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 is also possible, in which the surface conjuncts are coordinated directly. In the case of German, this 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, numerous examples of monoclausal HC constructions may be found in German corpora, while judgement experiments show a great variability of acceptance rates of monoclausal HC in German and demonstrate that the acceptability of such constructions depends on various 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 generalizations, we also include an appendix containing 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, acceptability judgement experiments, corpus linguistics, Minimalist Gradient Harmonic Grammar

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)) adduces (7), *inter alia*:[4]

(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 fever   got.over

   'Charlotte survived the vaccination well and without fever.'

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

(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.[5] However, cases of at least apparent heterofunctional coordination (HC)[6] are known since Browne 1972; see, e.g., the following examples from English and Serbo-Croatian (his (1E) and (4SC) on p. 223):[7]

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

(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

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[5]See, e.g., Dik 1968: 25, Huddleston and Pullum 2002: 1323, Peterson 2004: 650, Eisenberg 2020: 220, etc.

[6]This term is based on Grosu's (1987: 426) "heterofunctional coordinate constructions".

[7]In this paper, only examples from languages other than English and German are explicitly marked as such.

Serbo-Croatian (10) the nominative subject is coordinated with an instrumental dependent.[8]

Such constructions were investigated in a number of languages, including English (see §2) and the languages of Central and Eastern Europe (CEE) – Slavic languages (e.g., Browne 1972, Sannikov 1979, 1980, Kallas 1993, Kazenin 2001, Chaves and Paperno 2007, Gračanin-Yüksek 2007, Skrabalova 2007, Gribanova 2009, Gruet-Skrabalova 2011, Paperno 2012, Patejuk and Przepiórkowski 2012, Citko 2013, Citko and Gračanin-Yüksek 2013, 2016, Przepiórkowski and Patejuk 2014, Patejuk 2015, Przepiórkowski 2022a,c, Bošković 2022, 2023) as well as Hungarian (Lipták 2003, 2011, Gazdik 2011, Bîlbîie and Gazdik 2012) and Romanian (Comorovski 1996, Raţiu 2011, Bîlbîie and Gazdik 2012) – but also 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 elided) 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 underlying clause in (13) lacks the syntactically 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:[9]

(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 coordinated directly. Together with much of the literature, we will call analyses of HC in terms

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

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

of coordination of clauses, as in (11), "multiclausal",[10] 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 Dutch and German behave similarly to English in this respect (see §2), which leads to the generalization 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 §3, 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 experimental study described in §4 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 of subordinate clauses is more acceptable on average than in the Vorfeld of matrix clauses, 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 §5 as indicating that there are soft – violable – constraints against monoclausal HC in German and, in Appendix A, we sketch a proof-of-concept analysis that builds on Minimalist Gradient Harmonic Grammar (see Müller *et al.* 2022 and references therein).

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[10]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 – in English and presumably cross-linguistically – phrases bearing different grammatical functions or different semantic roles cannot normally be coordinated (see (15)), but they can in the case of *wh*-phrases (see (16)).[11]

(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 in English. 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

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[11]All English data in this section come from Grosu 1987, one of the most comprehensive – 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, (25) is more acceptable than (26).

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

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

Apparently, there must be some "common core" meaning – a "common integrator" (Lang 1984, 1991: 605–607) – implied by the two conjuncts in HC. In (25) this common core seems to be that John is writing a lot, while in (26) any common message conveyed by the two numeral phrases is not transparent.[12]

It is clear from the discussion in Grosu 1987 that HC is true coordination.[13] 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. 11) 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

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

[13]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. [superscript ??][[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.

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:

(31) [[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?'

(32) [superscript *][[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 (31) 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 (32), which involves two positions: adjunct and subject.[14] Note that this contrast is immediately handled by the multiclausal analysis:

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

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

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

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

(35) *[[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?'

(36) *[[Was] und [zum wievielten Mal]] errang Clark 1965?
     what.ACC and for how.many time 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:

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

(38) *[[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 (37) than (38) 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 (37)–(38) are a direct consequence of the judgements of the underlying structures (39)–(40).

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

(40) [*[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. In this way Germanic languages are assumed to be fundamentally different from CEE languages, where – as noted above – obligatory arguments may take part in HC (recall the contrast between (12) and (14) from Browne 1972).[15]

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[15]This and many other arguments for monoclausal analyses of HC in CEE languages may also 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

3. HC in German – Corpus Study

A qualitative corpus study was conducted, with the aim to check whether examples of HC involving syntactically obligatory arguments among conjuncts may be found in German texts. The following two corpora were queried for such HC constructions:

- DeReKo – Deutsches Referenzkorpus (Kupietz *et al.* 2018): a corpus of modern written German, containing 50.6 billion words;[16]

- deTenTen13 (Jakubíček *et al.* 2013): a corpus of texts collected from the Internet, containing 16.5 billion words.[17]

Given that the availability of HC constructions is sometimes linked to the availability of multiple *wh*-fronting, these corpora were also searched for examples such as (41).

(41) *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 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*-phrases (see (42)), negative quantifiers (see (43)), universal quantifiers (see (44)), focus *only* and *even* (see (45)–(46)), *any* (see (47)), superlatives (see (48)), *too* (see (49)), etc.

(42) [[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?'

(43) 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.'

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other hand, unlike Comorovski (1996), Raţiu (2011) and Bîlbîie and Gazdik (2012) analyse Romanian HC as multiclausal.

[16]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.

[17]Available via the SketchEnginge platform at `https://www.SketchEngine.eu/`. Appendix B also contains a few examples from deTenTen18, another corpus of Internet texts available via SketchEngine, containing 5.3 billion words.

(44) 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.’

(45) 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 anaesthet-
ist.’

(46) 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.’

(47) [[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.’

(48) “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.’

(49) 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 most of the above examples, conjuncts either clearly are or can be argued to be optional dependents of their respective heads. For example, (42) involves the direct object *was* 'what' and the adjunct *wo* 'where', both optional dependents of the verbal head *drehen* 'film, shoot'.[18] 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.:

(50) 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

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

(51) Übertaktet ist auch [[nichts] und [nie]] gewesen. (deTenTen13)
overlocked is also nothing.NOM and never been

'Also nothing has ever been overlocked.'

(52) 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.'[19]

(53) 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, and only in the format 20x30 to 30x40, with a maximum of three per participant.'

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[18]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).

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

In (50)–(53), 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 (50):

(54) 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 (50)–(53) 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 (55), i.e., overt versions of the hypothetical multiclausal structures underlying HC; compare the unacceptable (55) with the acceptable (56), in which the non-initial clausal conjuncts have the overt subject *er* 'he.NOM':

(55) 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

(56) 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 (51), involving overt subjects expressed by negative quantifiers, 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:[20]

(57) 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.'

(58) 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
     'Because no one will ever make what has been inflicted on us "good" again!'

(59) 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.'

(60) 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 B, which

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[20]In the case of *wh*-HC, as in (57), care must be taken to identify false positives involving sluicing, where the initial conjunct in the apparent HC is actually 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. 29.) The preceding context of (57) 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!'

also presents queries used to search German corpora for occurrences of HC.

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, (50) comes from *Saale-Zeitung*, and there are a dozen other relevant examples – listed in Appendix B – 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 experimental study reported in the next section demonstrate that such constructions are frequently *not* judged by native speakers as fully acceptable.

4.   HC in German – Experimental Study

On the basis of 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. In order to verify this prediction, we performed three acceptability judgement experiments, described in §§4.2–4.4. In each of these experiments, target items involved HC with three kinds of conjuncts that occurred most frequently in corpora: *wh*-phrases (e.g., *wer und wo* 'who and where'), universal quantifiers (e.g., *jeder und überall* 'everybody and everywhere'), and negative quantifiers (e.g., *niemand und nirgends* 'nobody and nowhere').

In one experiment (§4.4), we tested acceptability of some attested – spontaneously produced – sentences involving HC, with either 0 or 1 obligatory argument among the two conjuncts. The obligatory argument was always the subject, as subjects are known to be obligatory in German finite non-imperative sentences.

The other two experiments (§§4.2–4.3) involved artificially constructed sentences, following the usual token-set methodology (Cowart 1997). In both these experiments, target sentences had 0, 1, or 2 obligatory arguments among the two conjuncts; if there were 1 or 2 obligatory arguments, one was always the subject. As the reasoning about the monoclausal nature of HC crucially relies on the notion of "obligatory argument", we also performed a norming experiment, establishing which arguments are obligatory, and which are optional (§4.1).

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The two formal experiments described in §§4.2–4.3 differed in the position of HC: either in the *Vorfeld* 'prefield' of a simple matrix clause (§4.2), or in a subordinate clause (§4.3), where at least universal and negative quantifiers occupy the *Mittelfeld* 'middle field' position.[21] We will refer to these two experiments as "the Vorfeld experiment" and "the Mittelfeld experiment".

Respondents for all these experiments were recruited via the Clickworker platform.[22] They constituted opportunistic samples of native German speakers. Their native speaker status was established on the basis of their declaration of the fact, and it was partially verified by their acceptability judgements concerning uncontroversially grammatical and ungrammatical fillers. Respondents were compensated for their participation in the studies.[23] Respondents taking part in one experiment were excluded from further experiments.

In each experiment, respondents first read 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. 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 had to choose a number on the Likert scale from -2 (totally ill-formed) to 2 (totally well-formed) which best reflected their assessment. Respondents were presented sentences one by one and they could not return to sentences rated earlier. Time spent on each sentence was not technically limited, but participants were asked to rate each sentence quickly; filling a single questionnaire typically took around 15–20 minutes (cf. fn. 23).

While this section presents the basic design and cumulative results of all these experiments, it is accompanied by Appendix C, which explains the token-set methodology in more detail,

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[21]The position of *wh*-phrases in subordinate *Verbletzsätze* 'verb final clauses' is controversial in German linguistics. According to Altmann and Hofman 2004, such phrases may be analysed as occurring in the *Mittelfeld*, but two more popular positions are that they fill the so-called *linke Satzklammer* 'left sentence bracket' of the subordinate clause (see, e.g., https://grammis.ids-mannheim.de/terms/view/1248) and that they occupy the *Vorfeld* position of the subordinate clause (see Müller 2023: 48–49 for arguments). We do not attempt to resolve this issue here and – simplifying somewhat – we will collectively call the positions occupied by the three kinds of HC in subordinate clauses *the Mittelfeld position*. We are grateful to both anonymous reviewers for drawing our attention to this issue and to Stefan Müller for advice.

[22]https://www.clickworker.com/

[23]Respondents received 1.6 EUR in the case of experiments described in §§4.1–4.3, where filling a questionnaire took around 15 minutes, and 2.4 EUR in the case of the corpus experiment (see §4.4), which was more time consuming (around 20 minutes).

discusses the particulars of all statistical tests used in each of the experiments, describes the specific results for the three kinds of conjuncts, and additionally presents the results of fitting a mixed-effects ordinal model to the data collectively gathered in the three main experiments. Raw results of all experiments and by-item analyses are also available as spreadsheets accompanying this publication.

4.1 Norming Experiment

90 respondents completed the initial norming experiment, although 2 of them were excluded prior to the analysis due to failing an attention check.[24]

The aim of this experiment was to establish the obligatoriness status of arguments of particular verbs used in the next two experiments (Vorfeld and Mittelfeld; §§4.2–4.3). For example, one of the sentences used in the Vorfeld experiment was (61), involving two obligatory arguments (the subject and the direct object):

(61) Wer   und wen   hat   früher respektiert?

who.NOM and who.ACC AUX.3SG earlier respected

intended: 'Who used to respect whom?'

In order to establish that both arguments are really obligatory, respondents rated the hypothetical underlying clauses of sentences such as (61), i.e., they rated sentences such as (62)–(63).

(62) Wer   hat   früher respektiert?

who.NOM AUX.3SG earlier respected

intended: 'Who used to show respect?'

(63) Wen   hat   früher respektiert?

who.ACC AUX.3SG earlier respected

intended: 'Who was respected?'

In this particular case, sentence (62) was rated -1.43 on average (SD $= 0.85$, Mdn $= -2$), indicating that the direct object is obligatory for the acceptability of the sentence, while sentence (63) was rated -1.67 on average (SD $= 0.49$, Mdn $= -2$), indicating that – as expected – the subject is also obligatory.

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[24]Demographic information about participants was not collected during this experiment, but it will be provided for the three main experiments described in §§4.2–4.4.

On the basis of this experiment, 30 verbs were selected for the Vorfeld and Mittelfeld experiments whose arguments satisfied our pre-experimental assumptions about obligatoriness of particular arguments. See §C.2 in Appendix C for further details and `Norming_stage.csv` for raw results and by-item analyses.

4.2 Vorfeld Experiment

92 participants completed the first experiment of the main part of this study, although 17 of them were excluded prior to the analysis due to failing an attention check or wrong ratings of more than two filler items (whose grammaticality or ungrammaticality was not controversial).[25] The mean age of the remaining 75 participants – 32 women and 43 men – was 38.7 (SD = 12.5, Mdn = 35, min = 20, max = 71) and the mean education – calculated as years of formal education – was 15.7 (SD = 5.7, Mdn = 15, min = 3, max = 40).

In this experiment, we tested HC in the Vorfeld position of matrix clauses, as in (64)–(66).

(64)   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?'

(65)   Jeder   und überall   hat mit ihm   Spaß gehabt.

       everybody.NOM and everywhere AUX with him.DAT fun   had

       'Everyone had fun with him everywhere.'

