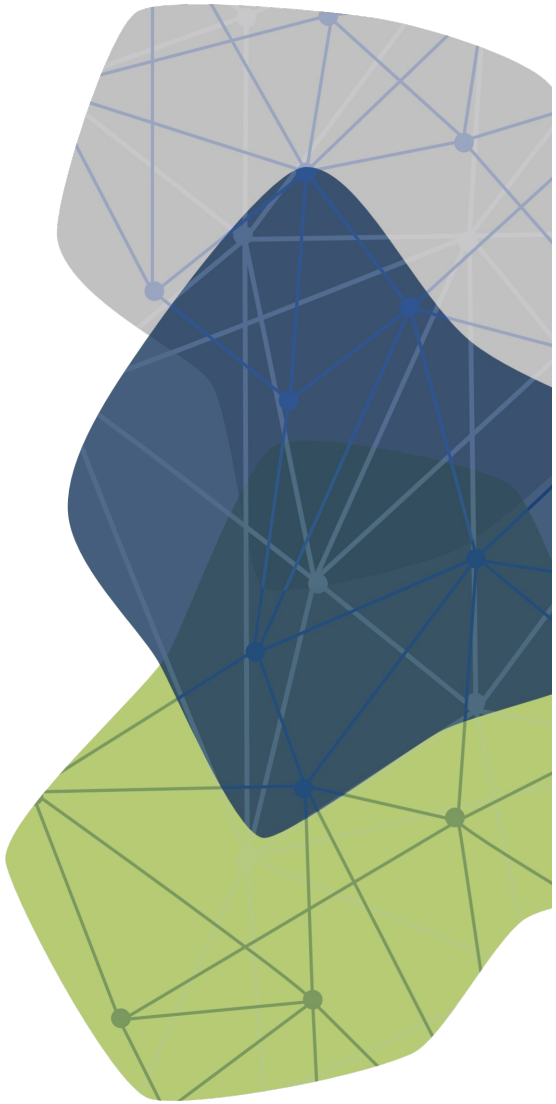
DGfS 2024 AG8 CONSTRAINING LINEARIZATION

AN INTEGRATIVE CONSTRAINT-BASED ACCOUNT OF CONSTITUENT LINEARIZATION IN THE GERMAN MIDFIELD

Alicia Katharina Börner, Simon Masloch & Tibor Kiss

Linguistic Data Science Lab, Ruhr-Universität Bochum



LDSL Linguistic Data Science Lab

RUHR UNIVERSITÄT BOCHUM RUB

Introduction

- The phenomenon: Flexible constituent ordering in the German midfield
- Accounts of argument linearization
- Accounts of adverbial linearization
- Our proposal

Flexible constituent ordering in the German midfield

The ordering of constituents is relatively flexible in the German midfield (all variants in (1) are grammatical and truth-conditionally equivalent, cf. Frey 2015).

This holds for arguments...

(1) a. *Zu Weihnachten wird der Mitarbeiter der Chefin eine Opernkarte schenken.*
for Christmas will the.NOM employee the.DAT.F boss a.ACC opera.ticket give

b *Zu Weihnachten wird der Mitarbeiter eine Opernkarte der Chefin schenken.*

c. *Zu Weihnachten wird eine Opernkarte der Mitarbeiter der Chefin schenken.*

d. *Zu Weihnachten wird der Chefin der Mitarbeiter eine Opernkarte schenken.*

e *Zu Weihnachten wird der Chefin eine Opernkarte der Mitarbeiter schenken.*

f. *Zu Weihnachten wird eine Opernkarte der Chefin der Mitarbeiter schenken.*

'The employee will give the boss an opera ticket for Christmas.'

