gerächt?
1	universal	Jeder hat sich an ihr gerächt.
		Überall hat sich an ihr gerächt.
1	negative	Niemand hat sich an ihr gerächt!
		Nirgends hat sich an ihr gerächt!

Table 6: Hypothetical underlying clauses of sentences from the token set in Table 5

The questionnaire was performed in three consecutive stages: pilot study, norming study, main study. Subjects who had taken part in one stage were not allowed to participate in subsequent stages. In each of the stages subjects were familiarised with the same story about a group of elderly friends who have known each other since school. During a meeting they gossip about some people they know who are not present at the time. The participants were asked if a sentence they saw on the screen was well-formed or not. The definition of well-formedness was formulated: a well-formed sentence could potentially occur in such a talk and it could be uttered by a native German speaker without an urge to correct him- or herself. Participants should have chosen a number, on the scale from -2 (totally ill-formed) to 2 (totally well-formed), which best reflected their assessment.

The first stage, the pilot study, was conducted in order to estimate the required sample size by means of power analysis. In this stage, 10 clauses were selected at random from the 576 underlying clauses, but in such a way that 5 were judged as grammatical by the authors of this paper and 5 were judged as ungrammatical. These were evaluated by 16 respondents (within-

subjects design) recruited via the Clickworker platform.[50] Based on the results of this survey ($M = -0.79$, $SD = 1.37$ for ungrammatical clauses, $M = 0.99$, $SD = 1.36$ for grammatical clauses), the difference between population means of 0.75 and the common standard deviation for the two populations of 1 were assumed. Significance level was set to $\alpha = 0.05$. One-sample two-sided t-test power calculation using the R software was performed.[51] Based on that, a minimal sample size of 15 was assumed to be sufficient to achieve the power of a test of 0.8.

The next stage, the norming study, was conducted in order to verify our assumptions about the obligatoriness of the conjuncts in each of the HC target sentences. Based on the results of this stage, 30 token sets (from the initial 48) that satisfied prior assumptions about obligatoriness of conjuncts were selected for the main study in the final stage. Detailed descriptions of these two stages are presented in the following two subsections.

B.1.1 *Norming Stage*

The object of the study at this stage were the hypothetical underlying clauses of HC. The goal of the study was to check the obligatoriness status of each of the conjuncts of the HC sentences. In order to do that the following procedure was developed: (i) every HC sentence from the existing database was split into two underlying clauses, resulting in a dataset of 576 underlying clauses: 48 token sets each containing 12 clauses (as in Table 6 above); (ii) the newly created material was divided into 6 questionnaires, each containing 96 target clauses and 6 filler sentences (within-subjects design); (iii) each questionnaire was taken by at least 15 participants; (iv) the ratings of clauses from each token set were evaluated in order to filter out – for the purpose of the main stage – those token sets in which the ratings of the hypothetically underlying clauses did not agree with the assumed number of obligatory arguments among conjuncts. Altogether, this stage involved 98 participants, although 10 of them were excluded prior to the analysis due to wrong ratings of some of the fillers (whose grammaticality or ungrammaticality was not controversial).

Consider the attached spreadsheet `Norming_stage.csv`. It consists of data resulting

[50] `https://www.clickworker.com/`

[51] `https://www.r-project.org/` (R Core Team 2022)

from the first two steps in the procedure described above. The first row stores the identification number of each participant. Every column in the range from B to CK represents one participant. Participants excluded from the survey are not included in the spreadsheet. Each row in the range from 2 to 613 represents one sentence (all target clauses and fillers). Thus, this spreadsheet provides information about the rating a given sentence got from a given participant. For example, participant number 2 gave the sentence in the second row a rating of 2. Note that the sentences are grouped in such a way that it is possible to infer which of the six questionnaires a given sentence has been assigned to. Thus, sentences in rows 2–102 appeared in the first questionnaire, in rows 103–205 in the second, etc. Columns CL–CN store values of the mean, standard deviation, and the median for each sentence, respectively. Columns CO–CR contain additional data about particular sentences. Column CO (TOKEN SET) indicates the token set to which the sentence belongs. Column CP (DATASET) stores the information about the token set: '0-1' indicates a token set contrasting originally (before the split) variants of a HC sentence with one obligatory argument and without obligatory arguments and, similarly, '1-2' indicates a token set consisting of HC sentences with 2 and with 1 obligatory argument. The values in column CQ (GRAM) indicate whether a given sentence is grammatical or ungrammatical (1 and 0, respectively). In column CR (OBLIG), value 0 means that a given underlying clause originates from a HC sentence with 0 obligatory arguments, 1 – with one obligatory argument, and 2 – with two obligatory arguments among conjuncts. In the final column, CS (ORDER), value 1 indicates that a given underlying clause corresponds to the first conjunct of the relevant HC sentence and value 2 – that it corresponds to the second conjunct.

The data in this spreadsheet were used to select token sets which formed the basis of the main stage of this study. 18 '0-1' token sets and 12 '1-2' token sets were selected. The process of selecting token sets was guided by the following assumptions:

- HC sentences with 0 obligatory arguments are built from two grammatical clauses since they do not lack any obligatory parts. Therefore, both underlying clauses should get high ratings.

- HC sentences with 1 obligatory argument are built from one grammatical clause (containing the obligatory argument) and one ungrammatical (lacking the obligatory argument).

The grammatical one should get high ratings and the ungrammatical one – low ratings.

- HC sentences with 2 obligatory arguments are built from two ungrammatical clauses (because each of them lacks one obligatory argument). Therefore, both underlying clauses should get low ratings.

Those token sets whose majority of underlying clauses received ratings according to the above assumptions were qualified for the main study. If some underlying clauses received average ratings violating those assumptions, i.e., an ungrammatical clause received an average rating greater than zero, or vice versa, token sets containing it were mostly excluded. If a token set contained clauses that received an average rating close to zero (greater than 0 for grammatical clauses and less than 0 for ungrammatical ones), that token set could be qualified for further analysis provided that there were fewer such clauses than non-controversial ones and that it was recognised that the near-zero ratings could be due to pragmatic aspects. As shown in Table 7, the token set presented earlier in Tables 5 and 6 contains an underlying clause (in bold) that received a score below our expectations, here, of 0.6; nevertheless this token set was qualified for the main study.

No. of obl.	Kind of conjuncts	Sentence	Rating
0	*wh*	Wo hat er sich gerächt?	1.6
		An wem hat er sich gerächt?	1.6
0	universal	Überall hat er sich gerächt.	1.21
		An jedem hat er sich gerächt.	1.69
0	negative	**Nirgends hat er sich gerächt!**	**0.6**
		An niemandem hat er sich gerächt!	1.15
1	*wh*	Wer hat sich an ihr gerächt?	1.79
		Wo hat sich an ihr gerächt?	−1.6
1	universal	Jeder hat sich an ihr gerächt.	1.8
		Überall hat sich an ihr gerächt.	−1.5
1	negative	Niemand hat sich an ihr gerächt!	1.73
		Nirgends hat sich an ihr gerächt!	−1.26

Table 7: Example of a token set that was qualified to the main study despite containing an underlying clause which got an average score relatively close to 0

B.1.2 *Main Stage*

In this stage, participants rated HC sentences from token sets that were selected based on the results of the norming study. Each participant saw 1 sentence from each selected token set, i.e.,

each saw $12 + 18 = 30$ target sentences, in addition to 36 fillers (the same for each participant).