(66)   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 conceptually split into two subexperiments, each following the 3 (kinds of conjuncts, as in (64)–(66)) $\times$ 2 (different numbers of obligatory arguments among conjuncts) within-subjects design. In this section, we ignore kinds of conjuncts and concentrate on the number of obligatory arguments; see §C.3 in Appendix C for analyses involving kinds of conjuncts, as well as `V_main_stage.csv` for raw results and by-item analyses.

In the first subexperiment, only those verbs (or light verb constructions) were used that had just one obligatory argument – the subject. This is the case in (64)–(66), were the subject

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[25]Wrong rating was operationalized as rating a grammatical filler below 0 or an ungrammatical filler above 0.

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 (64)–(66) – one of the conjuncts could be the obligatory subject; the number of obligatory arguments was coded accordingly, as 0 or 1. 18 verbs were used in this subexperiment, giving rise to $3 \times 2 \times 18 = 108$ target sentences.

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 number of obligatory arguments was coded accordingly, as 1 or 2. 12 verbs were used in this experiment, giving rise to $3 \times 2 \times 12 = 72$ target sentences.[26]

Given this experimental design, there were $108 + 72 = 180$ target sentences in the whole Vorfeld experiment. These sentences were split into 6 different questionnaires, each given to about 15 participants. Apart from the different sets of 30 target sentences, these questionnaires also contained the same 36 fillers, so each participant had to rate 66 sentences. Each questionnaire started with two training fillers and target sentences were interspersed with fillers so that there were at most two consecutive fillers or two consecutive target sentences. The order of target sentences was randomized for each participant.

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

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[26]One reason for this split into subexperiments was the objective to make target sentences as simple as possible. In the more straightforward 3 (kinds of conjuncts) × 3 (numbers of obligatory arguments) design, all sentences would have to involve verbs with (at least) two obligatory arguments. In order to rate constructions with two *optional* dependents among conjuncts, sentences would have to have at least four dependents: the two optional ones realized as conjuncts and the two obligatory ones that would have to be included, as otherwise the sentence would be ungrammatical for reasons independent of the makeup of the coordinate structure. Moreover, in order to ensure similar complexity of all target items, all of them would have to contain (at least) four dependents. By contrast, splitting the experiment into two subexperiments made it possible to simplify target items considerably: to sentences with (at least) two dependents in the first subexperiment and with (at least) three in the second.

The other reason was practical: it is difficult to find verbs with uncontroversially obligatory non-subject arguments. As described in §C.3 in Appendix C, out of 24 candidates predetermined – mostly on the basis of the near-native intuitions of one of the authors and on the basis of German valency dictionaries – as involving such obligatory arguments, only 12 were consistently judged in the norming experiment (§4.1) as requiring obligatory non-subject arguments.

arguments and those with 1 obligatory argument, the average score for those with 1 obligatory argument is -1.03, more readily interpretable as "ungrammatical" than as "grammatical".[27] Similarly, according to the second subexperiment, juxtaposing sentences with 1 and 2 obligatory arguments among conjuncts, average scores of these groups are -1.28 and -1.54 – see Table 1(b).[28] Again, these numbers suggest the "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).

	items	M	SD	Mdn			items	M	SD	Mdn
(a)	GF	1.78	0.24	1.89		(b)	GF	1.78	0.24	1.89
	0	1.15	0.60	1.22			1	-1.28	0.71	-1.50
	1	-1.03	0.78	-1.11			2	-1.54	0.47	-1.67
	UF	-1.83	0.24	-1.89			UF	-1.83	0.24	-1.89

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

These worse-than-expected results probably reflect the fact that, in this experiment, all target sentences contained HC in the Vorfeld position of matrix clauses. This should be contrasted with the fact that a great majority of corpus examples, cited in the previous section and in Appendix B, involve HC in the Mittelfeld, often in subordinate clauses (but cf. fn. 21). At this stage we hypothesized that HC would be more acceptable in subordinate clauses and performed experiments that demonstrate this.

4.3 Mittelfeld Experiment

89 participants completed the second experiment of the main part of this study, although 9 of them were excluded prior to the analysis due to failing attention checks and/or wrong ratings of some filler items. The mean age of the remaining 80 participants – 32 women and 48 men –

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

[28]Recall that the Vorfeld experiment was split into the two subexperiments only conceptually, which means that both subexperiments were part of the same questionnaires, with a single collection of grammatical and ungrammatical fillers. This explains the identical numbers in the GF and UF rows in the two tables.

was 39.2 (SD = 12.9, Mdn = 35, min = 22, max = 74) and the mean length of education was 15.8 (SD = 4.9, Mdn = 16, min = 1, max = 29).

The Mittelfeld experiment had the same design as the Vorfeld experiment described in the previous section; the main difference between these experiments is that the target constructions in the Mittelfeld experiment were contained in subordinate clauses, as in (67)–(69).[29]

(67)   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.'

(68)   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.'

(69)   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.'

In particular, this experiment was also conceptually split into two subexperiments, each following the 3 (kinds of conjuncts, as in (67)–(69)) × 2 (different numbers of obligatory arguments among conjuncts: 0 vs. 1 or 1 vs. 2) design, and it was also based on 180 target sentences split into 6 questionnaires and interspersed with 36 fillers. As above, we ignore kinds of conjuncts here and concentrate on the number of obligatory arguments; see §C.4 in Appendix C for analyses involving kinds of conjuncts, as well as `M_main_stage.csv` for raw results and by-item analyses.

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

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[29]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. 20). 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*. 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. (67)) 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.

in Table 2. 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.[30]

(a)

items	M	SD	Mdn
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	Mdn
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 the Mittelfeld with 0 vs. 1 obligatory arguments (a) and 1 vs. 2 obligatory arguments (b)

4.4 Corpus Experiment

30 participants completed the third experiment of the main part of this study, with only 1 excluded from the analysis due to an incorrect answer to an attention check. The mean age of the remaining 29 participants – 14 women and 15 men – was 39.0 (SD = 10.2, Mdn = 38, min = 18, max = 61) and the mean length of education was 15.5 (SD = 6.9, Mdn = 16, min = 1, max = 35).

The motivation for this experiment was the observation that constructed sentences used in formal experiments such as those described above may sound artificial and tend to be rated lower than attested sentences.[31] Consequently, for this experiment, we selected 72 sentences from corpora: 4 for each combination of 2 positions (matrix clause Vorfeld vs. subordinate clause Mittelfeld), 3 kinds of conjuncts (*wh* vs. universal vs. negative), and 3 types of oblig-atoriness (0 vs. 1 obligatory argument: either as the first or as the second conjunct). Results

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

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

analogous to those in Tables 1 and 2 are presented in Table 3.[32] What is notable about these results is that the mean score of HC with an obligatory conjunct is approximately 0.[33]

items	M	SD	Mdn
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 arguments

Acceptability ratings of corpus examples confirm the greater acceptability of HC in the Mittelfeld than in the Vorfeld; see Figure 1.[34] In the case of HC examples with an obligatory conjunct, the mean score in the Vorfeld is -0.44 (SD $= 0.77$, Mdn $= -0.50$), but it is positive in the Mittelfeld: 0.34 (SD $= 0.74$, Mdn $= 0.21$); the difference is statistically highly significant ($p < 0.001$).

An interesting effect observed in all the experiments and discussed in detail in Appendix C 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 significantly higher than coordination of universal quantifiers (as in *jeder und immer* 'everybody and always'), which in turn is rated significantly 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. This figure compresses three barplots, each comparable to that in Figure 1 but taking 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 $= 0.86$, Mdn $= 0.63$), HC with universal quantifiers (the second barplot) scores 0.27 (SD $= 0.71$, Mdn $= 0.25$), and HC with negative quantifiers (the third barplot) scores 0.15 on average (SD $= 0.84$, Mdn $= 0.13$).

The final observation is that there is a great variability in the acceptance of HC construc-

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

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

[34]In this and subsequent figures, error bars indicate 95% confidence intervals.
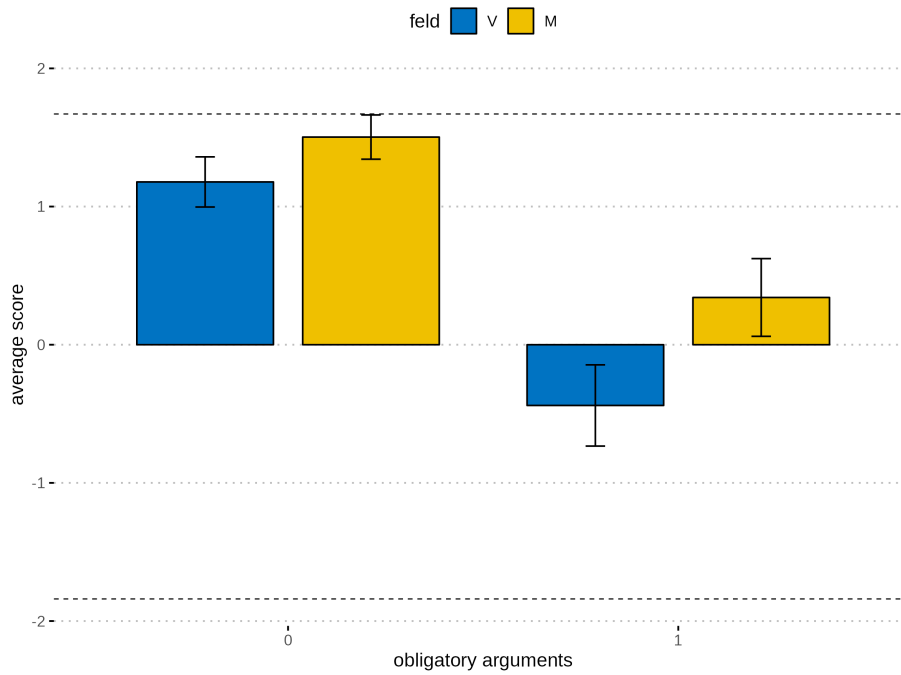
Figure 1: Mean acceptability scores of HC in corpus examples with 0 vs. 1 obligatory arguments in the Vorfeld and in the Mittelfeld; dashed lines are mean scores for grammatical and ungrammatical fillers
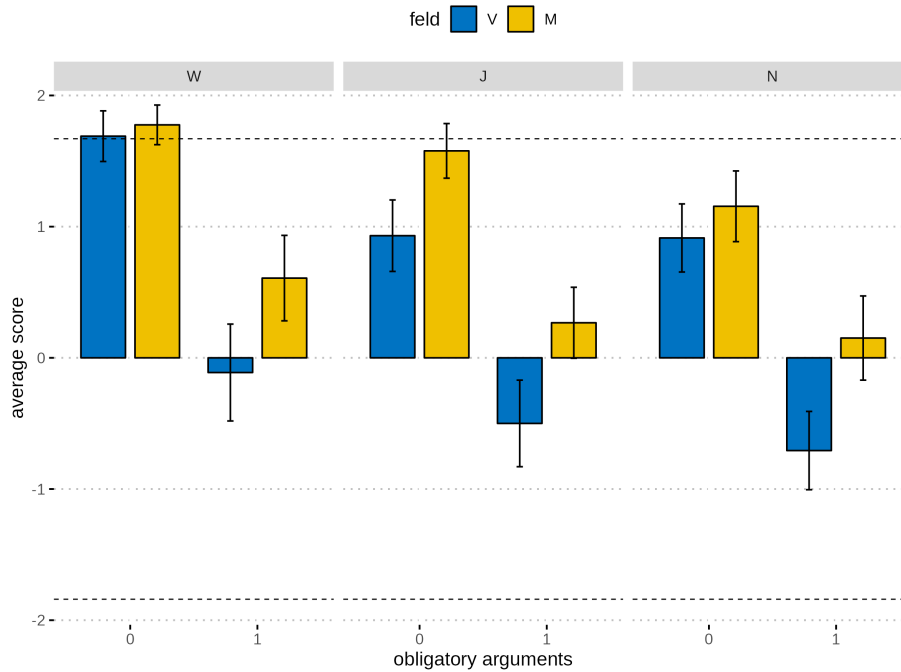

Figure 2: Mean acceptability scores of HC in corpus examples with 0 vs. 1 obligatory arguments in the Vorfeld and in the Mittelfeld, split by the kind of conjuncts (W: *wh*, J: universal, N: negative); dashed lines are mean scores for grammatical and ungrammatical fillers

tions. 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, and for 14 the scores are confidently negative;[35] overall, 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.[36]

See §C.6 in Appendix C for additional analyses, as well as `C_main_stage.csv` for raw results and by-item analyses.

5. 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 of attested HC examples with obligatory arguments makes it impossible to categorically claim that German does not allow for monoclausal HC.[37]

However, the experimental 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 36 in Appendix C); 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 of subordinate clauses than in the

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

[36]This significant random effect of participants is confirmed by the mixed-effects ordinal model described in §C.7 in Appendix C.