Flexible constituent ordering in the German midfield

... as well as for adverbials:

(2) *Ich habe gehört, dass er*
I have heard that he

a. *mit einer Pinzette einem Jungen einen Splitter aus der Hand gezogen hat.*
with a pair.of.tweezers a.DAT boy a.ACC splinter out.of the hand removed has

b. *einem Jungen mit einer Pinzette einen Splitter aus der Hand gezogen hat.*

c. *einem Jungen einen Splitter mit einer Pinzette aus der Hand gezogen hat.*

'I have heard that he removed a splinter from a boy's hand using a pair of tweezers.'

However, changes in linearization may have reflexes in e.g. information structure, scope interpretation and binding possibilities (see a.o. Frey 2015).

Normal order: the one that is contextually least restricted (Höhle 2019/1982)

Accounts of argument linearization

Base generation (a.o. Fanselow 2001, 2003)

- arguments of a head can be realized in (almost) any order ⇨ no fixed base order

Base order & movement (a.o. Frey 1993, Müller 1999, Haider & Rosengren 2003, Hinterhölzl 2004, Struckmeier 2017)

- arguments must be combined with the verbal projection in a specific order
- many differences between accounts: base order predicate-dependent? base order = normal order? Landing site? Triggered (if yes: which feature)? …

Accounts of argument linearization

Factors influencing linearization descriptively

- long research tradition (a.o. Lenerz 1977, Hoberg 1997, Kempen & Harbusch 2003)
- taken up as triggers for scrambling, but also in **optimality theoretic work** (e.g. Müller 1999, Keller 2000) which is in principle compatible with base-generation (Choi 1999), as well as with base-order approaches (e.g. Müller 1999)
  - one or more unmarked order(s), and several suboptimal orders (varying in acceptability)
- Recent experimental work on constraint hierarchy (Ellsiepen & Bader 2018):
  - NOMINATIVE ≺ ACCUSATIVE ≻
  - ANIMATE ≺ INANIMATE ≻
  - DEFINITE ≺ INDEFINITE ≻
  - AGENT ≺ NON-AGENT ≻
  - NOMINATIVE ≺ DATIVE ≻
  - DATIVE ≺ ACCUSATIVE ≻
  - RECIPIENT/GOAL/BENEFACTIVE ≺ THEME

Accounts of adverbial linearization

Base generation (Hetland 1992)

- The positioning of adverbials is completely unconstrained.

Semantic accounts (Ernst 2001, Haider 2000)

- constrained base-generation: Adverbials can be freely base-generated in relation to arguments, but there are linearization restrictions among adverbials of different classes.

Base order & scrambling (Frey & Pittner 1998, Frey 2003, Pittner 2004, Maienborn 2001, 2003)

- (Classes of) adverbials occupy base positions relative to the hierarchically ordered argument slots.
- Base positions are formulated in terms of class-specific properties.

Basic assumptions

- adverbial classes: adverbials relate to different semantic domains
- adverbial hierarchy : SPEECH ACT > PROPOSITION > EVENT > INTERNAL > PROCESS

Our proposal

The positional flexibility of arguments and adverbials in German should be accounted for in terms of a unified account.

Frey (2015): unified approach to constituent ordering in terms of base positions & scrambling

Proposed alternative account

- base generation of both arguments and adjuncts
- base generated orders are subject to violable linear precedence (LP) constraints
- model of constraint interaction: Maximum Entropy Grammar (Goldwater & Johnson 2003; Hayes 2022)

Empirical evidence: experimental data from two offline studies

- event-internal adverbials (some adverbial types adhere to the same constraints as arguments).
- experiencer-object (EO) verbs (some dative EO-verbs with animate subjects show no preference for a specific order, animacy of subject makes a difference)

Experimental studies

- Forced Choice study on event-internal adverbials (Kiss, Pieper & Börner under review)
- Forced Choice studies on EO verbs (Masloch, Poppek & Kiss under review)

Forced Choice study on event-internal adverbials

Definition of event-internal adverbials

- event-internal adverbials relate to a participant in an event (variable orientation: SUBJ vs. OBJ).
- encode additional thematic roles

Focus on two adverbial types (both subject-oriented)

- **instrumentals** (INSTR): concrete entities used intentionally as means for an end (role: instrument)

(3) a. *Der Häftling hat einen Wärter* ***mit einer Axt*** *verletzt.*
the.NOM inmate has a.ACC jailor with a.DAT axe harmed
'The inmate harmed the jailor with an axe.'