92 participants took part in this stage of study, although 17 of them were excluded prior to the analysis due to failing attention checks and/or rating filler items inconsistently.

The tested hypothesis is that German is a strictly multiclausal HC language:

- H1: German HC sentences in which one or more conjuncts are obligatory arguments are ungrammatical.
- H2: German HC sentences in which no conjuncts are obligatory arguments are grammatical.

Consider the complete results of this survey, which can be found in the `V_main_stage.csv` spreadsheet. The first five rows contain information about the respondents – id, age, number of completed years of education, gender, and the answer to the question whether they are native speakers of German (always Y, i.e., *yes*). The following rows store information about the HC sentences and their ratings. Each column from B to BX corresponds to one respondent, and each row from 6 to 221 corresponds to one sentence; rows 6–41 contain the 36 filler sentences and rows 42–221 – the 180 target HC sentences from the 30 selected token sets. For example, the sentence in row 42 received a rating of -2 from respondent number 2 (63-year-old female, 15 years of education, native speaker of German).

Columns BY–CA contain the mean, the standard deviation, and the median of the numerical variables (sentence ratings, but also relevant demographic data). Columns CB–CD store information about the sentences. Column CB (OBLIG) refers to the number of obligatory arguments acting as conjuncts in a sentence. Column CC (TOKEN SET) indicates the token set a given sentence belongs to. Finally, in column CD (DATASET), '0-1' means that a given sentence comes from a token set contrasting HC sentences with one obligatory argument and sentences with only optional arguments; similarly, '1-2' means that a given token set contains sentences with one and two obligatory arguments (compare with the token sets in Table 5 and in Table 8, respectively).

This spreadsheet contains results from all 6 questionnaires created for the main study. Each questionnaire contained 30 target HC sentences interspersed among the (same) 36 filler sentences; that is, each participant had to evaluate 66 sentences altogether. The spreadsheet also

No. of obl.	Kind of conjuncts	Sentence
1	*wh*	Wer und wann hat sie besucht?
1	universal	Jeder und immer hat sie besucht.
1	negative	Niemand und nie hat sie besucht!
2	*wh*	Wer und wen hat letztens besucht?
2	universal	Jeder und jeden hat letztens besucht.
2	negative	Niemand und niemanden hat letztens besucht!

Table 8: Example of a token set with 1 and 2 obligatory conjuncts

provides information on which sentences were evaluated in which survey and by which participants. For example, respondents in columns B–O rated the sentences found in rows 42–71 (as well as the fillers in rows 6–41), respondents in columns P–AB rated the sentences in rows 72–101 (and the fillers in rows 6–41), etc.

A statistical analysis was carried out on the basis of this data. Firstly, consider the data from the '0-1' token sets. The middle part of Table 1(a), repeated here as Table 9, presents the acceptability of those sentences depending on the number of obligatory arguments involved in coordination.

oblig	M	SD	MED
0	1.15	0.60	1.22
1	−1.03	0.78	−1.11

Table 9: Comparing acceptability of HC with 0 vs. 1 obligatory dependents; M stands for mean, SD – for standard deviation, MED – for median

The mean of 1.15 indicates that HC sentences with no obligatory arguments were considered by the subjects as "rather acceptable". The HC sentences, on the other hand, were rated less than "rather unacceptable". Thus, the paired t-test results in a statistically significant difference and a large effect size ($t(74) = 23.6$, $d = 2.73$, $p < 0.001$).

Results were then analysed in a 2 (obligatory arguments: 0 or 1) $\times$ 3 (phrases: *wh*, universal, negative) two-way within-subjects ANOVA with interaction scheme in order to study the effect of the levels of the independent categorical variables (number of obligatory arguments and kind of conjuncts) on the dependent quantitative variable (ratings). The results of this test are presented in Table 10.

Both the effect of the number of obligatory arguments (see 'oblig' in the tables) as well as the kind of conjuncts (see 'phrase' in the tables) were detected. The interaction between those

Effect	DFn	DFd	F	p	η^2_G
oblig	1	74	558.14	< 0.05	0.615
phrase	2	148	59.59	< 0.05	0.132
interaction	2	148	3.72	< 0.05	0.008

Table 10: ANOVA results for HC sentences with 0 vs. 1 obligatory dependents; DFn stands for degrees of freedom in the nominator, DFd for degrees of freedom in the denominator, and η^2_G for Generalized Eta-Square

two terms was also significant, which indicated that the effects of one independent variable is partially dependent on the effect of the other. The effect of kind of conjuncts was considerably smaller than the effect of the number of obligatory arguments ($\eta^2_G = 0.132$ vs. $\eta^2_G = 0.615$). Nevertheless it is important to point out that the effect of the former should still be considered large.

Within-subjects ANOVAs are susceptible to the violation of the sphericity condition, which is a condition where the variances of the differences between all combinations of related levels are equal. In order to control this, Mauchly's test for sphericity was performed, which indicated that the assumption of sphericity was not violated both for the effect of the kind of conjunct ($W = 0.980$, $p > 0.05$) and for the interaction between the two effects ($W = 0.994$, $p > 0.05$). Since the effect of the number of obligatory arguments has only two levels, sphericity holds necessarily for this effect. On this basis, it can be concluded that the results of ANOVA are reliable.

Consider now Table 11, which presents the descriptive statistics of groups depending on each level of the variables representing the number of obligatory arguments and the kind of conjuncts. Notice that HC sentences with *wh*-phrases were rated highest regardless of the number of obligatory arguments (mean 1.560 for 0 and -0.578 for 1 obligatory argument), while negative phrases were rated lowest, with universal phrases in between.

Post-hoc paired t-tests revealed significant differences between all kinds of conjuncts in HC sentences with 0 or 1 obligatory argument (Table 12). Note that the only insignificant result is found between universal and negative phrases in HC sentences with 1 obligatory argument. Thus, interestingly, HC sentences with *wh*-phrases were always rated significantly better than HC with any other kind of conjuncts. Similarly, HC with universal phrases were rated higher than HC with negative phrases – significantly so in the case of 0 obligatory arguments.

oblig	phrase	M	SD	MED	n
0	*wh*	1.560	0.509	1.667	75
0	universal	1.222	0.768	1.333	75
0	negative	0.676	1.013	0.667	75
1	*wh*	−0.578	1.072	−0.667	75
1	universal	−1.164	0.908	−1.333	75
1	negative	−1.333	0.822	−1.667	75

Table 11: Descriptive statistics of HC sentences with 0 vs. 1 obligatory dependents depending on the number of obligatory dependents and the kind of conjuncts

oblig	phrase1	phrase2	n1	n2	t	df	*p*
0	universal	negative	75	75	5.07	74	< 0.001
0	universal	*wh*	75	75	−3.74	74	< 0.001
0	negative	*wh*	75	75	−8.19	74	< 0.001
1	universal	negative	75	75	1.85	74	0.068
1	universal	*wh*	75	75	−5.33	74	< 0.001
1	negative	*wh*	75	75	−6.94	74	< 0.001

Table 12: Results of the paired t-tests between HC sentences with different kinds of conjuncts divided by the number of obligatory arguments

The same test revealed that differences between means of HC sentences differing in the number of obligatory arguments are significant regardless of the kind of conjuncts. This effect is presented in Table 13.

phrase	oblig1	oblig2	n1	n2	t	df	*p*
wh	0	1	75	75	16.5	74	< 0.001
universal	0	1	75	75	20.8	74	< 0.001
negative	0	1	75	75	16.2	74	< 0.001

Table 13: Results of the pairwise t-test testing the difference between the acceptability of HC sentences with 0 vs. 1 obligatory dependents depending on the kind of conjuncts

The same steps were taken in the analysis of the sentences with 1 vs. 2 obligatory arguments. The paired t-test of HC with 1 and 2 obligatory arguments indicated a statistically significant difference between the group means, although the effect size was small ($t(74) = 4.31$, $d = 0.50$, $p < 0.001$) – consider the middle part of Table 1(b), repeated here as Table 14.