[37]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 type." (Francis 2022: 149).
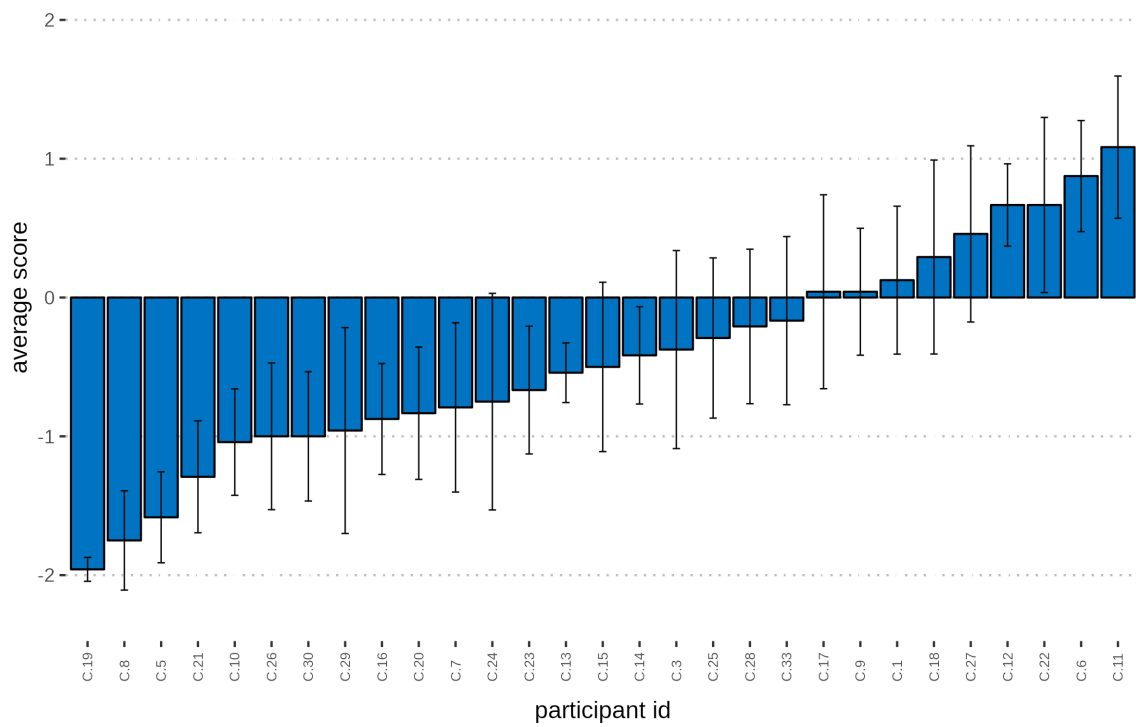
Figure 3: Mean acceptability scores of corpus examples of HC in the Vorfeld with 1 obligatory dependent (by participant)
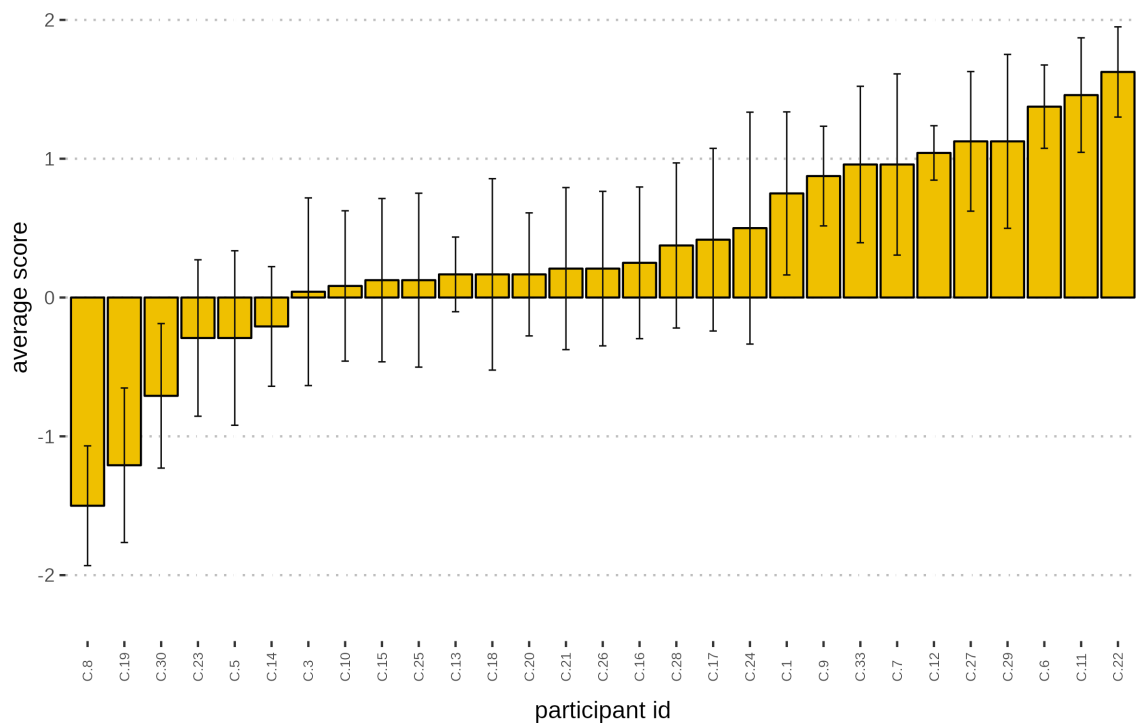

Figure 4: Mean acceptability scores of corpus examples of HC in the Mittelfeld with 1 obligatory dependent (by participant)

Vorfeld of matrix clauses, 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.

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 taken 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 each of the two formal experiments described in §§4.2–4.3, 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 (70) (with the obligatory subject among conjuncts) and (71) (with no obligatory arguments).

(70) 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?'

(71) Wann und mit wem   hat sie   Verstecken   gespielt?
      when and with who.DAT AUX she.NOM hide.and.seek played
      'When and 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 (71) over (70). There are also no reasons to assume that the processing of subjects in the Vorfeld position (e.g., *wer* in (70)) is harder than the processing of other dependents (e.g., *mit wem* in (71)); both occur in the Vorfeld frequently. And also the order of conjuncts (*wer und wann* in (70) vs. *wann und mit wem* in (71)) is unlikely to be a processing factor. While sentences in the Mittelfeld experiment were longer, as in (72)–(73), all relevant dependencies were similarly local, within the subordinate clause.

(72) 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.'

(73) 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 different number of obligatory arguments.[38]

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 (70) with (72) or (71) with (73)). As noted above, given that target sentences in the Mittelfeld experiment were a few words longer than those in the Vorfeld experiment (compare (70)–(71) with (72)–(73) again), the opposite processing effect would rather be expected.

In summary, we see no processing explanation for the difference in acceptability between HC with 0, 1, and 2 obligatory arguments, or for the differences between the Mittelfeld of subordinate clauses and the Vorfeld of matrix clauses. Hence, until a convincing argument is made that these effects are a matter of performance rather than competence, they should be modelled in grammar – a kind of grammar that allows for degrees of grammaticality. A proof-of-concept analysis of German HC couched in such a grammar is offered in Appendix A.

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[38]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'.

6. 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 experimental 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 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.

References

Agmon, G., Loewenstein, Y., and Grodzinsky, Y. (2019). Measuring the cognitive cost of downward monotonicity by controlling for negative polarity. *Glossa: A Journal of General Linguistics*, **4**(36), 1–18.

Altmann, H. and Hofman, U. (2004). *Topologie fürs Examen: Verbstellung, Klammerstruktur, Stellungsfelder, Satzglied- und Wortstellung*. VS Verlag für Sozialwissenschaften, Wiesbaden.

Bayer, S. (1996). The coordination of unlike categories. *Language*, **72**(3), 579–616.

Bloomfield, L. (1933). *Language*. Holt, New York.

Boersma, P. and Hayes, B. (2001). Empirical tests of the gradual learning algorithm. *Linguistic Inquiry*, **32**(1), 45–86.

Bošković, Ž. (2022). Wh&wh coordinations. Unpublished manuscript, University of Connecticut, `https://ling.auf.net/lingbuzz/006842`.

Bošković, Ž. (2023). Multiple wh-fronting in a typological setting: What is behind multiple wh-fronting? Unpublished manuscript, University of Connecticut, `https://ling.auf.net/lingbuzz/007218`.

Bresnan, J., Dingare, S., and Manning, C. (2001). Soft constraints mirror hard constraints: Voice and person in English and Lummi. In M. Butt and T. H. King, editors, *The Proceedings of the LFG'01 Conference*, pages 13–32, University of Hong Kong. CSLI Publications.

Browne, III, E. W. (1972). Conjoined question words and a limitation of English surface structures. *Linguistic Inquiry*, **3**(2), 223–226.

Bruening, B. and Al Khalaf, E. (2020). Category mismatches in coordination revisited. *Linguistic Inquiry*, **51**(1), 1–36.

Bîlbîie, G. and Gazdik, A. (2012). Wh-coordination in Hungarian and Romanian multiple questions. *Empirical Issues in Syntax and Semantics*, **9**, 19–36.

Chaves, R. P. and Paperno, D. (2007). On the Russian hybrid coordination construction. In S. Müller, editor, *Proceedings of the HPSG 2007 Conference*, pages 46–64, Stanford, CA. CSLI Publications.

Chomsky, N. (1957). *Syntactic Structures*. Mouton, The Hague.

Chomsky, N. (1965). *Aspects of the Theory of Syntax*. MIT Press, Cambridge, MA.

Chomsky, N. (2021). Minimalism: Where are we now, and where can we hope to go. *Gengo Kenkyu*, **160**, 1–41.

Christensen, R. H. B. (2011). Regression models for ordinal data: Introducing R-package `ordinal`. In *Proceedings of the R User Conference, University of Warwick, Coventry, UK*, pages 16–18.

Christensen, R. H. B. (2022). A tutorial on fitting cumulative link mixed models with `clmm2` from the `ordinal` package. `https://cran.r-project.org/web/packages/ordinal/vignettes/clmm2_tutorial.pdf`.

Citko, B. (2005). On the nature of merge: External merge, internal merge, and parallel merge. *Linguistic Inquiry*, **36**(4), 475–496.

Citko, B. (2013). The puzzles of *wh*-questions with coordinated *wh*-pronouns. In T. Biberauer and I. Roberts, editors, *Challenges to Linearization*, pages 295–329. De Gruyter Mouton, Berlin/Boston.

Citko, B. and Gračanin-Yüksek, M. (2013). Towards a new typology of coordinated *wh*-questions. *Journal of Linguistics*, **49**(1), 1–32.

Citko, B. and Gračanin-Yüksek, M. (2016). Multiple (coordinated) (free) relatives. *Natural Language and Linguistic Theory*, **34**, 393–427.

Citko, B. and Gračanin-Yüksek, M. (2023). Coordinated wh-questions: A response to Bošković (2022). Abstract for FASL 32, `https://fasl32.sitehost.iu.edu/FASLabstracts/Citko-Gra%C4%8Danin-Y%C3%BCksek.PDF`.

Clark, B. Z. (2004). *A Stochastic Optimality Theory Approach to Syntactic Change*. Ph.D. dissertation, Stanford University.

Comorovski, I. (1996). *Interrogative Phrases and the Syntax-Semantics Interface*. Kluwer Academic Publishers, Dordrecht.

Cowart, W. (1997). *Experimental Syntax: Applying Objective Methods to Sentence Judgments*. Sage Publications, Thousand Oaks, CA.

Dalrymple, M. (2017). Unlike phrase structure category coordination. In V. Rosén and K. De Smedt, editors, *The Very Model of a Modern Linguist*, volume 8 of *Bergen Language and Linguistics Studies*, pages 33–55. University of Bergen Library, Bergen.

Dayal, V. (2016). *Questions*. Oxford University Press, Oxford.

Deschamps, I., Agmon, G., Loewenstein, Y., and Grodzinsky, Y. (2015). The processing of polar quantifiers, and numerosity perception. *Cognition*, **143**, 115–128.

Dik, S. C. (1968). *Coordination: Its Implications for a Theory of General Linguistics*. North-Holland, Amsterdam.

Eisenberg, P. (2006). *Grundriss der deutschen Grammatik. Band 2: Der Satz*. J.B.Metzler, Stuttgart, 3rd edition.

Eisenberg, P. (2020). *Grundriss der deutschen Grammatik: Der Satz*. J.B.Metzler, Berlin, 5th edition.

Engel, U. and Schumacher, H. (1978). *Kleines Valenzlexikon deutscher Verben*. Gunter Narr Verlag, Tübingen.

Featherston, S. (2005). The Decathlon model of empirical syntax. In S. Kepser and M. Reis, editors, *Linguistic Evidence: Empirical, Theoretical and Computational Perspectives*, pages 187–208. Mouton de Gruyter, Berlin/New York.

Featherston, S. (2019). The Decathlon model. In A. Kertész, E. Moravcsik, and C. Rákosi, editors, *Current Approaches to Syntax: A Comparative Handbook*, pages 155–186. De Gruyter Mouton, Berlin/Boston.

Francis, E. J. (2022). *Gradient Acceptability and Linguistic Theory*. Oxford University Press, Oxford.

Gazdik, A. (2011). *Multiple Questions in French and Hungarian: A Lexical-Functional Analysis with Special Emphasis on the Syntax-Discourse Interface*. Ph.D. dissertation, Université Paris 7.

Geurts, B. and Van Der Slik, F. (2005). Monotonicity and processing load. *Journal of Semantics*, **22**(1), 97–117.

Gibson, E., Piantadosi, S., and Fedorenko, K. (2011). Using Mechanical Turk to obtain and analyze English acceptability judgments. *Language and Linguistics Compass*, **5**(8), 509–524.

Gleitman, L. R. (1965). Coordinating conjunctions in English. *Language*, **41**(2), 260–293.

Gračanin-Yüksek, M. (2007). *About Sharing*. Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge, MA.

Greenhouse, S. and Geisser, S. (1959). On methods in the analysis of profile data. *Psychomet-

rika, **24**, 95–112.

Gribanova, V. (2009). Structural adjecency and the typology of interrogative interpretations. *Linguistic Inquiry*, **40**(1), 133–154.