- **subject-oriented comitatives** (COM(S)): co-presence and co-involvement in an action (role: co-agent)

(4) a. *Er verreist* ***zusammen mit einem Freund.***
he travels together with a.DAT friend
'He and a friend go on a journey.'

Forced Choice study on event-internal adverbials

ANSWER(PP<OBJ, OBJ<PP) ~ TYPE(COM(S), INSTR) × SENSE(affirmative, privative)

Minimal pair for affirmative COM(S)

(5) a. *Ich habe gehört, dass ein Minister zusammen mit einem General was unterschrieben hat. Was es war, weiß ich aber nicht.*

I have heard that a minister together with a general something signed has what it was know I but not

'I have heard that a minister decided something together with a general. But I don't know what it was exactly.'

b. *Ich habe gehört, dass ein Minister was zusammen mit einem General unterschrieben hat. Was es war, weiß ich aber nicht.*

Minimal pair for privative COM(S)

(6) a. *Ich habe gehört, dass ein Offizier ganz ohne einen Berater was entschieden hat. Was es war, weiß ich aber nicht.*

I have heard that a officer entirely without a counsellor something decided has what it was know I but not

'I have heard that an officer decided something without a counsellor. But I don't know what it was exactly.'

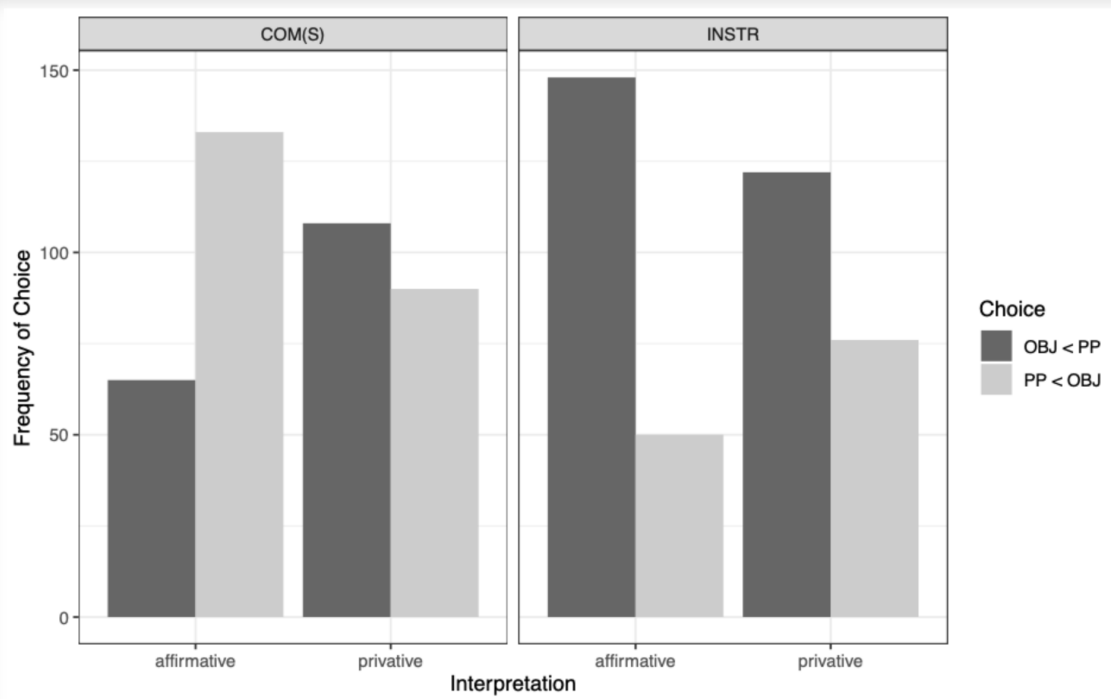
b. *Ich habe gehört, dass ein Offizier was ganz ohne einen Berater entschieden hat. Was es war, weiß ich aber nicht.*