A two-way ANOVA with interaction analysis revealed the same effects as previously – an effect of the number of obligatory arguments, an effect of the kind of conjuncts, and the interaction – see Table 15. Both effect sizes were by conventional interpretation small. This time, however, the effect of the kind of conjuncts was larger than the effect of the number of

oblig	M	SD	MED
1	-1.28	0.71	-1.50
2	-1.54	0.47	-1.67

Table 14: Comparing acceptability of HC with 1 vs. 2 obligatory dependents

obligatory arguments ($\eta^2_G = 0.069$ vs. $\eta^2_G = 0.029$).

Effect	DFn	DFd	F	p	η^2_G
oblig	1	74	18.6	< 0.05	0.029
phrase	2	148	26.7	< 0.05	0.069
interaction	2	148	15.9	< 0.05	0.033

Table 15: ANOVA results for HC sentences with 1 vs. 2 obligatory dependents

Mauchly's test for sphericity indicated a violation of the assumption about sphericity for both applicable effects ($W = 0.768$, $p < 0.05$ for phrase, $W = 0.900$, $p < 0.05$ for interaction). In order for the ANOVA results to be reliable, two corrections to the degrees of freedom were therefore applied – the Greenhouse-Geisser and Huynh-Feldt corrections (Greenhouse and Geisser 1959, Huynh and Feldt 1976). After that, the two effects were still significant (see Table 16).

Effect	GGe	p[GGe]	HFe	p[HFe]
phrase	0.812	< 0.05	0.827	< 0.05
interaction	0.909	< 0.05	0.931	< 0.05

Table 16: Sphericity corrections for ANOVA of HC with 1 vs. 2 obligatory dependents; GGe and HFe stand for Greenhouse-Geisser and Huynh-Feldt epsilon, respectively; similarly p[GGe] and p[HFe] stand for p-values after the application of the corresponding corrections

Consider now Table 17. Again, HC sentences with *wh*-phrases were rated highest for both values of the number of obligatory arguments (mean -0.807 for 1 obligatory argument and -1.454 for 2 obligatory arguments), while negative phrases were rated lowest, with universal phrases in between, which is analogous to the results for 0 and 1 obligatory argument.

This time, *post-hoc* paired t-test, whose results are presented in Table 18, yielded significant differences between all kinds of conjuncts only for HC sentences with 1 obligatory argument. This again means that HC with *wh*-phrases were rated significantly better than HC with any other kind of conjuncts, but only among HC with 1 obligatory argument (similarly for universal and negative phrases). No comparison for HC with 2 obligatory arguments reached statistical

oblig	phrase	M	SD	MED	n
1	*wh*	−0.807	1.148	−1.0	75
1	universal	−1.433	0.759	−1.5	75
1	negative	−1.607	0.565	−2.0	75
2	*wh*	−1.454	0.703	−1.5	75
2	universal	−1.560	0.620	−2.0	75
2	negative	−1.613	0.579	−2.0	75

Table 17: Descriptive statistics of HC sentences with 1 vs. 2 obligatory dependents depending on the number of obligatory dependents and the kind of conjuncts

oblig	phrase1	phrase2	n1	n2	t	df	*p*
1	universal	negative	75	75	2.678	74	< 0.05
1	universal	*wh*	75	75	−5.927	74	< 0.001
1	negative	*wh*	75	75	−7.123	74	< 0.001
2	universal	negative	75	75	0.694	75	0.490
2	universal	*wh*	75	75	−1.203	75	0.466
2	negative	*wh*	75	75	−1.756	75	0.250

Table 18: Results of the paired t-tests between HC sentences with different kinds of conjuncts divided by the number of obligatory arguments

significance – those HC sentences were rated as ungrammatical independently of the kind of conjuncts.

The same test (see Table 19), revealed only one significant difference between HC sentences with 1 and 2 obligatory arguments, namely for *wh*-phrases.

phrase	oblig1	oblig2	n1	n2	t	df	*p*
wh	1	2	75	75	5.9351	74	< 0.001
universal	1	2	75	75	1.4218	74	0.159
negative	1	2	75	75	0.0888	74	0.929

Table 19: Results of the pairwise t-test testing the difference between the acceptability of HC sentences with 1 vs. 2 obligatory dependents depending on the kind of conjuncts

B.2 Mittelfeld Questionnaire

The design of the Mittelfeld questionnaire was fully analogous to that of the Vorfeld questionnaire. This study consisted only of main stage, as both fillers and verbs were the same as in the questionnaire described in §B.1.2.

B.2.1 *Main Stage*

In this questionnaire, the target sentences contained examples of German HC in the Mittelfeld position. They involved 0, 1, or 2 obligatory arguments among conjuncts that where of three kinds: *wh*-phrases, or phrases expressing universal or a negative quantification. As before, the experiment was conceptually split into two subexperiments, one involved verbs whose only obligatory argument was the subject, the other involved verbs with two obligatory arguments. The 30 token sets were built the same way as in the Vorfeld questionnaire.

As in the previous study, in addition to 36 fillers, each participant evaluated one sentence from each token set on a scale from -2 (totally ill-formed) to 2 (totally well-formed). Individuals who participated in any of the stages of the study described in §B.1 were excluded from this survey. We recruited 89 participants over Clickworker platform. Nine participants were excluded for subsequent analysis. The exclusion conditions were the same as in the study described in §B.1.2.

A compilation of the data obtained from the study can be found in the spreadsheet `M_main_stage.csv` that is structured similarly to the spreadsheet described in §B.1.2. Each of the B–CC columns corresponds to the ratings of a single respondent, and each of the rows 6–221 represents one sentence. The initial rows, 6–41, contain fillers sentences, followed by target sentences (rows 42–221). Columns CD–CF contain rowwise statistics and columns CG–CI contain information about the corresponding sentences.

Let us start by discussing the results for the first subexperiment. Consider the middle part of Table 2(a), repeated below as Table 20, showing descriptive statistics for sentences with one or zero obligatory arguments. As in the case of the Vorfeld study, the Mittelfeld sentences are on average rated worse if one of the coordination components is an obligatory argument ($t(80) = 18.4$, $p < 0.001$, $d = 2.05$). At first glance, however, the difference appears to be smaller in this case than in the case of the Vorfeld sentences.

oblig	M	SD	MED
0	1.23	0.64	1.44
1	−0.50	0.91	−0.56

Table 20: Comparing acceptability of HC with 0 vs. 1 obligatory dependents

A 2 by 3 two-way within-subjects ANOVA confirms the significant effect of the number of obligatory arguments as well as the kind of conjuncts (see 'phrase' in the tables). In contrast to the similar analysis of the Vorfeld sentences, here the interaction between these two factors was not found to be significant. As in the Vorfeld study, the effect size of the number of obligatory arguments was larger than the effect size of the kind of conjuncts ($\eta^2_G = 0.470$ vs. $\eta^2_G = 0.054$). The assumption of sphericity was not violated in any of the cases. The results of this analysis are given in Table 21.