Grimshaw, J. (1978). On the syntax of conjoined wh words in English questions. *University of Massachusetts Occasional Papers in Linguistics*, **3**(2), 1–10.

Grosu, A. (1985). Subcategorization and parallelism. *Theoretical Linguistics*, **12**(2–3), 231–240.

Grosu, A. (1987). On acceptable violations of parallelism constraints. In R. Dirven and V. Fried, editors, *Functionalism in Linguistics*, pages 425–457. John Benjamins, Amsterdam/Philadelphia.

Gruet-Skrabalova, H. (2011). Czech questions with two wh-words. In P. Kosta and L. Schürcks, editors, *Formalization of Grammar of Slavic Languages: Contributions of the Eighth International Conference on Formal Description of Slavic Languages – FDSL VIII 2009 University of Potsdam, December 2–5, 2009*, pages 179–192, Frankfurt am Main. Pter Lank.

Haida, A. and Repp, S. (2011). Monoclausal question word coordinations across languages. In S. Lima, K. Mullin, and B. Smith, editors, *NELS 39: Proceedings of the 39th Annual Meeting of the North East Linguistic Society*, pages 352–372.

Haider, H. (1982). Dependenzen und Konfigurationen: Zur deutschen V-Projektion. *Groninger Arbeiten zur Germanistischen Linguistik*, **21**, 1–60.

Hartung, N. (2012). Und-*Koordination in der frühen Kindersprache: Eine korpusbasierte Untersuchung*. Ph.D. dissertation, Universität Tübingen.

Helbig, G. and Schenkel, W. (1983). *Wörterbuch zur Valenz und Distribution deutscher Verben*. Max Niemeyer Verlag, Tübingen, 7th edition.

Huddleston, R. and Pullum, G. K. (2002). *The Cambridge Grammar of the English Language*. Cambridge University Press, Cambridge.

Huynh, H. and Feldt, L. S. (1976). Estimation of the Box correction for degrees of freedom from sample data in randomised block and split-plot designs. *Journal of Educational Statistics*, **1**, 69–82.

Häussler, J. and Juzek, T. S. (2021). Variation in participants and stimuli in acceptability experiments. In G. Goodall, editor, *The Cambridge Handbook of Experimental Syntax*, pages

97–117. Cambridge University Press, Cambridge.

Ishii, T. (2014). On coordinated multiple wh-questions. In S. Kawahara and M. Igarashi, editors, *Formal Approaches to Japanese Linguistics 7 (MIT Working Papers in Linguistics 73)*, pages 89–100. MITWPL, Cambridge, MA.

Jakubíček, M., Kilgarriff, A., Kovář, V., Rychlý, P., and Suchomel, V. (2013). The TenTen corpus family. In *7th International Corpus Linguistics Conference CL*, pages 125–127.

Kallas, K. (1993). *Składnia współczesnych polskich konstrukcji współrzędnych*. Wydawnictwo Uniwersytetu Mikołaja Kopernika, Toruń.

Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy*, **1**, 3–44.

Kasai, H. (2016). Coordinated *Wh*-questions in Japanese. *Lingua*, **183**, 126–148.

Kazenin, K. I. (2001). On coordination of wh-phrases in Russian. Unpublished manuscript, University of Tübingen and Moscow State University, `https://www.lingexp.uni-tuebingen.de/sfb441/b2/papers/whcord.pdf`.

Keller, F. (2000). *Gradience in Grammar: Experimental and Computational Aspects of Degrees of Grammaticality*. Ph.D. thesis, University of Edinburgh.

Kim, N., Rawlins, K., and Smolensky, P. (2019). The complement-adjunct distinction as gradient blends: The case of English prepositional phrases. Unpublished manuscript, `https://ling.auf.net/lingbuzz/004723`.

Kupietz, M., Lüngen, H., Kamocki, P., and Witt, A. (2018). The German reference corpus DeReKo: New developments – new opportunities. In N. Calzolari, K. Choukri, C. Cieri, T. Declerck, S. Goggi, K. Hasida, H. Isahara, B. Maegaard, J. Mariani, H. Mazo, A. Moreno, J. Odijk, S. Piperidis, and T. Tokunaga, editors, *Proceedings of the Eleventh International Conference on Language Resources and Evaluation (LREC 2018)*, pages 4353–4360, Paris, France. European Language Resources Association (ELRA).

Lang, E. (1984). *The Semantics of Coordination*. John Benjamins, Amsterdam.

Lang, E. (1991). Koordinierende Konjunktionen. In A. von Stechow and D. Wunderlich, editors, *Semantik. Ein Internationales Handbuch der Zeitgenösischen Forschung*, pages 597–623. Mouton de Gruyter, Berlin.

Legendre, G., Miyata, Y., and Smolensky, P. (1990). Harmonic grammar – a formal multi-level connectionist theory of linguistic well-formedness: An application. ICS Technical Report

#90-4, University of Colorado, Boulder.

Levine, R. D. (2011). Linearization and its discontents. In S. Müller, editor, *Proceedings of the HPSG 2011 Conference*, pages 126–146, Stanford, CA. CSLI Publications.

Lipták, A. (2003). Conjoined questions in Hungarian. In C. Boeckx and K. K. Grohmann, editors, *Multiple* wh-*Fronting*, pages 141–160. John Benjamins, Amsterdam.

Lipták, A. (2011). Strategies of wh-coordination. *Linguistic Variation*, **11**(2), 149–188.

Merchant, J. (2017). Spurious coordination in Vlach multiple wh-fronting. In N. LaCara, K. Moulton, and A.-M. Tessier, editors, *A Schrift to Fest Kyle Johnson*, pages 271–280. University of Massachusets – Amherst.

Miller, M. (1976). *Zur Logik der frühkindlichen Sprachentwicklung: Empirische Untersuchungen und Theoriediskussion (Konzepte der Humanwissenschaften)*. Klett, Stuttgart.

Munn, A. (2000). Three types of coordination asymmetries. In K. Schwabe and N. Zhang, editors, *Ellipsis in Conjunction*, pages 1–22. Max Niemeyer Verlag, Tübingen.

Müller, G., Englisch, J., and Opitz, A. (2022). Extraction from NP, frequency, and minimalist gradient harmonic grammar. *Linguistics*, **60**(5), 1619–1662.

Müller, S. (2003). Mehrfache Vorfeldbesetzung. *Deutsche Sprache*, **31**(1), 29–62.

Müller, S. (2023). *Grammatical Theory: From Transformational Grammar to Constraint-Based Approaches*. Language Science Press, Berlin, 5th edition.

Nunes, J. (2001). Sideward movement. *Linguistic Inquiry*, **32**(2), 303–344.

Paperno, D. (2012). *Semantics and Syntax of Non-Standard Coordination*. Ph.D. dissertation, University of California, Los Angeles.

Patejuk, A. (2015). *Unlike Coordination in Polish: An LFG Account*. Ph.D. dissertation, Institute of Polish Language, Polish Academy of Sciences, Cracow.

Patejuk, A. and Przepiórkowski, A. (2012). Lexico-semantic coordination in Polish. In M. Butt and T. H. King, editors, *The Proceedings of the LFG'12 Conference*, pages 461–478, Stanford, CA. CSLI Publications.

Patejuk, A. and Przepiórkowski, A. (2023). Category mismatches in coordination vindicated. *Linguistic Inquiry*, **54**(2), 326–349.

Peterson, P. G. (2004). Coordination: Consequences of a lexical-functional account. *Natural Language and Linguistic Theory*, **22**(4), 643–679.

Przepiórkowski, A. (2016). How *not* to distinguish arguments from adjuncts in LFG. In D. Arnold, M. Butt, B. Crysmann, T. H. King, and S. Müller, editors, *The Proceedings of the Joint 2016 Conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, pages 560–580, Stanford, CA. CSLI Publications.

Przepiórkowski, A. (2022a). A compositional intersective account of heterofunctional coordination. In J. R. Starr, J. Kim, and B. Öney, editors, *Proceedings of Semantics and Linguistic Theory 32*, pages 270–293.

Przepiórkowski, A. (2022b). Coordination of unlike grammatical cases (and unlike categories). *Language*, **98**(3), 592–634.

Przepiórkowski, A. (2022c). Polyadic cover quantification in heterofunctional coordination. In D. Gutzmann and S. Repp, editors, *Proceedings of Sinn und Bedeutung 26*, pages 677–696.

Przepiórkowski, A. and Patejuk, A. (2014). Koordynacja leksykalno-semantyczna w systemie współczesnej polszczyzny (na materiale Narodowego Korpusu Języka Polskiego). *Język Polski*, **XCIV**(2), 104–115.

Raţiu, D. (2011). A multidominance account for conjoined questions in Romanian. In J. Herschensohn, editor, *Romance Linguistics 2010: Selected Papers from the 40th Linguistic Symposium on Romance Languages (LSRL), Seattle, Washington, March 2010*, pages 257–269. John Benjamins, Amsterdam.

Reich, I. (2013). Asymmetrische Koordination. In J. Meibauer, M. Steinbach, and H. Altmann, editors, *Satztypen des Deutschen*, pages 356–371. De Gruyter, Berlin/Boston.

Roland, D. and Jurafsky, D. (2002). Verb sense and verb subcategorization probabilities. In P. Merlo and S. Stevenson, editors, *Sentence Processing and the Lexicon: Formal, Computational, and Experimental Perspectives*, pages 325–346. John Benjamins, Amsterdam.

Rudin, C. (1988). On multiple questions and multiple wh-fronting. *Natural Language and Linguistic Theory*, **6**, 445–501.

Sag, I. A., Gazdar, G., Wasow, T., and Weisler, S. (1985). Coordination and how to distinguish categories. *Natural Language and Linguistic Theory*, **3**(2), 117–171.

Sannikov, V. Z. (1979). Sočinitel'nye i sravnitel'nye konstrukcii: ix blizost', ix sintaksičeskoe predstavlenie I. *Wiener Slawistischer Almanach*, **4**, 413–432.

Sannikov, V. Z. (1980). Sočinitel'nye i sravnitel'nye konstrukcii: ix blizost', ix sintaksičeskoe

predstavlenie II. *Wiener Slawistischer Almanach*, **5**, 211–242.

Schachter, P. (1977). Constraints on coördination. *Language*, **53**(1), 86–103.

Schumacher, H., editor (1986). *Verben in Feldern: Valenzwörterbuch zur Syntax und Semantik deutscher Verben*. De Gruyter, Berlin.

Sinopoulou, O. (2011). *Wh & Wh*-questions in Greek: Monoclausal or biclausal? *Linguistic Analysis*, **37**(1–2), 189–229.

Sinopoulou, O. (2020). *Wh*-questions with conjunction in Greek: Ellipsis as an epiphenomenon of multidominance. *Acta Linguistica Hafniensia*, **52**(2), 180–200.

Skrabalova, H. (2007). Wh-questions with conjoined wh-words. In M. Dočekal, P. Karlik, and J. Zmrzlíková, editors, *Czech in Generative Grammar*, pages 161–174. Lincom, Munich.

Smolensky, P. and Goldrick, M. (2016). Gradient symbolic representations in grammar: The case of French liaison. Rutgers Optimality Archive (ROA) 1286.

Szymanik, J. (2016). *Quantifiers and Cognition: Logical and Computational Perspectives*. Springer International Publishing.

Tesnière, L. (1959). *Éléments de Syntaxe Structurale*. Klincksieck, Paris.

Tesnière, L. (2015). *Elements of Structural Syntax*. John Benjamins, Amsterdam.

Whitman, N. (2004). Semantics and pragmatics of English verbal dependent coordination. *Language*, **80**(3), 403–434.

Whitman, P. N. (2002). *Category Neutrality: A Type-Logical Investigation*. Ph.D. dissertation, Ohio State University, Columbus, OH.

Williams, E. (1981). Transformationless grammar. *Linguistic Inquiry*, **12**(4), 645–653.

Zhang, N. N. (2007). The syntactic derivations of two paired dependency constructions. *Lingua*, **117**(12), 2134–2158.

Appendix A: Proof of Concept Analysis

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

A.1 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 offered below.[39]

On this account, both Germanic and CEE languages have at their disposal the multiclausal structure in (74), involving multidominance (nodes with multiple mothers), while CEE languages (at least Slavic and Hungarian) also have the monoclausal structure in (75).