Test environment: existential *wh*-indefinites (scrambling resistant, Diesing 1992, Haider 2010)

Forced Choice study on event-internal adverbials

72 minimal pairs (1 list: 24 test pairs, 48 filler pairs)

33 participants (Prolific)



Predictions:

- Frey & Pittner (1998), Frey (2003): general preference for PP<OBJ (minimal c-command condition)
- Maienborn (2001): general preference OBJ<PP
- Haider (2000): no preference

Results

- Affirmative COM(S) prefer PP<OBJ
- All other conditions: preference OBJ<PP

LDSL
Linguistic Data Science Lab

Forced Choice study on event-internal adverbials

Discussion

- subject-oriented event-internal modifiers neither behave uniformly across types, nor across senses
- no evidence for base-positions (contra base-position accounts)
- ordering is not fully unconstrained (contra semantic accounts)
- type/sense-specifc results suggest the influence of violable LP-constraints
  - **OBJ < INSTR (affirmative & privative)**: NP ≺ PP
  - **OBJ < privative COM(S)**: NP ≺ PP, *ANIMATE ≺ INANIMATE
  - **affirmative COM(S) > OBJ**: ACTOR ≺ NON-ACTOR, ANIMATE ≺ INANIMATE, *NP ≺ PP
  - ➢ assumption: affirmative COM take over the thematic role of a c-commanding argument

The normal argument order of EO verbs

- psych verbs: characterized by an entailment about the mental state of an experiencer
- experiencer-object (EO) verbs: psych verbs that realize the experiencer as their object: *to frighten, to please, to annoy,...*
- subdivided according to case of object: Accusative / dative EO (Belletti & Rizzi 1988)
- normal order:
  - Dative: object before subject (OS) (near consensus; see a.o. Lenerz 1977, Fanselow 1992, Wegener 1999, Haider & Rosengren 2003, Temme & Verhoeven 2016, but see Lötscher 1981, Barðdal et al. 2014)
  - (non-agentive) accusative: disputed. Theoretical literature often assumes OS (a.o. Lenerz 1977, Haider & Rosengren 2003), experimental literature favours subject before object (SO) (a.o. Scheepers et al. 2000, Temme & Verhoeven 2016, Ellsiepen & Bader 2018)

Experimental studies

(Masloch, Poppek & Kiss under review) Common features:

- Forced Choice studies, choices vary in order of subject and object
- target clauses embedded in a matrix clause and presented together with an introductory question (designed to make the context as neutral as possible information-structure-wise)
- example (from study A):

(7) *Was hat Marek berichtet?*

'What did Marek report?'

(8) a. *Marek hat berichtet, dass ein Resultat einen Forscher verblüfft hat.*

Marek has reported that a.NOM result a.ACC researcher baffled has

b. *Marek hat berichtet, dass einen Forscher ein Resultat verblüfft hat.*

'Marek reported that a result baffled a researcher.'