Effect	DFn	DFd	F	p	η^2_G
oblig	1	79	337.36	< 0.05	0.470
phrase	2	158	30.60	< 0.05	0.054
interaction	2	158	1.26	> 0.05	0.002

Table 21: ANOVA results for HC sentences with 0 vs. 1 obligatory dependents

Table 22 provides the descriptive statistics for the Mittelfeld sentences depending on the number of obligatory arguments and the kind of conjuncts. As in the case of the Vorfeld, the HC sentences with *wh*-phrases were rated highest regardless of the number of obligatory arguments, while sentences with negative phrases were rated lowest.

oblig	phrase	M	SD	MED	n
0	*wh*	1.471	0.609	1.667	80
0	universal	1.329	0.760	1.667	80
0	negative	0.883	0.941	1.000	80
1	*wh*	−0.271	1.129	−0.500	80
1	universal	−0.492	0.966	−0.667	80
1	negative	−0.738	1.032	−1.000	80

Table 22: Descriptive statistics of HC sentences with 0 vs. 1 obligatory dependents depending on the number of obligatory dependents and the kind of conjuncts

The results of the *post-hoc* paired t-tests, as shown in Table 23, revealed a statistically significant difference between nearly all pairs of kind of coordinated phrases. The only exception were the comparisons between sentences with *wh*- and universal phrases with zero obligatory arguments. As can be seen in Table 22, both these groups of sentences were rated as quite acceptable (M = 1.471 for sentences with *wh*-phrases, M = 1.329 for sentences with universal phrases).

As in the case of the Vorfeld HC sentences, also in the Mittelfeld sentences the *post-hoc*

oblig	phrase1	phrase2	n1	n2	t	df	p
0	universal	negative	80	80	5.26	79	< 0.001
0	universal	*wh*	80	80	-1.75	79	0.084
0	negative	*wh*	80	80	-6.13	79	< 0.001
1	universal	negative	80	80	2.65	79	0.019
1	universal	*wh*	80	80	-2.08	79	0.041
1	negative	*wh*	80	80	-4.76	79	< 0.001

Table 23: Results of the paired t-tests between HC sentences with different kinds of conjuncts divided by the number of obligatory arguments

pairwise comparisons revealed statistically significant differences between the number of obligatory arguments regardless of the kind of the phrase (see Table 24).

phrase	oblig1	oblig2	n1	n2	t	df	p
wh	0	1	80	80	13.8	79	< 0.001
universal	0	1	80	80	16.9	79	< 0.001
negative	0	1	80	80	13.1	79	< 0.001

Table 24: Results of the pairwise t-test testing the difference between the acceptability of HC sentences with 0 vs. 1 obligatory dependents depending on the kind of conjuncts

The same statistical analyses were performed for the sentences with 1 vs. 2 obligatory arguments. The results obtained for the HC sentences in the Mitelfeld are largely analogous to those obtained for the Vorfeld sentences. Firstly, as before, sentences with one obligatory argument were on average rated higher than sentences with two obligatory arguments (see Table 25). In the Mittelfeld, however, the difference is greater in this regard – although sentences with one obligatory argument are still rated well below 0, this time their average rating is much higher ($\mathrm{M} = -0.78$) than for sentences with two obligatory arguments ($\mathrm{M} = -1.24$; $t(80) = 6.82$, $p < 0.001$, $d = 0.76$).

oblig	M	SD	MED
1	-0.78	0.79	-0.92
2	-1.24	0.66	-1.33

Table 25: Comparing acceptability of HC with 1 vs. 2 obligatory dependents

This observation is confirmed by the analysis of variance (see Table 26), which detected a statistically significant effect of both the number of obligatory arguments and the kind of the phrase, as well as the interaction between these variables. In this case, however, there is no

difference between the magnitude of the effects, since in both cases they are rather small. The assumption of sphericity was not violated in any of the cases.

Effect	DFn	DFd	F	p	η_G^2
oblig	1	79	46.5	< 0.05	0.065
phrase	2	158	29.9	< 0.05	0.052
interaction	2	158	11.2	< 0.05	0.022

Table 26: ANOVA results for HC sentences with 1 vs. 2 obligatory dependents

Secondly, also in case of sentences with 1 vs. 2 obligatory arguments, sentences with *wh*-phrases are rated highest, and sentences with negative phrases are rated lowest, regardless of the number of obligatory arguments (see Table 27).

oblig	phrase	M	SD	MED	n
1	*wh*	−0.338	1.102	−0.50	80
1	universal	−0.950	0.892	−1.00	80
1	negative	−1.062	0.894	−1.50	80
2	*wh*	−1.156	0.825	−1.50	80
2	universal	−1.144	0.812	−1.25	80
2	negative	−1.425	0.671	−1.50	80

Table 27: Descriptive statistics of HC sentences with 1 vs. 2 obligatory dependents depending on the number of obligatory dependents and the kind of conjuncts

Third, the t-test comparisons presented in Table 28 and Table 29 indicate that despite the negative means, most comparisons between groups are still statistically significant.

oblig	phrase1	phrase1	n1	n2	t	df	*p*
1	universal	negative	80	80	1.212	79	0.229
1	universal	*wh*	80	80	−5.428	79	< 0.001
1	negative	*wh*	80	80	−6.309	79	< 0.001
2	universal	negative	80	80	3.561	79	< 0.001
2	universal	*wh*	80	80	0.141	79	0.889
2	negative	*wh*	80	80	−4.004	79	< 0.001

Table 28: Results of the paired t-tests between HC sentences with different kinds of conjuncts divided by the number of obligatory arguments

B.2.2 *Comparison of results: Vorfeld vs. Mitelfeld*

The results presented in §§B.1.2 and B.2.1 suggest that there is a difference in the acceptability of sentences with HC between the Mittelfeld and the Vorfeld. On average, sentences with one

phrase	oblig1	oblig2	n1	n2	t	df	p
wh	1	2	80	80	7.01	79	< 0.001
universal	1	2	80	80	2.06	79	0.042
negative	1	2	80	80	3.66	79	< 0.001

Table 29: Results of the pairwise t-test testing the difference between the acceptability of HC sentences with 1 vs. 2 obligatory dependents depending on the kind of conjuncts

obligatory argument were rated higher in the Mittelfeld than in the Vorfeld (see Table 9 and Table 14 for Vorfeld as well as Table 20 and Table 25 for Mittelfeld). These observations are confirmed by the results of the between-subjects ANOVA for sentences with 0 vs. 1 argument both for the Vorfeld and the Mittelfeld (Table 30). A statistically significant effect of the position of HC in the sentence (F = 9.012, $p < 0.05$) was detected, as well as two-way interactions between the kind of conjuncts and the number of arguments.

The quality of the significant effects and interactions was confirmed by applying appropriate corrections and Mauchlye's sphericity test. Three-way interaction remained insignificant.