(74)

(75)
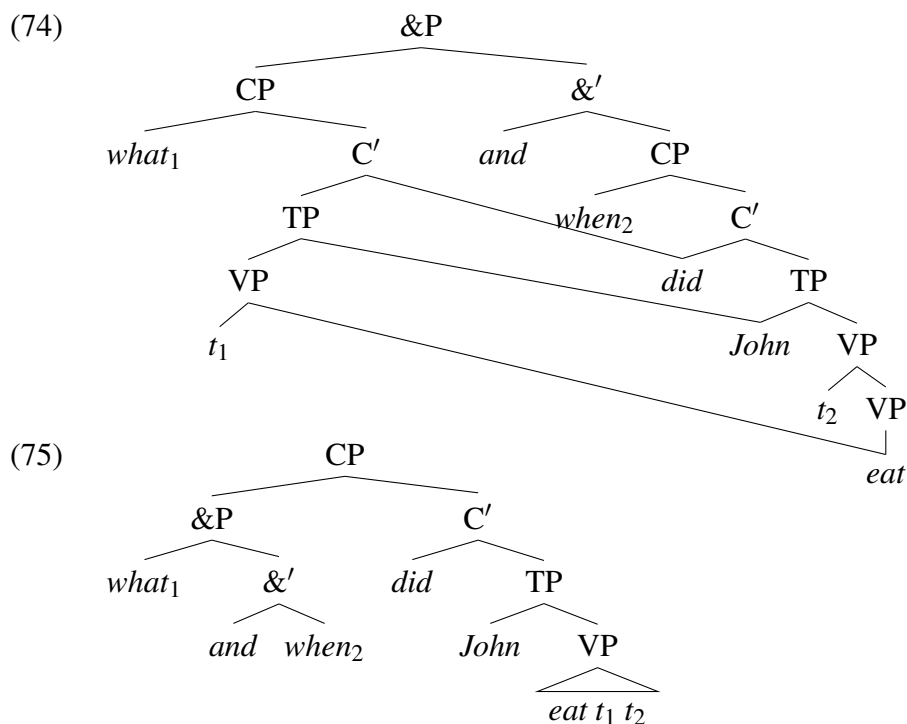
Citko 2005 and Gračanin-Yüksek 2007 argue that the operation – which they call Parallel Merge and Sharing, respectively – leading to the construction of multidominant structures such

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[39]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 this appendix 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).

as (74) 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 (75), which – following Zhang 2007 – is often assumed to involve sideward movement (Nunes 2001) of the *wh*-phrases. The proof-of-concept analysis sketched below 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 (76) with the structure in (78) is somehow conditioned on the acceptability of (77) with the structure in (79).[40]

(76)   Kto   i   co   jadł?   (Polish)
       who.NOM and what.ACC ate

       'Who ate and what did they eat?' (lit. 'Who and what ate?')

(77)   Kto   co   jadł?   (Polish)
       who.NOM what.ACC ate

       'Who ate what?'

(78)   . . .

        &P   TP

   kto_1 &' t_1 *jadł* t_2
   'who$_1$'   't_1 ate t_2'
            i co_2
           'and'   'what$_2$'

(79)   . . .

   kto_1 . . .
   'who$_1$'
                    co_2 TP
                   'what$_2$'
                              t_1 *jadł* t_2
                              't_1 ate t_2'
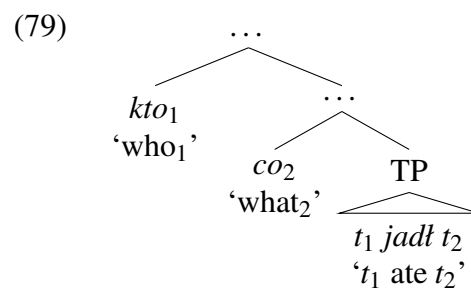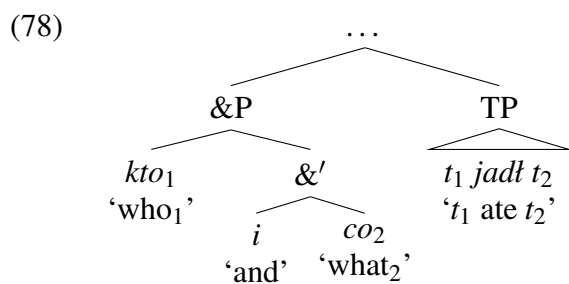
This claim is fully explicated in Haida and Repp 2011, where it is argued that a structure like (79) is a necessary stage in the derivation of a monoclausal HC structure such as (78).

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 (80)

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[40]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 (78)–(79).

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., (133), (145), (155), (159), (160), (164), (175) (the relevant part of which is presented as (81) below), (221), (224), (243), (249), (263), (267) in Appendix B, all containing the obligatory subject.[41]

(80) *Wer   wo   wird gewählt?

      who.NOM where AUX elected

      intended: 'Who is elected where?'

(81) 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 *wh*-phrases.[42] 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.

A.2 *Analytical Preliminaries*

The main building blocks of the analysis sketched below are:

- Zhang's (2007) analysis of HC via sideward movement, as in (75),

- 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,[43]

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[41] 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.

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

[43] 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.

- 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.

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)):

(82)   [$_{PP}$ 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?')

(83)   *[$_{PP}$ 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 (82)) allow for such an extraction, but others (e.g., *Buch stehlen* in (83)) 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 (82); normalized $\Delta P_{lesen|Buch} = 0.6272$), but not when it is below this threshold (as in (83); normalized $\Delta P_{stehlen|Buch} = 0.1253$).

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

(84)   MERGE CONDITION (MC):

       For all features [•F•], [•F•] triggers Merge of an XP with a matching [F].

(85)   ECONOMY CONDITION (EC):

Merge is prohibited.

(86)   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:

$$(87) \quad H = \sum_{k=1}^{K} s_k w_k$$

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.[44]

MC in (84) 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 (85) 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 (86), 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 $\Delta P_{Y|X}$. 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 (87). So, in the case of extraction across an N–V combination with normalized $\Delta P_{V|N} = 0.12$, harmony increases by $7.5 \times 0.12 = 0.9$, which does not suffice for movement to win (see (88); cells in columns MC, EC, and CED contain

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

scores, empty cells correspond to score 0). However, with normalized $\Delta P_{V|N} = 0.16$, harmony increases by $7.5 \times 0.16 = 1.2$, which makes movement more harmonic than lack thereof (see (89); both tables based on Müller *et al.* 2022: 1644, (34)–(35)).

(88) (assuming normalized $\Delta P_{V|N} = 0.12$)

I: $[_{vP} [_{VP} [_{NP} \ldots [_{N'} N \ldots XP_1]] V] v_{[\bullet X \bullet]}]$	MC $w = 4.0$	EC $w = 5.0$	CED $w = 7.5$	H
O$_1$: $[_{vP} XP_1 [_{v'} [_{VP} [_{NP} \ldots [_{N'} N \ldots t_1]] V] v]]$		-1	0.12	-4.1
☞ O$_2$: $[_{vP} [_{VP} [_{NP} \ldots [_{N'} N \ldots XP_1]] V] v_{[\bullet X \bullet]}]$	-1			-4.0

(89) (assuming normalized $\Delta P_{V|N} = 0.16$)

I: $[_{vP} [_{VP} [_{NP} \ldots [_{N'} N \ldots XP_1]] V] v_{[\bullet X \bullet]}]$	MC $w = 4.0$	EC $w = 5.0$	CED $w = 7.5$	H
☞ O$_1$: $[_{vP} XP_1 [_{v'} [_{VP} [_{NP} \ldots [_{N'} N \ldots t_1]] V] v]]$		-1	0.16	-3.8
O$_2$: $[_{vP} [_{VP} [_{NP} \ldots [_{N'} N \ldots XP_1]] V] v_{[\bullet X \bullet]}]$	-1			-4.0

A.3 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.[45]

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 (90), which illustrates the stage just before the coordination is merged with the C′.

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[45]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.

(90)

&P   C′

 what₁ &′   *did*   TP

   and *when₂*   *John* VP

           eat t₁ t₂
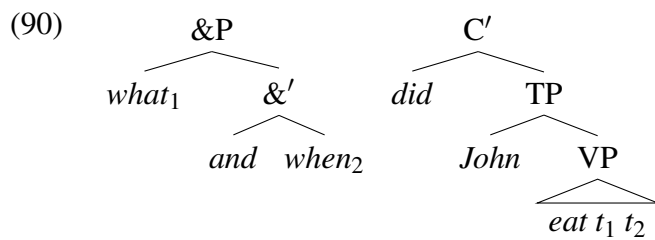
These two trees in the workspace constitute a single multi-rooted structure in the sense that there are active dependencies between elements of these two separate trees. On the traditional approach to movement, illustrated in (90), these dependencies are expressed via co-indexation between the moved 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 trees in (90) 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 sub-ordinate 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:

(91) NO SIDEWARD MOVEMENT (NSM)

  Sideward movement is prohibited.

(92) SINGLE-ROOTED STRUCTURES (SRS)

  All structures in the workspace are single-rooted.[46]

Both constraints have weights and possibly non-trivial scores; for simplicity, we assume that

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

all weights are 1, and the magnitude of constraint violation will be encoded directly in scores.

In the case of NSM in (91), 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.[47] 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 (92), the score is some monotonic function of the number of steps in the derivation during which the costly multi-rooted structures must be maintained.[48] 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 experimental study.

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

(93)

		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 experiments, i.e., in the subexperiments that compared

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

[48] 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.

constructions with 1 and 2 obligatory conjuncts, incurs the penalty of -0.25: this is exactly the difference between the acceptability of HC with 1 obligatory conjunct in the two subexperiments in the Vorfeld experiment (see Table 1 on page 19), while the analogous difference in the Mittelfeld experiment is -0.28 (see Table 2 on page 21).

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 experiment (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 between the predictions of this grammar and the observations of the Vorfeld and Mittelfeld experiments are similar or smaller – always smaller than 0.1.[49]

Feld	# oblig	subexperiment	NSM	SRS	Val	H	observation	$|\Delta|$
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; Val stands for the penalty for verbs with two obligatory arguments

In summary, this analysis successfully models the degrees of grammaticality associated with Heterofunctional Coordination in German as a function of the topological position of coordination and the number of obligatory conjuncts.

On the other hand, this analysis does not attempt to model the difference in the acceptability

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[49]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 §C.7 in Appendix C. 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 experiment and 1.70 in the Mittelfeld experiment) 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.

of the three kinds of conjuncts – *wh*-phrases, universal quantifiers, and negative quantifiers – reported in Appendix C, as it may well be a processing effect. In particular, the lower acceptability of HC with negative quantifiers 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).[50]

A.4 Experiments vs. Corpora

The above gradient grammar successfully models the average acceptability scores of the experimental 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 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

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[50]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.
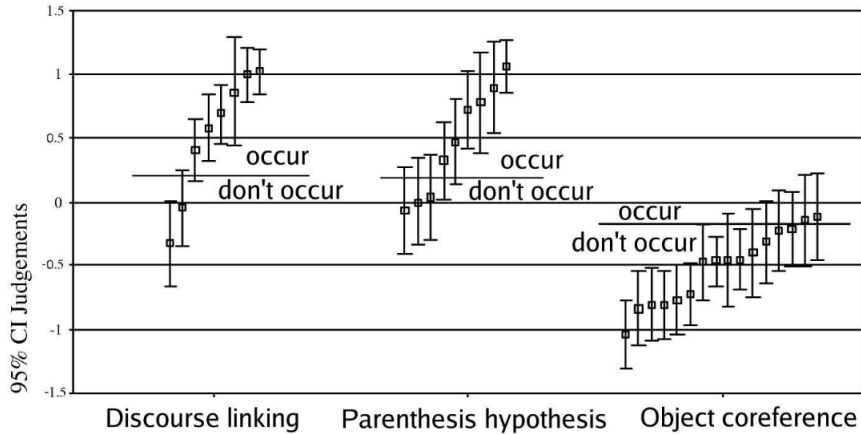
Figure 5: The mismatch of well-formedness and occurrence: Production is competitive (from Featherston 2005: 201)

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 (91)–(92). Hence, if the Decathlon Model is right, then the problem of discrepancy between non-negligible corpus presence and relatively low acceptability disappears.

A.5 Conclusion

In this appendix, we have shown that 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.

On this analysis, interspeaker variation (reported in §4.4 above for the corpus experiment but also observed in the other two experiments) may be modelled via the assumption that different speakers may have different weights and/or scores attached to particular grammatical constraints.[51] 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.

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[51]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 to be generated by a normal distribution (with a given mean and a given – relatively small – standard deviation) each time a constraint is violated.

Appendix B: 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 – where few or no examples were found in DeReKo – 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 §B.1 were found with the help of the following COSMAS II query:

(94) `wer was "und" wo`

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

(95) `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 §B.30) may be found with query (96), and sequences such as *sogar ich und sogar in Handschuhen* (see §B.33) – with (97).

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

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

Specifically, (96) 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, (97) 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.

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

Here are all relevant examples found with query (94):

(98)   Der Händler hat dadurch einen Überblick, wer, was und wo eingekauft hat.

(Saale-Zeitung)

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

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

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

(102)   Nach einer Föderalismusreform müsse deutlich werden "wer was und wo verantwortet".

(Stuttgarter Zeitung)

(103)   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)

(104)   Er nutzt eine Interessentendatenbank, wo er festhält, wer was und wo sucht.

(Sächsische Zeitung)

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

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

wo konsumiert wird...

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

(108) 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.

(109) 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".

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

B.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 (111).

(111) `wer "und" wann`

(112) 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.

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

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

(115) 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.

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

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

(118) 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)

(119) 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)

(120) 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)

(121) 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)

(122) 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)

(123) "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)

(124) 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)

(125) 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)

(126) 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.

<div align="right">(Ostthüringer Zeitung)</div>

(127) 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)

(128) 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)

(129) 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)

(130) 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.

<div align="right">(Wiener Zeitung)</div>

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

Below is a sample of relevant examples out of 174 results of query (131).

(131) `wann "und" wer`

(132) 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".

<div align="right">(Saale-Zeitung)</div>

(133) 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)

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

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

(135) "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)

(136) "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)

(137) 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)

(138) 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)

(139) 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)

(140) 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)

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

(142) 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)

(143) "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)

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

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

(146) 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)

(147) 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)

(148) 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)

(149) 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)

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

(151) 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)

(152) 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)

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

(154) 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)

(155) 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)

(156) 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)

(157) 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)

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

(159) 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)

(160) "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)

(161) 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)

(162) 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)

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

Below is a sample of relevant examples out of 290 results of query (163).