Effect	DFn	DFd	F	p	η^2_G
feld	1	153	9.012	< 0.05	0.027
feld : oblig	1	153	11.634	< 0.05	0.016
feld : phrase	2	306	5.328	< 0.05	0.006
feld : oblig : phrase	2	306	0.562	> 0.05	0.0005

Table 30: ANOVA results for HC sentences in Mittelfeld and Vorfeld with 0 vs. 1 obligatory dependents

In addition, a *post-hoc* t-test yielded a statistically significant difference between the Vorfeld and the Mittelfeld sentences in the mean ratings of sentences with a single obligatory argument (see Table 31).

oblig	feld1	feld2	n1	n2	t	df	p
0	M	V	80	75	0.754	153	0.452
1	M	V	80	75	3.857	153	< 0.001

Table 31: Results of the paired t-tests between sentences with HC in different positions divided by the number of obligatory arguments

Post-hoc paired t-test presented in Table 32 indicate a significant difference between the Vorfeld and the Mittelfeld in the sentences with one obligatory argument and universal and negative phrases as a kind of conjuncts.

oblig	phrase	feld1	feld2	n1	n2	t	df	p
0	*wh*	M	V	80	75	-0.992	151	0.323
0	universal	M	V	80	75	0.871	152	0.385
0	negative	M	V	80	75	1.320	150	0.189
1	*wh*	M	V	80	75	1.737	153	0.084
1	universal	M	V	80	75	4.469	153	< 0.001
1	negative	M	V	80	75	3.988	149	< 0.001

Table 32: Results of the paired t-tests between sentences with HC in different positions divided by the number of obligatory arguments and kinds of conjuncts

Finally, let us look at Table 33 for sentences from token sets with sentences with 1 vs. 2 arguments. In this case, the effect of the position of HC in the sentence has also been discovered, but interactions with obligatoriness and kinds of conjuncts were not statistically significant.

Effect	DFn	DFd	F	p	η^2_G
feld	1	153	16.740	< 0.05	0.056
feld : oblig	1	153	4.783	> 0.05	0.004
feld : phrase	2	306	0.439	> 0.05	0.0005
feld : oblig : phrase	2	306	1.272	> 0.05	0.001

Table 33: ANOVA results for HC sentences in Mittelfeld and Vorfeld with 1 vs. 2 obligatory dependents

Despite the low average ratings (as can be seen in Table 14 for the Vorfeld and Table 25 for the Mittelfeld), the difference between the position of HC in the sentence has a significant effect on the average rating of sentences regardless of the number of obligatory arguments (see Table 34). Generally speaking, sentences with the HC in the Mittelfeld are significantly more acceptable.

oblig	feld1	feld2	n1	n2	t	df	p
1	M	V	80	75	4.13	153	< 0.001
2	M	V	80	75	3.29	143	0.001

Table 34: Results of the paired t-tests between sentences with HC in different positions divided by the number of obligatory arguments

Comparisons of the number of obligatory arguments and the kind of the phrase, presented in Table 35, revealed significant differences between most types of sentences.

oblig	phrase	feld1	feld2	n1	n2	t	df	p
1	*wh*	M	V	80	75	2.59	151	0.010
1	universal	M	V	80	75	3.64	152	< 0.001
1	negative	M	V	80	75	4.56	135	< 0.001
2	*wh*	M	V	80	75	2.42	152	0.017
2	universal	M	V	80	75	3.60	147	< 0.001
2	negative	M	V	80	75	1.87	152	0.063

Table 35: Results of the paired t-tests between sentences with HC in different positions divided by the number of obligatory arguments and kinds of conjuncts

B.3 Corpus Questionnaire

We selected for evaluation 72 examples with HC constructions taken from German corpora. This time, the design of the study was 2 (position of HC: Vorfeld vs. Mittelfeld) $\times$ 2 (number of obligatory arguments: 0 vs. 1) $\times$ 3 (kind of the conjunct: *wh* vs. universal vs. negative). Additionally, in the case of sentences with one obligatory argument, the position of the obligatory subject was recorded: the first conjunct vs. the second conjunct. There were four sentences for each of the 18 conditions.

Individuals who participated in any of the stages of the study described in §§B.1–B.2 were excluded from this survey. Thirty people took part in this study and only one was excluded from the analysis due to incorrect answers on the attention checks.

A compilation of the data obtained from the study can be found in the spreadsheet `C_main_stage.csv` that is structured similarly to the spreadsheet described in §B.1.2. Columns B–AD contain ratings of each of the participants in this stage of the study. Columns AE–AG contain rowwise statistics and AH–AJ information about the corresponding sentences. Rows 6–41 represent filler sentences and 42–113 target sentences.

Table 36 (the middle part of Table 3) and Table 37 show descriptive statistics for the corpus HC sentences. The results replicate the patterns already seen in previous studies. Again, sentences with one obligatory argument scored lower on average compared to sentences without obligatory arguments ($t(28) = 9.99$, $p < 0.001$, $d = 1.86$). What is noticeable, however, is the relatively high average rating for sentences with one obligatory argument – its value is close to zero.

As before, sentences with *wh*-phrases were rated highest and sentences with negative phrases

oblig	M	SD	MED
0	1.34	0.42	1.38
1	−0.05	0.71	−0.13

Table 36: Comparing acceptability of corpus HC with 0 vs. 1 obligatory dependents

feld	oblig	phrase	M	SD	MED
V	0	*wh*	1.690	0.507	2.000
V	0	universal	0.931	0.716	1.000
V	0	negative	0.914	0.682	1.000
V	1	*wh*	−0.112	0.971	−0.375
V	1	universal	−0.500	0.867	−0.500
V	1	negative	−0.707	0.784	−0.625
M	0	*wh*	1.776	0.397	2.000
M	0	universal	1.578	0.547	1.750
M	0	negative	1.155	0.708	1.000
M	1	*wh*	0.608	0.856	0.625
M	1	universal	0.267	0.712	0.250
M	1	negative	0.151	0.843	0.125

Table 37: Descriptive statistics of corpus HC sentences depending on the position of HC, the number of obligatory dependents and the kind of conjuncts

lowest (see Table 37). The difference between sentences in the Vorfeld and the Mittelfeld turned out to be relatively large. Importantly, sentences in the Mittelfeld with one obligatory argument receive average ratings above zero, and this regardless of the kind of conjunct. There is a clear contrast with the corresponding group of sentences in the Vorfeld, which are rated on average below zero. As can be seen in Table 38, these differences are statistically significant.

oblig	phrase	feld1	feld2	n1	n2	t	df	p
0	*wh*	M	V	29	29	1.26	28	0.217
0	universal	M	V	29	29	4.85	28	< 0.001
0	negative	M	V	29	29	1.68	28	0.105
1	*wh*	M	V	29	29	4.70	28	< 0.001
1	universal	M	V	29	29	6.25	28	< 0.001
1	negative	M	V	29	29	7.20	28	< 0.001

Table 38: Results of the paired t-tests between corpus sentences with HC in different positions divided by the number of obligatory arguments and kinds of conjuncts

The corpus survey examined the effect of subject position in HC sentences with an obligatory argument on their acceptability. In the case of these sentences, the subject could occur as the first conjunct or the second.

Table 39 shows the results of the within-subjects ANOVA for sentences with one obligatory argument. A small significant effect of subject position was detected. All other interactions, not mentioned in the table, came out statistically insignificant. In the case of the effect of the phrase, the assumption of sphericity was violated, but after applying corrections the effect was still significant ($p < 0.05$).

Effect	DFn	DFd	F	p	η^2_G
phrase	2	56	19.066	< 0.05	0.052
feld	1	28	70.528	< 0.05	0.146
subject	1	28	14.824	< 0.05	0.029
feld : ubject	1	28	21.587	< 0.05	0.023

Table 39: ANOVA results for corpus HC sentences with 1 obligatory dependent

Table 40 reveals that sentences with the subject in the second position were on average rated higher than sentences with the subject in the first position ($t(28) = -3.85$, $p < 0.001$, $d = -0.715$). Sentences with the subject in the second position received an average rating above zero, although it should be noted that in both cases the average ratings are close to zero.

subject	M	SD	MED
1	−0.21	0.61	−0.21
2	0.11	0.86	0.16

Table 40: Comparing acceptability of HC with 1 obligatory dependent divided by the position of the subject. 1 denotes the subject standing first from the left in HC and 2 as second from the left

feld	phrase	subject1	subject2	n1	n2	t	df	*p*
V	*wh*	1	2	29	29	−2.556	28	0.016
V	universal	1	2	29	29	−4.383	28	< 0.001
V	negative	1	2	29	29	−3.794	28	< 0.001
M	*wh*	1	2	29	29	−0.376	28	0.710
M	universal	1	2	29	29	2.351	28	0.026
M	negative	1	2	29	29	−1.624	28	0.116

Table 41: Results of the paired t-tests between HC sentences with different positions of subjects divided by the position of HC and kind of conjuncts. Note that these comparisons take into account only sentences with one obligatory argument

Table 41 presents a comparison of sentences with the subject in the first and second position depending on the position of HC in the sentence and the kind of conjuncts. It turns out that

significant differences are found in every case for the Vorfeld and only in one case for the Mittelfeld (for universal phrases).

B.4 Mixed-Effects Ordinal Model

The final stage of analysis involved using a mixed-effects model on the data from all three studies to model global effects and account for random effects, i.e., for grouping factors. Random effects are factors in a model that account for unexplained variation between groups or individuals. They capture unique characteristics or differences among the groups or individuals being studied, helping to model and understand the variability beyond what can be explained by fixed factors.

In the studies reported above, the division between fixed and random effects is as follows. Most of the effects that were analysed in the sections above were modelled as fixed effects. This includes the number of obligatory arguments (0, 1, 2), phrase kind (*wh*, universal, negative), HC position in the sentence (Vorfeld, Mittelfeld), and some of the interactions between them (phrase kind with number of obligatory arguments, HC position in the sentence with number of obligatory arguments, and the three-way interaction of these variables). The previous analysis of variance made it possible to determine which of them significantly affect the mean HC sentences ratings (see, e.g., Table 10, confirming a significant effect of the number of obligatory arguments for 0 vs. 1 HC sentences in the Vorfeld, and Table 30, showing a significant effect of the HC position for 0 vs. 1 HC sentences, etc.).

However, there may also be other effects in the collected data. These are related, for example, to the design of the survey, to how the sentences were grouped, and in this sense they are unavoidable. We distinguished three such grouping factors or random effects: respondent (individual respondents, 184 in total), survey (Vorfeld 1 and 2 – surveys described in §B.1, Mittelfeld 1 and 2 – surveys described in §B.2, C – survey from §B.3), and token set (a total of 61 token sets – 30 from the Vorfeld study in §B.1, 30 from the Mittelfeld study in §B.2, and 1 token set composed of corpus sentences; sentences from the corpus study in §B.3 were not constructed, i.e., they were not grouped into token sets, but for the purposes of the model they were treated as if they came from a single token set). The idea is that each respondent, due to e.g., their own linguistic habits, may have exhibited individual patterns of sentence evaluation,

thereby introducing additional variance into the data, unrelated to the modelled effects. In the case of surveys, the fact that respondents were only exposed to sentences from a given survey during the study may have influenced their ratings, e.g., by systematically underestimating them. A token set, on the other hand, involves the selection of individual verbs (the construction of the token set can be seen in Table 5), some of which may be systematically rated worse than others.

The model is defined in such a way that it accounts for the fact that respondents are "nested" within surveys. It means that each respondent could only take part in one study but could take part in two surveys (it applies to the respondents from the studies described in §§B.1–B.2, as there each participant within a study rated sentences from both 1 vs. 0 and 1 vs. 2 surveys).

Finally, we model random effects as random intercepts, which allows us to model unique tendencies among the groups (e.g., the fact that they may have different baselines).

So, the formula used to fit the model is as follows:

(292) rating ~ kind of phrase + no. of oblig. arguments + position of HC +
kind of phrase : no. of oblig. arguments +
no. of oblig. arguments : position of HC +
no. of oblig. arguments : kind of phrase : position of HC +
(1 | respondent / survey) + (1 | token set)

A properly defined mixed-effects model is able to better capture differences in variance within and between groups and thus better model the actual magnitude of fixed effects.

We used a variant of the model called CLMM (Cumulative Link Mixed Model) implemented in R.[52] The model, expressed by the above formula, achieved the most optimal values of the evaluation measures among the approximately 30 models tested (AIC of 15761.24, number of conditional Hessian of 14000, log-likelihood of -7856.62). Both defined random effects are significant, which was shown by a likelihood ratio test ($\chi^2 = 1368$, $p < 0.001$ for the nested effect and $\chi^2 = 84.279$, $p < 0.001$ for the token set effect).

CLMMs are adapted for a dependent variable expressed on an ordinal scale (sentence rating). In this case, the interpretation of the coefficients differs from that known from traditional

[52] `https://CRAN.R-project.org/package=ordinal` (Christensen 2022)

linear models. Here, they are defined in terms of log odds, i.e., the logarithm of the odds ratio (OR) that a given outcome, compared to the baseline category, belongs to a given or higher category (in our case, that a given sentence will be rated at a given level or higher on an ordinal scale of -2 to 2).

Let us take a look at Table 42. To save space, only statistically significant fixed effects (with significance defined by confidence intervals) have been reported in it. It shows, for example, that a negative phrase has a significant negative effect on sentence ratings, i.e., that sentences with this kind of phrase are more likely to be rated low ($\beta = -1.010$). The odds ratio (which is equal to $e^{-1.010}$) is 0.364. This is the odds ratio determined against the baseline category – in this case universal phrase – that a sentence will be rated a particular number of the scale or higher.

Fixed effect	Coefficient	Std. error	z value	OR	2.5%	97.5%
negative phrase	−1.010	0.161	−6.282	0.364	0.266	0.499
wh phrase	0.444	0.176	2.528	1.558	1.105	2.198
oblig 1	−3.193	0.149	−21.502	0.041	0.031	0.055
oblig 2	−3.819	0.216	−17.666	0.022	0.014	0.034
Vorfeld	−0.987	0.183	−5.405	0.373	0.260	0.533
negative phrase : oblig 1	0.726	0.192	3.787	2.066	1.419	3.008
oblig 1 : Vorfeld	−0.453	0.202	−2.246	0.636	0.428	0.944
wh phrase : oblig 0 : Vorfeld	0.720	0.244	2.945	2.054	1.272	3.315
wh phrase : oblig 1 : Vorfeld	0.389	0.154	2.529	1.475	1.091	1.994

Table 42: Estimated coefficient for fixed effects and corresponding standard errors, z values, odds ratios and confidence intervals

In the last two columns, delineating the 95% confidence intervals for the odds ratio, it can be seen that the value 1 does not fall into their range (here, we are operating on ratios, so it is the value 1 that indicates the absence of an effect) and the range itself is not very wide. Therefore, it can be inferred with a high degree of confidence that the determined odds ratio value is true. By analogy, we can check the significance and reliability of the other effects. (The ranges of confidence intervals of interactions are in most cases much wider. And while it is still correct to mark them as significant, they do not give as much certainty as in the case of main effects.)