(163) `wer "und" wo`

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

(165) Der Förster weist dem Interessenten ein Waldstück zu, aus dem er das so genannte Res-
tholz 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)

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

(Südkurier)

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

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

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

(Schweriner Volkszeitung)

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

(Usinger Anzeiger)

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

(172) 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)

(173) 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)

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

(175) 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)

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

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

Below is a sample of relevant examples out of 297 results of query (177).

(177) `wo "und" wer`

(178) 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)

(179) 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)

(180) 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)

(181) 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)

(182) 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.

<div align="right">(Stuttgarter Zeitung)</div>

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

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

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

<div align="right">(Sächsische Zeitung)</div>

(186) 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)

(187) 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)

(188) 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)

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

Query (189) 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 (52) in the main text.

(189) `jeder "und" immer`

(190) 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)

(191) 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)

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

Query (192) gave 21 results, but all turned out to be false positives.

(192) `immer "und" jeder`

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

Query (193) gave 59 results. Below is the list of all true positives (minus a few less comprehensible potential true positives).

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

(194) 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/)

(195) Schlüssel hat jeder und immer bei sich.

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

(196) 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)

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

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

(198) 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/)

(199) 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/)

(200) 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)

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

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

(202) 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)

(203) 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)

(204) 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)

(205) 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/)

(206) 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)

(207) 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)

(208) 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)

(209) 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/)

(210) 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)

(211) Hélio konnte 70 Paar Flipflops organisieren (hier trägt jeder und immer und überall Flipflops) 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)

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

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

(213) Verantwortung trägt jeder und immer, besonders wenns um Kinder geht.

(http://www.mandyimnet.de/gb.php)

(214) 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/)

(215) 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)

(216) 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)

(217) 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/)

(218) Was auch auffaellt ist, das hier jeder und immer spuckt!

(http://www.umdiewelt.de/Asien/Ostasien/China/Reisebericht-1764/Kapitel-
8.html)

(219) 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/)

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

Query (220) 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).

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

(221) 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)

(222) 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`)

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

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

(225) 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`)

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

Below is the list of all relevant examples from the 13 results of query (226).

(226) `jeder "und" überall`

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

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

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

(230) 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)

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

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

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

(234) "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."

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

Below are the two relevant examples from the 41 results of query (235).

(235) `überall "und" jeder`

(236) 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)

(237) 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)

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

Below are the two results of query (238).

(238) `niemand "und" nirgendwo`

(239) 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)

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

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

Query (241) gave four results, all false positives.

(241) `nirgendwo "und" niemand`

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

Query (242) gave 13 results including two relevant examples in the case of deTenTen13.

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

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

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

(244) 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.

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

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

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

Query (246) gave three results but no true positives in the case of deTenTen13 and no results in the case of deTenTen18.

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

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

Query (247) gave no results.

(247) `niemand "und" nirgends`

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

Query (248) gave six results, but just one true positive.

(248) `nirgends "und" niemand`

(249) 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)

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

Query (250) gave eight results including three relevant examples in the case of deTenTen13.

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

(251) Garantien über "ewiges Leben" der Temp.-Quelle gibt Dir sowieso niemand und nir-
gends.

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

(252) In der DDR waren die Verbrechen des 3. Reiches, die Rolle der NSDAP und iher Glie-
derungen, 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)

(253) 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.

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

Query (254) gave two results including one relevant example in the case of deTenTen13.

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

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

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

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

Query (256) gave no results.

(256) `niemand "und" nie`

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

Query (257) gave five results, all false positives.

(257) `nie "und" niemand`

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

Query (258) gave five results including three relevant examples in the case of deTenTen13.

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

(259) 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`)

(260) 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`)

(261) 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.

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

Query (262) gave 19 results including three relevant examples in the case of deTenTen13 – the two below and (58) in the main text.

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

(263) 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/`)

(264) 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 (58) in the main text.

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

Query (265) gave one result – a false positive.

(265) `irgendjemand "und" irgendwann`

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

Query (266) gave one result – a true positive.

(266) `irgendwann "und" irgendjemand`

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

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

Query (268) gave only one false positive in the case of deTenTen13 and no results in the case of deTenTen18.

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

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

Query (269) gave four results in the case of deTenTen13, including the two fully comprehensible true positives below.