Note that these results confirm our the results of our earlier analyses: *wh*-phrases are rated best and negative phrases worst, HC in the Vorfeld is rated worse than in the Mittelfeld, and obligatoriness causes a clear drop in acceptability.

In Table 43, the so-called threshold coefficients can be found, which indicate the change point on the latent continuous scale at which the probability of transitioning from a lower rating to a higher one increases. The magnitude of the coefficients indicates the strength of the corresponding effect. These values, in combination with the values from the Table 42 and the corresponding random effects, make it possible to determine the logit of estimated cumulative probability of the specific rating falling into a specific category (rating scale) or below.

Threshold	Estimate	Std. error	z value
$-2 \mid -1$	-4.307	0.176	-24.408
$-1 \mid 0$	-2.594	0.172	-15.065
$0 \mid 1$	-1.998	0.171	-11.698
$1 \mid 2$	-0.462	0.168	-2.753

Table 43: Estimated threshold coefficients and corresponding standard errors and z values

Estimated values from Table 43 are a bit hard to interpret in isolation, but non-cumulative probabilities of falling into a category on a rating scale for fixed effects (while setting all other model parameters to zero) can be determined from them. These values are presented for these effects in Table 44.

Effect	-2	-1	0	1	2
oblig 1	0.247	0.398	0.122	0.171	0.061
oblig 2	0.381	0.392	0.088	0.106	0.034
wh phrase	0.009	0.037	0.034	0.208	0.712
negative phrase	0.036	0.135	0.101	0.362	0.366
Vorfeld	0.035	0.132	0.100	0.361	0.372

Table 44: Non-cumulative probabilities of being in a category for each effect disregarding all other fixed and random effects

Consider now the random effects. It turns out that they do indeed bring additional variance to the data that was previously unexplained. The largest amount of variance is associated with respondents (V = 1.195, SD = 1.093), confirming the presence of individual sentence rating patterns in the collected data. There is also some variance associated with the nested random effect, indicating that the setting in which the sentence occurred (i.e., which study it belonged to) may also have influenced how it was evaluated. In addition, variance is also contributed by token set, which may confirm that some verbs used in the study were rated significantly worse or better than others.

Group	V	SD
survey : id	0.282	0.531
id	1.195	1.093
token set	0.179	0.423

Table 45: Estimated random intercepts; V stands for variance and SD for standard deviation

In order to better explore this issue, the estimated effects for each respondent are shown in Figure 6. Each point corresponds to one of the 184 respondents, and the whiskers are the estimated 95% confidence interval. As can be seen, there is quite a large group of respondents for whom the confidence interval does not cross zero, indicating a significant negative or positive effect on sentence ratings.

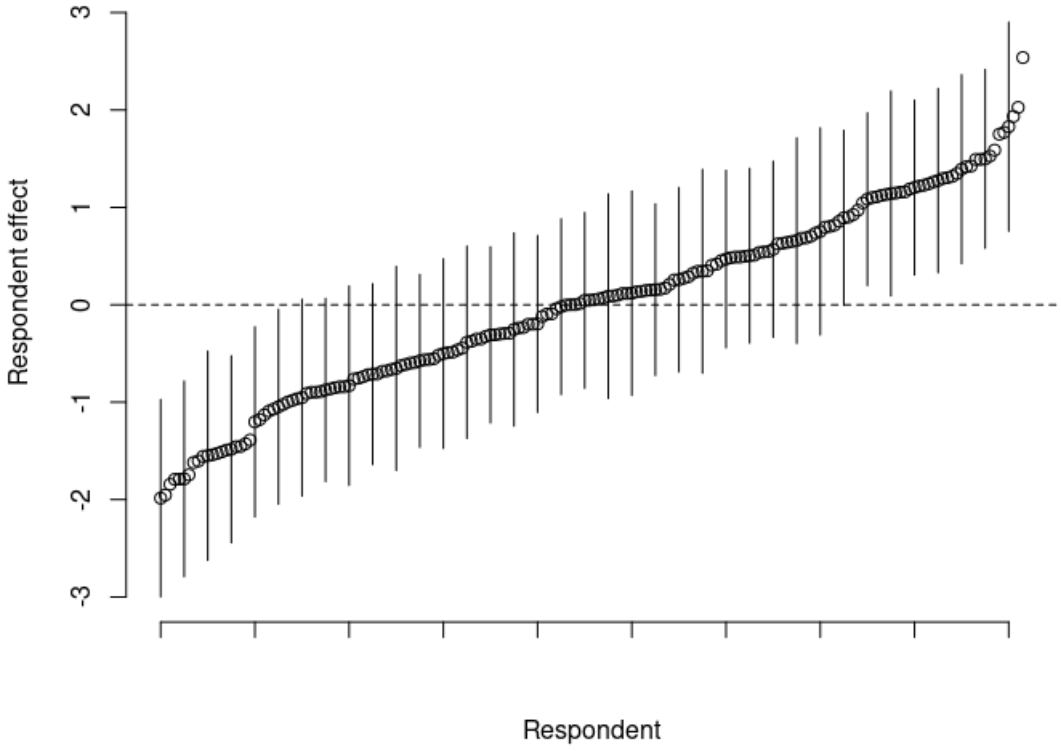

Figure 6: Estimated effects for respondents with 95% confidence intervals. For better visibility, the graph indicates the confidence interval for only one in five respondents

In addition, Figure 7 shows the distributions of the estimated probabilities of receiving a given rating (marked in the upper left corner of each subplot) depending on the number of

obligatory arguments, the phrase kind, and the HC position in the sentence. From this graph, it can be inferred, for example, that the estimated probability that a sentence with a *wh*-phrase (marked as W) and zero obligatory arguments with HC in the Vorfeld or the Mittelfeld will receive a rating of -2 is low – in both corresponding boxplots, the median score is close to 0. Furthermore, the boxplots are very narrow, indicating that the respondents did not differ too much about their ratings. Similarly in the case of sentences with universal phrases (marked as J), although here, three outliers can be found, the highest of which is as high as 0.25. However, it is enough to look at the boxplots corresponding to sentences with one obligatory argument to realize the enormous variability in the ratings of the corresponding sentences. In the case of sentences with negative phrases (marked as N), the interquartile range covers almost the entire scale – the minimum value is around zero and the maximum value is around 0.80. In the case of the Mittelfeld, the median is much lower than the Vorfeld – this indicates that the respondents were much more likely to assign the lowest rating on the scale to sentences with HC in the Vorfeld than in the Mittelfeld (in the case of negative phrases and one obligatory argument). In many cases, a similar or even greater difference between the HC sentences can be found, e.g., in the case of scores of -1 for sentences with *wh*-phrases and zero obligatory arguments, or scores of 2 for *wh*-phrases and one obligatory argument.

In general, this graph shows mostly high variability among respondents – this is indicated by the wide boxplots and whiskers, the presence of outliers and the ranges on the y-axes – e.g., in the case of rating 1, no third quartile seems to exceed the value of 0.50. In this example, probability distributions appear to be rather evenly distributed between categories.

Finally, let us consider Figure 8. It illustrates the effect that each token set had on the rating of HC sentences. It turns out that among the token sets used, there were some that showed a statistically significant positive effect on sentence ratings (i.e., sentences from these token sets were likely to be rated higher on the scale) – these are the token sets whose points are above the line denoting zero and for which the whiskers indicating the 95% confidence interval do not intersect zero. Similarly, one can find token sets that showed a negative effect on the rating of sentences (below the line marking zero).

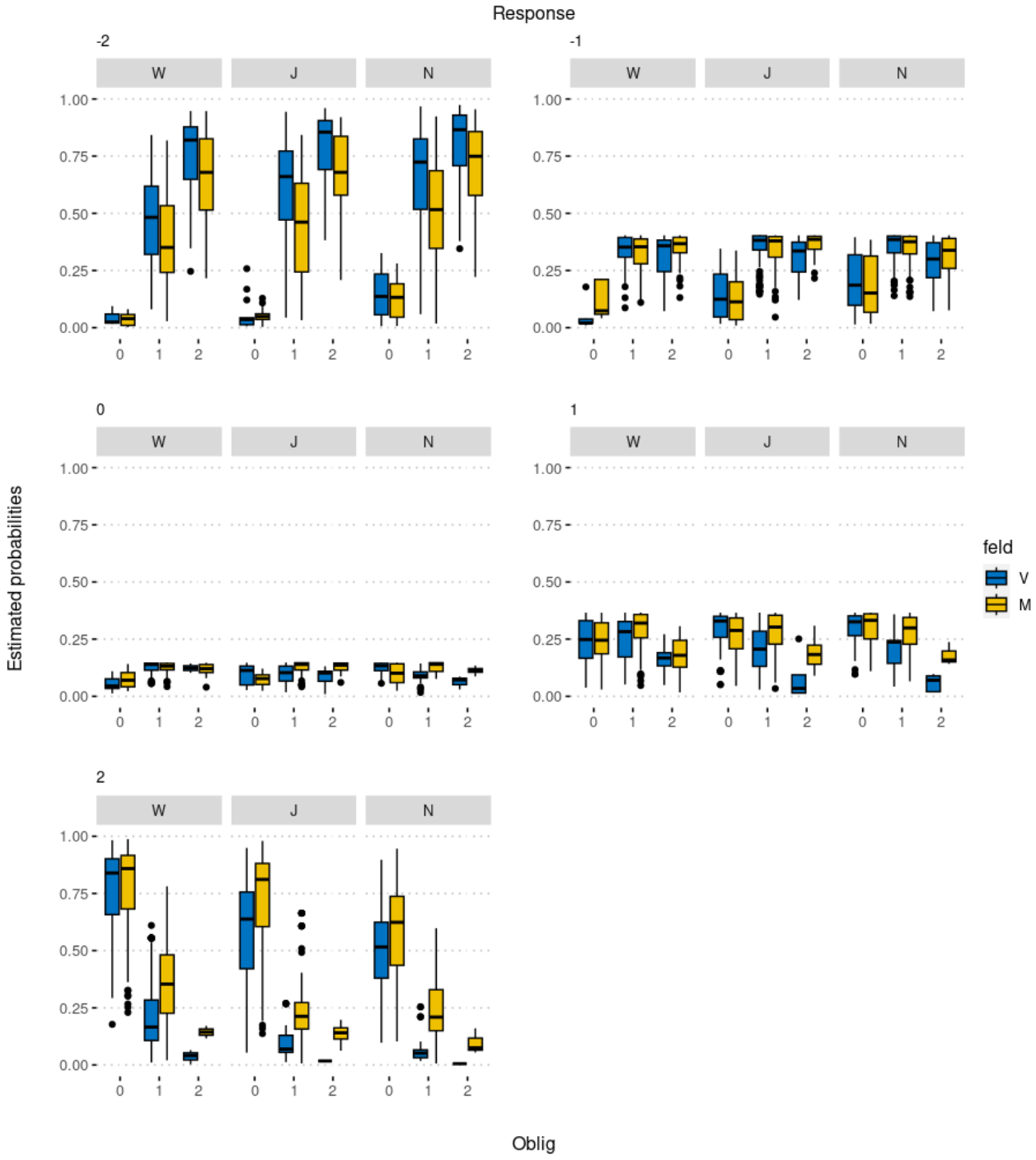

Figure 7: Distributions of the estimated probabilities of evaluating a sentence at a given point on the scale from -2 to 2. Each subplot is divided by phrase kind. 0, 1, and 2 on the x-axes correspond to the number of obligatory arguments. The number in the top left corner of each subplot indicates the corresponding rating on the scale. The yellow boxplots indicate the sentences with HC in the Mittelfeld and the blue ones HC in the Vorfeld. The lower edge of the boxplot is at first quartile level and the upper edge is at third quartile level. The ends of the whiskers indicate the minimum and maximum values of the distribution. The bold line in the middle of the boxplot is at the median level. The individual points correspond to the outliers

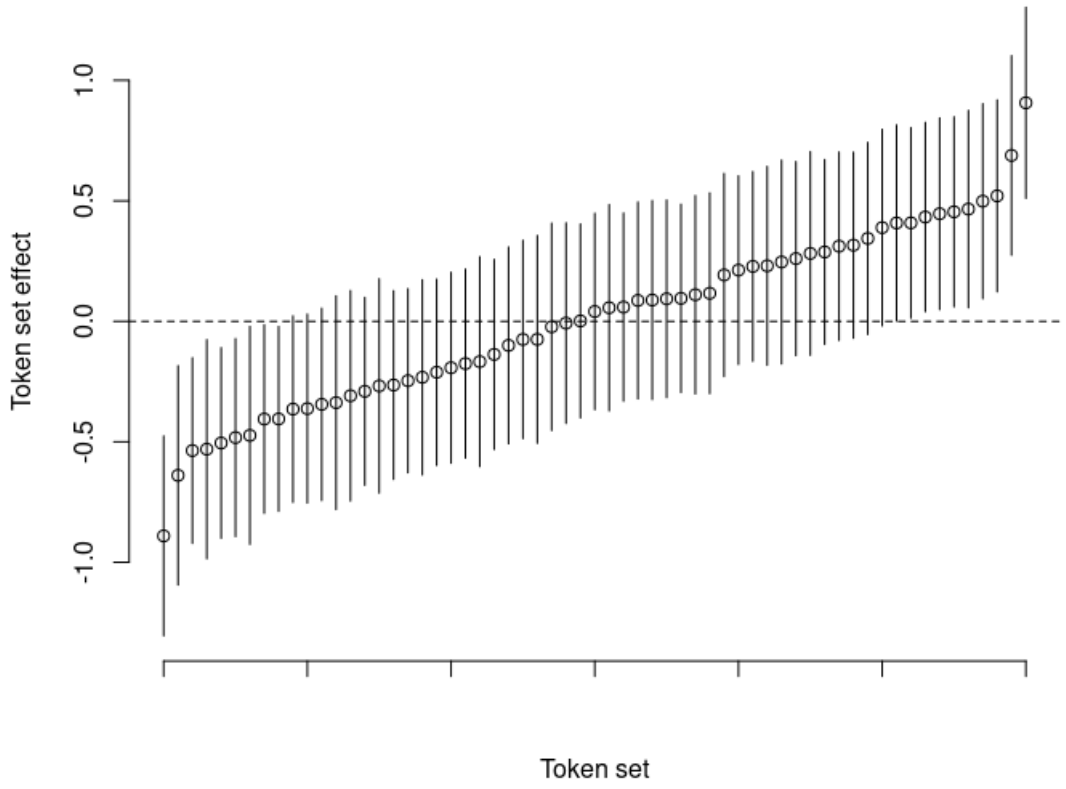

Figure 8: Estimated effects for token sets with 95% confidence intervals