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

(270) 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)
```

(271) 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:

(272) 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)

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

Query (273) gave no results.

(273) `irgendjemand "und" irgendwo`

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

Query (274) gave no results.

(274) `irgendwo "und" irgendjemand`

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

Query (275) gave two results including one true positive in the case of deTenTen13.

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

(276) Alles was man mühsam in den Archiven von Zeitungen als auch von Regierungen ver-

schwinden 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.

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

Query (277) gave only two false positives in the case of deTenTen13 and no results in the case

of deTenTen18.

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

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

Query (278) gave 1228 results, including many HC examples with only optional dependents among conjuncts, but also a couple of examples with an obligatory argument.

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

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

(280) 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)

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

Query (281) only gave 17 false positive in the case of W4 DeReKo, but query (97) – repeated below as (282) – resulted in at least one true positive among the 159 results in deTenTen18.

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

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

(283) 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)

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

Query (95) – repeated below as (284) – gave 183 results, only one of which turned out to be an uncontroversial example of HC with an obligatory argument.

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

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

Appendix C: Experimental Study

The aim of this appendix is to exemplify the token-set methodology (Cowart 1997) employed in the experiments (§C.1), to provide additional details of and analyses for each of the experiments (§§C.2–C.6), and to present the results of fitting a mixed-effects ordinal model to the data collectively gathered in the three main experiments described in §§C.3–C.6 (see §C.7).

C.1   Token sets

We have initially selected – on the basis of valency dictionaries and near-native knowledge of German of one of the authors – 48 verbs on which to build target sentences.[52] 24 of these were supposed to have exactly 1 obligatory argument (the subject), and another 24 were assumed to have exactly two obligatory arguments (including the subject).

A token set was constructed for each verb, with 6 sentences differing only in the 3 kinds of conjuncts (*wh*-phrases, universal quantifiers, negative quantifiers) and in the 2 numbers of obligatory arguments among conjuncts (0 or 1 in the case of the first 24 verbs, 1 or 2 in the case of the second group of 24 verbs).[53] An example of a token set based on the verb *sich rächen* 'retaliate, take revenge', assumed to have only 1 syntactically obligatory argument, 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

C.2   Norming Experiment

Sentences such as those in Table 5, i.e., simple sentences with relevant coordinations in the Vorfeld position, were candidates for target items in the Vorfeld experiment (described in §4.2 in the main text and in §C.3 below). So, in total, there were $48 \times 6 = 288$ such potential

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[52]The following 4 dictionaries were consulted: Helbig and Schenkel 1983, Schumacher 1986, Engel and Schumacher 1978, and E-VALBU (https://grammis.ids-mannheim.de/verbvalenz).

[53]See fn. 26 in §4.2 in the main text for motivation for such a design.

target items. 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	Underlying clause
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

In order to confirm our assumptions regarding the number of obligatory arguments of particular verbs, we decided to run a comprehensive norming experiment, testing the acceptability of all 576 such sentences. For example, if our assumption about *sich rächen* 'retaliate, take revenge' that its only obligatory argument is the subject is correct, then both sentences of the first three pairs in Table 6 (corresponding to HC with 0 obligatory arguments among conjuncts) should be judged as acceptable, as they all contain the subject. However, only first sentences of each the next three pairs (corresponding to HC with 1 obligatory conjunct) should be judged acceptable for the same reason, as the second sentences in each of these pairs lack the subject.

Before running this norming experiment, we conducted a pilot study in order to estimate the required sample size by means of power analysis. In this study, 10 clauses were selected from the 576 underlying clauses: 5 were selected at random from the subset judged as grammatical by the authors of this paper and another 5 were selected at random from those judged as ungrammatical. These were rated by 16 respondents (within-subjects design) recruited via the Clickworker platform. Ungrammatical sentences were judged to be unacceptable ($M = -0.79$, $SD = 1.37$) and grammatical clauses to be acceptable ($M = 0.99$, $SD = 1.37$). The difference from the mid-point of the scale expressed in standard deviations was $d = 0.57$ for

the ungrammatical sentences and d = 0.72 for the grammatical clauses. Based on these results, for the purpose of power analysis we assumed d = 0.75 for the true effect size in the population, given that we only wanted uncotroversially gramatical and ungramatical sentences for the main studies. This enabled us to compute required sample size needed to reliably – with 0.8 probability – detect the deviation from the mid-point (i.e., 0) of the scale of 0.75 standard deviations. Next, assuming one-sample two-sided t-test and the level of statistical significance $\alpha = 0.05$, we determined that minimal sample size of 15 is sufficient to achieve the power of a test of 0.8. All calculations were performed using the R statistical environment.

On the basis of these considerations, the following procedure was adopted in the norming experiment: (i) the 576 underlying clauses were divided into 6 questionnaires, each containing 96 target clauses and 6 filler sentences (within-subjects design);[54] (ii) each questionnaire was taken by at least 15 participants; (iii) the average scores of clauses were evaluated in order to filter out those token sets in which the scores of the hypothetically underlying clauses did not agree with the assumed number of obligatory arguments among conjuncts.

Raw results of this norming experiment and by-item analyses may be found in the attached spreadsheet `Norming_stage.csv`. On the basis of these results, we selected token sets – and, hence, verbs – which formed the basis of the Vorfeld and Mittelfeld experiments described in §§4.2–4.3 in the main text and in §§C.3–C.4 below. The selection process 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 scores.

- 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 scores and the ungrammatical one – low scores.

- HC sentences with 2 obligatory arguments are built from two ungrammatical clauses (be-

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[54]There were only 6 fillers because of the large size of the questionnaires and because we estimated the risk of participants forming theories about such simple sentences as relatively low. That is, the main function of these 6 uncontroversially grammatical or ungrammatical fillers was to identify respondents who were inattentive or did not have a sufficient command of German.

cause each of them lacks one obligatory argument). Therefore, both underlying clauses should get low scores.

Those token sets where all or almost all underlying clauses received scores according to the above assumptions were qualified for the main study. If some underlying clauses received average scores violating those assumptions, i.e., an ungrammatical clause received an average score greater than zero or vice versa, token sets containing it were mostly excluded. If a token set contained clauses that received an average score 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 scores 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	Underlying clause	Score
0	*wh*	Wo hat er sich gerächt?	1.60
		An wem hat er sich gerächt?	1.60
0	universal	Überall hat er sich gerächt.	1.21
		An jedem hat er sich gerächt.	1.69
0	negative	**Nirgends hat er sich gerächt!**	**0.60**
		An niemandem hat er sich gerächt!	1.15
1	*wh*	Wer hat sich an ihr gerächt?	1.79
		Wo hat sich an ihr gerächt?	-1.60
1	universal	Jeder hat sich an ihr gerächt.	1.80
		Überall hat sich an ihr gerächt.	-1.50
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

This procedure led to the selection of 18 verbs with exactly one obligatory argument and 12 verbs with exactly two obligatory arguments. Hence, $18 + 12 = 30$ token sets were used in each of the two formal experiments described in §§C.3–C.4. Token sets based on verbs with 1 obligatory argument are referred to below as "0-1 token sets", and those based on verbs with 2 obligatory arguments as "1-2 token sets".

As explained in the main text, target sentences in this experiment contained examples of German HC in the Vorfeld position of matrix clauses. The raw results of the experiment and by-item analyses may be found in the attached spreadsheet `V_main_stage.csv`.

Multiple statistical analyses were 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 8, presents the acceptability of those sentences depending on the number of obligatory arguments involved in coordination.

oblig	M	SD	Mdn
0	1.15	0.60	1.22
1	-1.03	0.78	-1.11

Table 8: Comparing acceptability of HC in the Vorfeld with 0 vs. 1 obligatory arguments; M stands for mean, SD – for standard deviation, Mdn – for median

The mean of 1.15 indicates that HC sentences with no obligatory arguments were considered to be "rather acceptable", while those with one obligatory argument were rated -1.03 on average, i.e., as "rather unacceptable". The paired t-test shows that this difference is statistically significant and the effect size is large ($t(74) = 23.6$, $d = 2.73$, $p < 0.001$).

Results were then analysed in a 2 (obligatory arguments: 0 or 1) $\times$ 3 (kinds: *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 9.

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

Table 9: ANOVA results for HC Vorfeld sentences with 0 vs. 1 obligatory arguments; DFn stands for degrees of freedom in the nominator, DFd for degrees of freedom in the denominator, and η_G^2 for Generalized Eta-Square

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

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 ($\eta_G^2 = 0.132$ vs. $\eta_G^2 = 0.615$). Nevertheless, 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 either for the effect of the kind of conjunct ($W = 0.980$, $p > 0.05$), or 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. Hence, it can be concluded that the results of ANOVA are reliable.

Consider now Table 10, which presents the descriptive statistics of groups for 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 (the mean is 1.560 for 0 and -0.578 for 1 obligatory argument), while negative quantifiers were rated lowest (0.676 and -1.333, respectively), with universal quantifiers in between.

oblig	kind	M	SD	Mdn	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 10: Descriptive statistics of HC Vorfeld sentences with 0 vs. 1 obligatory arguments depending on the number of obligatory arguments and the kind of conjuncts

Post-hoc paired t-tests (with Holm correction, which was applied to each t-test here and below) revealed significant differences between all kinds of conjuncts in HC sentences with 0 or 1 obligatory argument (Table 11). Note that the only insignificant result is found between universal and negative quantifiers in HC sentences with 1 obligatory argument. Thus, interestingly, HC sentences with *wh*-phrases were always rated significantly better than HC with any

oblig	kind1	kind2	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 11: Results of the paired t-tests between HC Vorfeld sentences with different kinds of conjuncts divided by the number of obligatory arguments (0 or 1)

other kind of conjuncts. Similarly, HC with universal quantifiers were rated higher than HC with negative quantifiers – significantly so in the case of 0 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 12.

kind	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 12: Results of the pairwise t-test testing the difference between the acceptability of HC Vorfeld sentences with 0 vs. 1 obligatory arguments 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 13.

oblig	M	SD	Mdn
1	−1.28	0.71	−1.50
2	−1.54	0.47	−1.67

Table 13: Comparing acceptability of HC in the Vorfeld with 1 vs. 2 obligatory arguments

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 14. 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 obligatory arguments ($\eta_G^2 = 0.069$ vs. $\eta_G^2 = 0.029$).

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

Table 14: ANOVA results for HC Vorfeld sentences with 1 vs. 2 obligatory arguments

Mauchly's test for sphericity indicated a violation of the assumption about sphericity for both applicable effects ($W = 0.768$, $p < 0.05$ for kind, $W = 0.900$, $p < 0.05$ 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 15.

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

Table 15: Sphericity corrections for ANOVA of HC in the Vorfeld with 1 vs. 2 obligatory arguments; 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 16. Again, HC sentences with *wh*-phrases were rated highest for both values of the number of obligatory arguments, while negative quantifiers were rated lowest, with universal quantifiers in between, which is analogous to the results for 0 and 1 obligatory argument.

oblig	kind	M	SD	Mdn	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 16: Descriptive statistics of HC Vorfeld sentences with 1 vs. 2 obligatory arguments depending on the number of obligatory arguments and the kind of conjuncts

This time, the *post-hoc* paired t-test, whose results are presented in Table 17, yielded significant differences between all kinds of conjuncts only for HC sentences with 1 obligatory

oblig	kind1	kind2	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	0.249

Table 17: Results of the paired t-tests between HC Vorfeld sentences with different kinds of conjuncts divided by the number of obligatory arguments (1 or 2)

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 quantifiers). No comparison for HC with 2 obligatory arguments reached statistical significance – those HC sentences were rated as ungrammatical independently of the kind of conjuncts.

The same test revealed only one significant difference between HC sentences with 1 and 2 obligatory arguments, namely for *wh*-phrases – see Table 18.

kind	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	0.318
negative	1	2	75	75	0.0888	74	0.929

Table 18: Results of the pairwise t-test testing the difference between the acceptability of HC Vorfeld sentences with 1 vs. 2 obligatory arguments depending on the kind of conjuncts

C.4 Mittelfeld Experiment

In the Mittelfeld experiment, target sentences contained examples of German HC in the Mittelfeld position (but cf. fn. 21 on p. 15) of subordinate clauses. Otherwise, the design of this experiment was fully analogous to that of the Vorfeld experiment. The raw results of the experiment and by-item analyses may be found in the attached spreadsheet `M_main_stage.csv`.

Let us start by discussing the results for the first subexperiment, based on verbs with exactly 1 obligatory argument (the subject). Consider the middle part of Table 2(a), repeated below as Table 19, showing descriptive statistics for sentences with 1 or 0 obligatory arguments. As in the case of the Vorfeld study, Mittelfeld sentences are on average rated worse if one of the conjuncts is an obligatory argument ($t(80) = 18.4$, $p < 0.001$, $d = 2.05$). At first glance,

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

Table 19: Comparing acceptability of HC in the Mittelfeld with 0 vs. 1 obligatory arguments

however, the difference appears to be smaller in this case than in the case of Vorfeld sentences.

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. In contrast to the similar analysis of 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 ($\eta_G^2 = 0.470$ vs. $\eta_G^2 = 0.054$). The assumption of sphericity was not violated in any of the cases. The results of this analysis are given in Table 20.

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

Table 20: ANOVA results for HC Mittelfeld sentences with 0 vs. 1 obligatory arguments

Table 21 provides the descriptive statistics for Mittelfeld sentences depending on the number of obligatory arguments and the kind of conjuncts. As in the case of the Vorfeld experiment, HC sentences with *wh*-phrases were rated highest regardless of the number of obligatory arguments, while sentences with negative quantifiers were rated lowest.

oblig	kind	M	SD	Mdn	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 21: Descriptive statistics of HC Mittelfeld sentences with 0 vs. 1 obligatory arguments depending on the number of obligatory arguments and the kind of conjuncts

The results of the *post-hoc* paired t-tests, shown in Table 22, revealed a statistically significant difference between nearly all pairs of kinds of conjuncts. The only exception were the comparisons between sentences with *wh*- and universal quantifiers with zero obligatory

oblig	kind1	kind2	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 22: Results of the paired t-tests between HC Mittelfeld sentences with different kinds of conjuncts divided by the number of obligatory arguments (0 or 1)

arguments. As can be seen in Table 21, 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 quantifiers).

As in the case of Vorfeld HC sentences, also in Mittelfeld sentences the *post-hoc* pairwise comparisons revealed statistically significant differences between the number of obligatory arguments regardless of the kind of conjuncts – see Table 23.

kind	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 23: Results of the pairwise t-test testing the difference between the acceptability of HC Mittelfeld sentences with 0 vs. 1 obligatory arguments depending on the kind of conjuncts

The same statistical analyses were performed for sentences with 1 vs. 2 obligatory arguments, with results largely analogous to those obtained for Vorfeld sentences. Firstly, as before, sentences with one obligatory argument were on average rated higher than sentences with two obligatory arguments – see Table 24. 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 score is much higher (M = -0.78) than for sentences with two obligatory arguments (M = -1.24; $t(80) = 6.82$, $p < 0.001$, $d = 0.76$).

This observation is confirmed by the analysis of variance, which detected a statistically significant effect of both the number of obligatory arguments and the kind of conjuncts, as well as the interaction between these variables – see Table 25. In this case, however, there is no difference between the magnitude of the effects, since in both cases they are rather small. The

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

Table 24: Comparing acceptability of HC in the Mittelfeld with 1 vs. 2 obligatory arguments

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

Table 25: ANOVA results for HC Mittelfeld sentences with 1 vs. 2 obligatory arguments

assumption of sphericity was not violated in any of the cases.

Secondly, also in the case of sentences with 1 vs. 2 obligatory arguments, sentences with *wh*-phrases are rated highest, and sentences with negative quantifiers are rated lowest, regardless of the number of obligatory arguments – see Table 26.

oblig	kind	M	SD	Mdn	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 26: Descriptive statistics of HC Mittelfeld sentences with 1 vs. 2 obligatory arguments depending on the number of obligatory arguments and the kind of conjuncts

Third, the t-test comparisons presented in Tables 27 and 28 indicate that despite the negative means, most comparisons between groups are still statistically significant.

C.5   Comparison of results: Vorfeld vs. Mittelfeld

The results presented in §§C.3 and C.4 suggest that there is a difference in the acceptability of sentences with HC between the Mittelfeld and the Vorfeld. On average, sentences with one obligatory argument were rated higher in the Mittelfeld than in the Vorfeld (compare Tables 8 and 13 for Vorfeld with Tables 19 and 24 for Mittelfeld). These observations are confirmed by the results of the between-subjects ANOVA comparing Vorfeld and Mittelfeld for sentences with 0 vs. 1 argument – see Table 29. 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

oblig	kind1	kind1	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 27: Results of the paired t-tests between HC Mittelfeld sentences with different kinds of conjuncts divided by the number of obligatory arguments (1 or 2)

kind	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 28: Results of the pairwise t-test testing the difference between the acceptability of HC Mittelfeld sentences with 1 vs. 2 obligatory arguments depending on the kind of conjuncts

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

Table 29: ANOVA results for HC sentences in the Mittelfeld and in the Vorfeld with 0 vs. 1 obligatory arguments

kind of conjuncts and the number of arguments.

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

In addition, a *post-hoc* t-test yielded a statistically significant difference between the Vorfeld and Mittelfeld sentences in the mean scores of sentences with a single obligatory argument – see Table 30. Moreover, *post-hoc* independent samples t-tests presented in Table 31 indicate a significant difference between the Vorfeld and the Mittelfeld in the sentences with one obligatory argument and universal and negative quantifiers as a kind of conjuncts.

Finally, let us look at Table 32 for sentences based on verbs taking two obligatory 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.

Despite the low average scores (seen in Table 13 for the Vorfeld and Table 24 for the Mittelfeld), the position of HC in the sentence has a significant effect on the average score of sen-

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 30: Results of the between-subjects t-tests between sentences with HC in different positions divided by the number of obligatory arguments (0 or 1)

oblig	kind	feld1	feld2	n1	n2	t	df	p
0	*wh*	M	V	80	75	-0.992	151	0.646
0	universal	M	V	80	75	0.871	152	0.646
0	negative	M	V	80	75	1.320	150	0.567
1	*wh*	M	V	80	75	1.737	153	0.338
1	universal	M	V	80	75	4.469	153	< 0.001
1	negative	M	V	80	75	3.988	149	< 0.001

Table 31: Results of the between-subjects t-tests between sentences with HC in different positions divided by the number of obligatory arguments (0 or 1) and kinds of conjuncts

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

Table 32: ANOVA results for HC sentences in the Mittelfeld and in the Vorfeld with 1 vs. 2 obligatory dependents

tences regardless of the number of obligatory arguments – see Table 33. Generally speaking, sentences with the HC in the Mittelfeld are significantly more acceptable than corresponding Vorfeld sentences.

Comparisons of the number of obligatory arguments and the kind of conjuncts, presented in Table 34, revealed significant differences between most types of sentences.

C.6 Corpus Experiment

We selected for rating 72 examples with HC constructions taken from German corpora. This time, the design of the study was 2 (position of HC: Vorfeld vs. Mittelfeld) × 2 (number of obligatory arguments: 0 vs. 1) × 3 (kind of conjuncts: *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. The raw results of the experiment and by-item analyses may be found in the attached spreadsheet `C_main_stage.csv`.

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 33: Results of the between-subjects t-tests between sentences with HC in different positions divided by the number of obligatory arguments

oblig	kind	feld1	feld2	n1	n2	t	df	p
1	*wh*	M	V	80	75	2.59	151	0.031
1	universal	M	V	80	75	3.64	152	0.002
1	negative	M	V	80	75	4.56	135	< 0.001
2	*wh*	M	V	80	75	2.42	152	0.034
2	universal	M	V	80	75	3.60	147	0.002
2	negative	M	V	80	75	1.87	152	0.063

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

Table 35 (the middle part of Table 3) and Table 36 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 ($t(28) = 9.99$, $p < 0.001$, $d = 1.86$). However, sentences with one obligatory argument were rated relatively high on average, at around 0.

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

Table 35: Comparing acceptability of corpus HC sentences with 0 vs. 1 obligatory arguments

As before, sentences with *wh*-phrases were rated highest and sentences with negative quantifiers lowest – see Table 36. *Post-hoc* paired t-tests revealed significant differences between all kinds of conjuncts in HC sentences with 0 or 1 obligatory argument – 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 scores above zero – regardless of the kind of conjunct. There is a clear contrast with the corresponding group of sentences in the Vorfeld, which were rated on average below zero. As can be seen in Table 38, these differences are statistically significant.

The corpus experiment also 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

feld	oblig	kind	M	SD	Mdn
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 36: Descriptive statistics of corpus HC sentences depending on the position of HC, the number of obligatory arguments and the kind of conjuncts

oblig	kind1	kind2	n1	n2	t	df	*p*
0	universal	negative	29	29	2.29	28	0.029
0	universal	*wh*	29	29	−5.32	28	< 0.001
0	negative	*wh*	29	29	−7.46	28	< 0.001
1	universal	negative	29	29	2.54	28	0.017
1	universal	*wh*	29	29	−3.69	28	0.002
1	negative	*wh*	29	29	−5.54	28	< 0.001

Table 37: Results of the paired t-tests between corpus HC sentences with different kinds of conjuncts divided by the number of obligatory arguments (0 or 1)

oblig	kind	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

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 kind, the assumption of sphericity was violated, but after applying corrections the effect was still significant ($p < 0.05$).

Table 40 reveals that sentences with the subject in the second position were on average

Effect	DFn	DFd	F	p	η_G^2
kind	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

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 score above zero, although it should be noted that in both cases the average scores are close to zero.

subject	M	SD	Mdn
1	-0.21	0.61	-0.21
2	0.11	0.86	0.16

Table 40: Comparing acceptability of corpus HC sentences 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	kind	subject1	subject2	n1	n2	t	df	p
V	*wh*	1	2	29	29	-2.556	28	0.064
V	universal	1	2	29	29	-4.383	28	< 0.001
V	negative	1	2	29	29	-3.794	28	0.004
M	*wh*	1	2	29	29	-0.376	28	0.710
M	universal	1	2	29	29	2.351	28	0.078
M	negative	1	2	29	29	-1.624	28	0.232

Table 41: Results of the paired t-tests between corpus 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 only found in the Vorfeld position (in the case of universal and negative quantifiers).

C.7   *Mixed-Effects Ordinal Model*

Previous sections presented analyses of results of each of the three main experiments and a comparison of the Vorfeld and the Mittelfeld experiments. This section presents the results of fitting

a mixed-effects model to the data from *all* three main experiments, in order to model fixed effects and to account for random effects (i.e., grouping factors).

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), the kind of conjuncts (*wh*, universal, negative), HC position in the sentence (Vorfeld, Mittelfeld), and some of the interactions between them (kind of conjuncts with number of obligatory arguments, HC position in the sentence with number of obligatory arguments, and the three-way interaction of these variables). Analyses of variance made it possible to determine which of them significantly affect the mean HC sentence scores (see, e.g., Table 9, confirming a significant effect of the number of obligatory arguments for 0 vs. 1 HC sentences in the Vorfeld, Table 29, 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 questionnaire, 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), experiment (Vorfeld 1 and 2 – subexperiments described in §C.3, Mittelfeld 1 and 2 – subexperiments described in §C.4, Corpus – experiment described in §C.6), and token set (a total of 61 token sets – 30 from the Vorfeld study in §C.3, 30 from the Mittelfeld study in §C.4, and 1 token set composed of corpus sentences; sentences from the corpus study in §C.6 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 may have exhibited individual patterns of sentence rating, thereby introducing additional variance into the data, unrelated to the modelled effects. In the case of experiments, the fact that respondents were only exposed to sentences from a given questionnaire 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 (see §C.1), 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 experiments. It means that each respondent could only take part in one experiment but could take part in two subexperiments (it applies to the respondents from the studies de-

scribed in §§C.3–C.4, as there each participant within an experiment rated sentences from both 1 vs. 0 and 1 vs. 2 conceptual subexperiments). Random effects are only modelled as random intercepts here.

The formula used to fit the model is as follows:

(286) score ~ kind of conjuncts + no. of oblig. arguments + position of HC +

kind of conjuncts : no. of oblig. arguments +

no. of oblig. arguments : position of HC +

no. of oblig. arguments : kind of conjuncts : position of HC +

(1 | respondent / experiment) + (1 | token set)

We used a variant of the the Cumulative Link Mixed Model (CLMM), as implemented in the R `ordinal` package.[55] The model, expressed by the above formula, achieved the most optimal values of the evaluation measures among the approximately 30 models tested (AIC of $15{,}761.24$, number of conditional Hessian of $14{,}000$, 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 appropriate when the dependent variable is expressed on an ordinal scale (here: sentence score). Coefficients in CLMMs express 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 the ordinal scale of -2 to 2).

Consider Table 42. To save space, only statistically significant fixed effects (with significance defined by confidence intervals) are reported here. For example, the OR in the "negative quantifier" row is 0.364, which is equal to $e^{-1.010}$, indicating that sentences with this kind of conjuncts are more likely than the baseline category (in this case universal quantifier) to be rated low ($\beta = -1.010$). 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 the confidence interval (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 ($0.499 - 0.266 = 0.233$). Therefore, it can be inferred with a high

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[55]`https://CRAN.R-project.org/package=ordinal` (Christensen 2011, 2022)

Fixed effect	Coefficient	Std. error	z value	OR	2.5%	97.5%
negative quantifier	−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 quantifier : 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

degree of confidence that the determined detrimental effect of negative quantifiers is real. (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 the results of our earlier analyses: *wh*-phrases are rated best and negative quantifiers 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 score 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 score falling into a specific category (rating scale) or below.

Threshold	Estimate	Std. error	z value
−2 ∣ −1	−4.307	0.176	−24.408
−1 ∣ 0	−2.594	0.172	−15.065
0 ∣ 1	−1.998	0.171	−11.698
1 ∣ 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 not easy 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 quantifier	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), 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 experiment it belonged to) may also have influenced how it was rated. In addition, variance is also contributed by token sets, which may confirm that some verbs used in the experiment were rated significantly worse or better than others – see Table 45.

Group	V	SD
experiment : 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 scores.

In addition, Figure 7 shows the distributions of the estimated probabilities of receiving a given score (marked in the upper left corner of each subplot) depending on the number of obligatory arguments, the kind of conjuncts, and the HC position in the sentence. From this graph, it may 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 score of -2 is low – in both corresponding boxplots, the median score is close
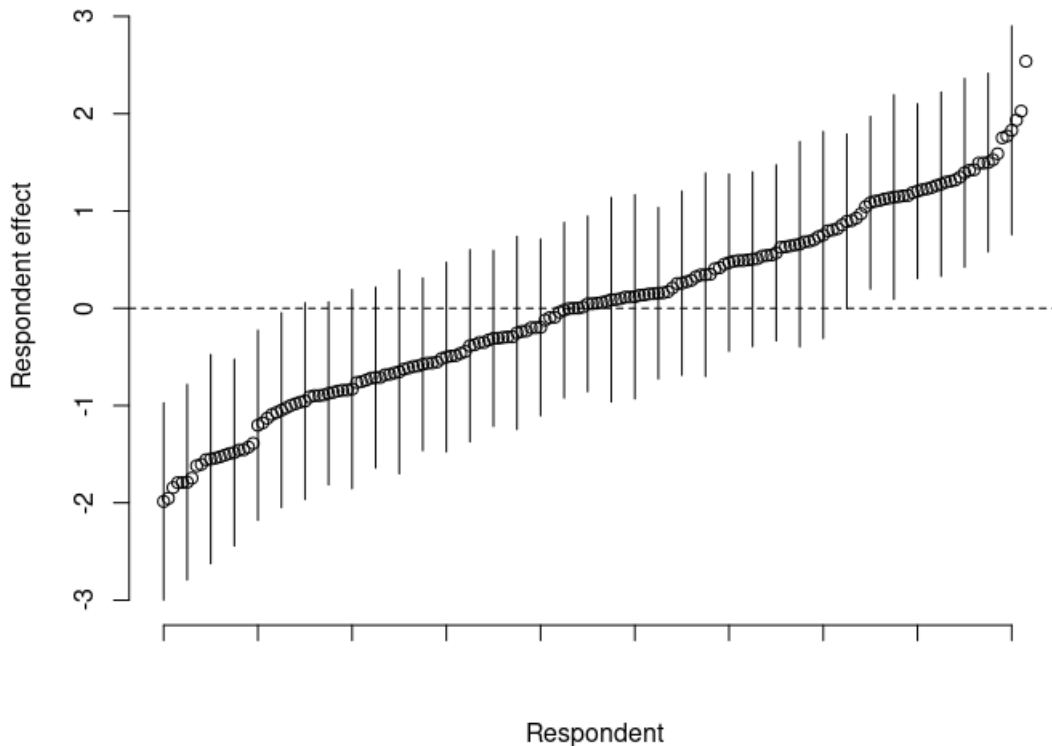
Figure 6: Estimated effects for respondents with 95% confidence intervals. For better visibility, the graph indicates the confidence interval for only one in five respondents

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 quantifiers (marked as J), although three outliers may be found here, 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 scores of the corresponding sentences. In the case of sentences with negative quantifiers (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 score on the scale to sentences with HC in the Vorfeld than in the Mittelfeld (in the case of negative quantifiers and one obligatory argument). In many cases, a similar or even greater difference between HC sentences may 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.

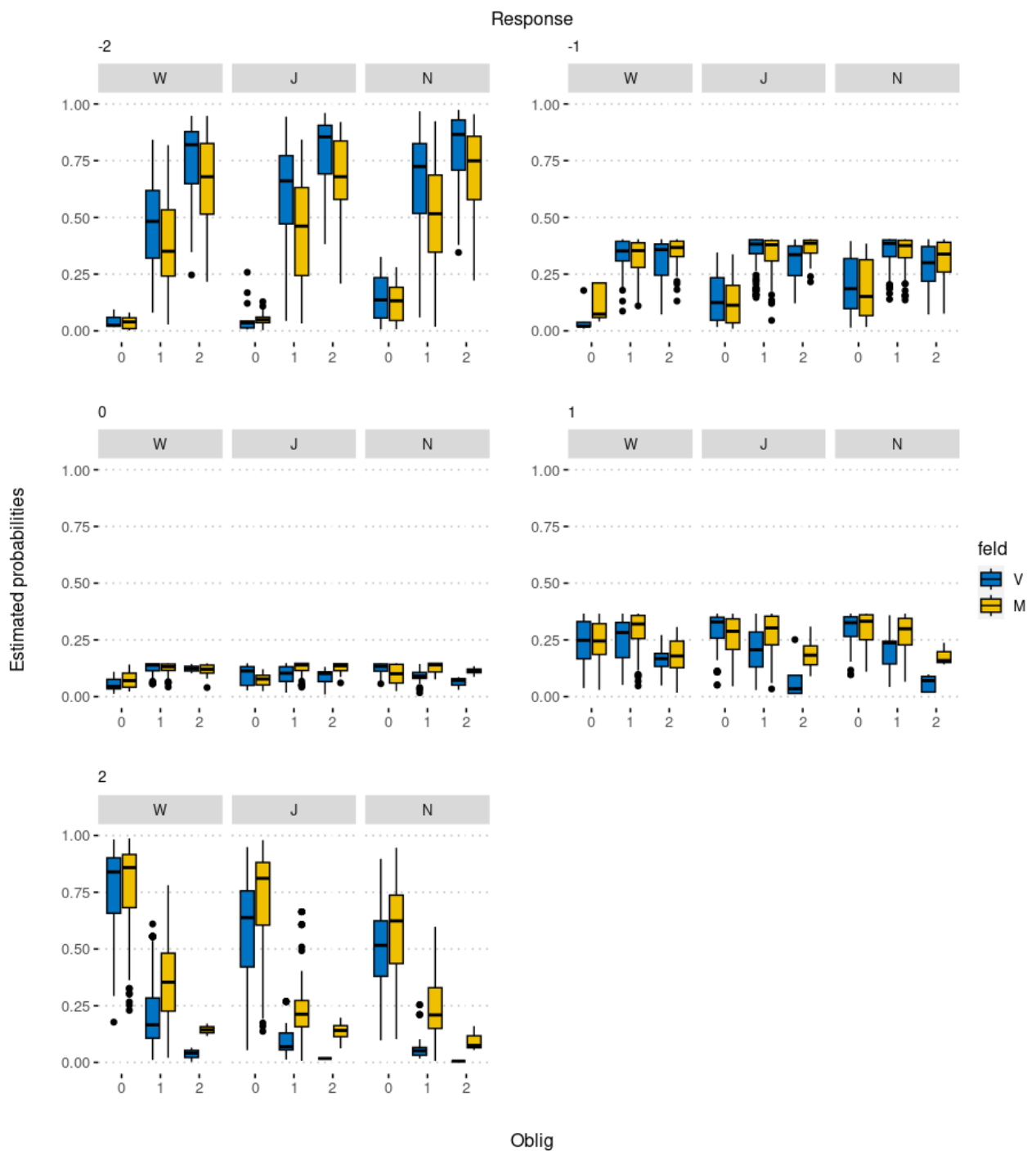In general, this graph shows mostly high variability among respondents – this is indicated

Figure 7: Distributions of the estimated probabilities of rating a sentence at a given point on the scale from −2 to 2. Each subplot is divided by kind of conjuncts. 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 score 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

by the wide boxplots and whiskers, the presence of outliers and the ranges on the y-axes – e.g., in the case of score 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 scores (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).
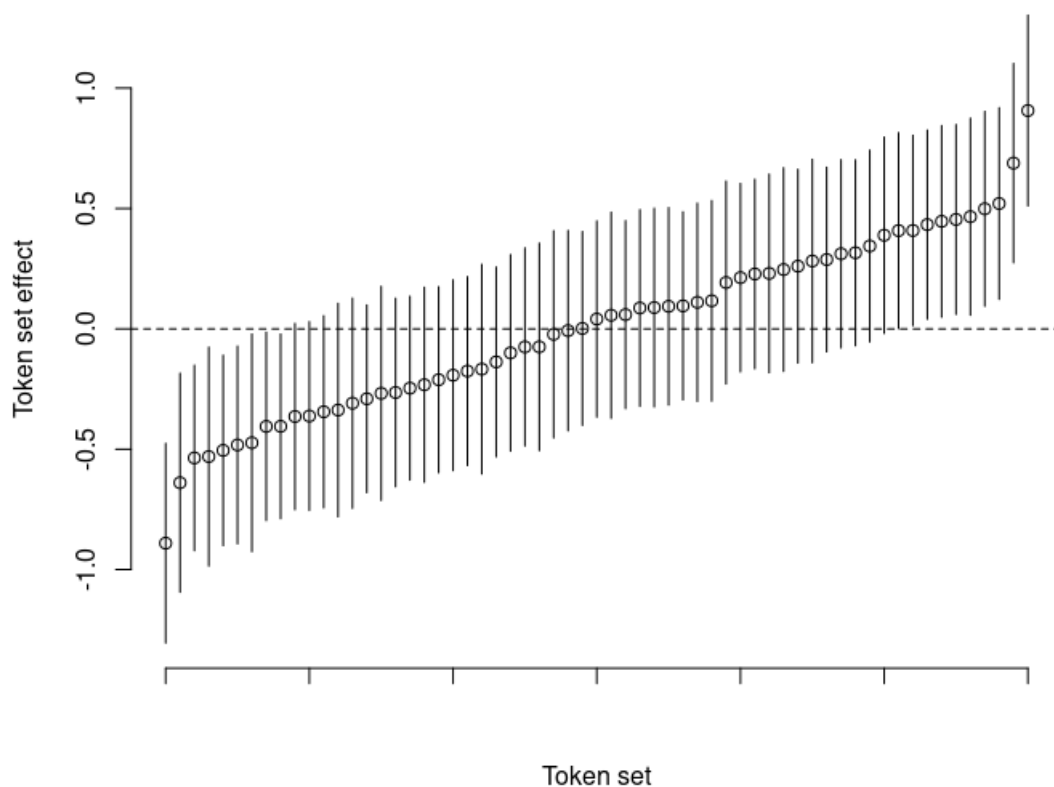

Figure 8: Estimated effects for token sets with 95% confidence intervals