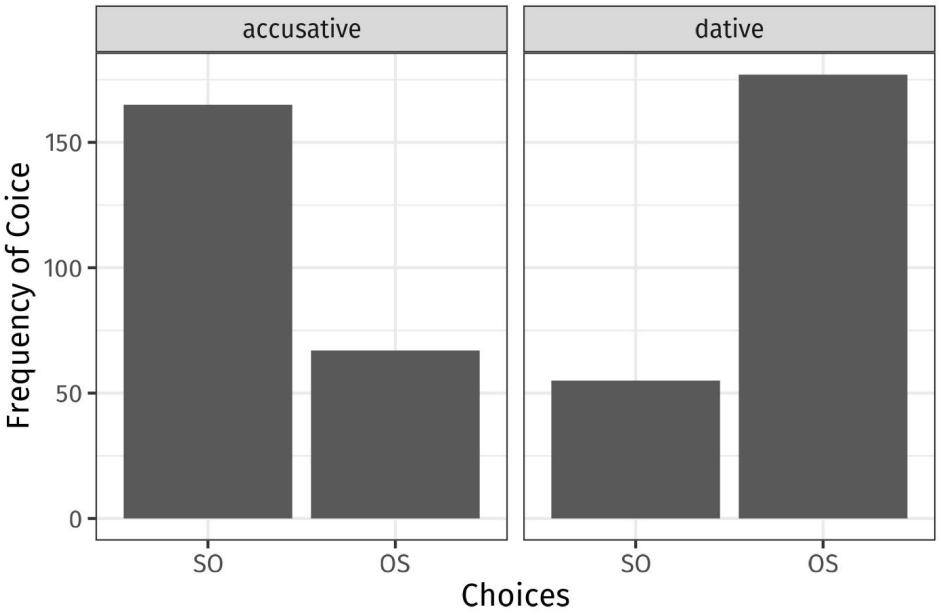
Study A

- inanimate subjects
- FC(ORDER) ~ CASE
- 8 lexicalisations per condition: 16 test items (+ 66 fillers), one list
- 40 participants recruited via Prolific (11 excluded following pre-specified exclusion criteria)
- predicted preferences (cf. Temme & Verhoeven's 2016 similar study):
  - accusative: SO (perhaps only mild preference)
  - dative: OS

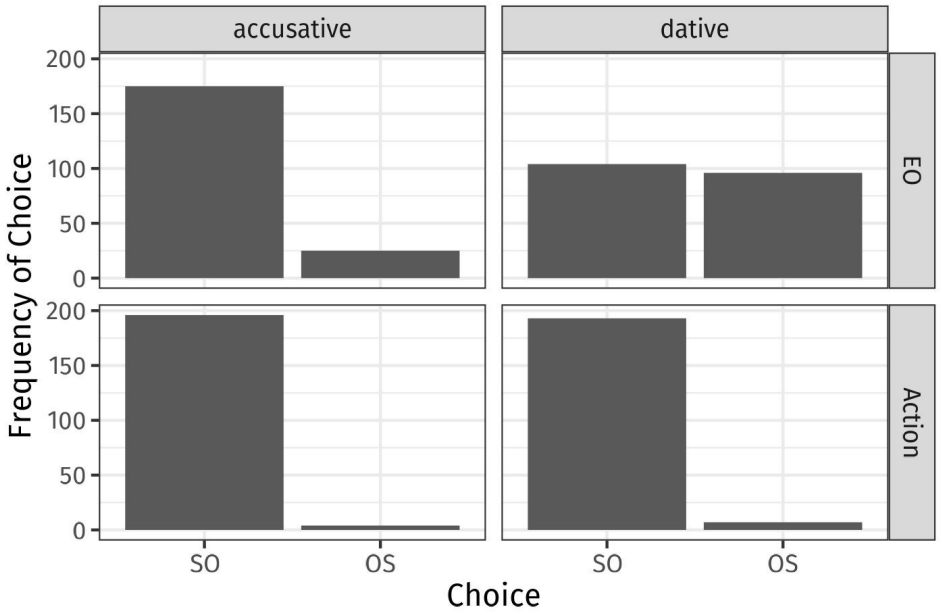
Study B

- animate subjects
- FC(ORDER) ~ AGENTIVITY × CASE
- 8 lexicalisations per condition: 32 test items (+ 64 fillers), one list
- each verb used twice (for lack of suitable verbs)
- 33 participants recruited via Prolific (8 excluded following pre-specified exclusion criteria)
- predicted preferences:
  - action verbs, accusative EO: SO
  - dative EO: OS

Overall results



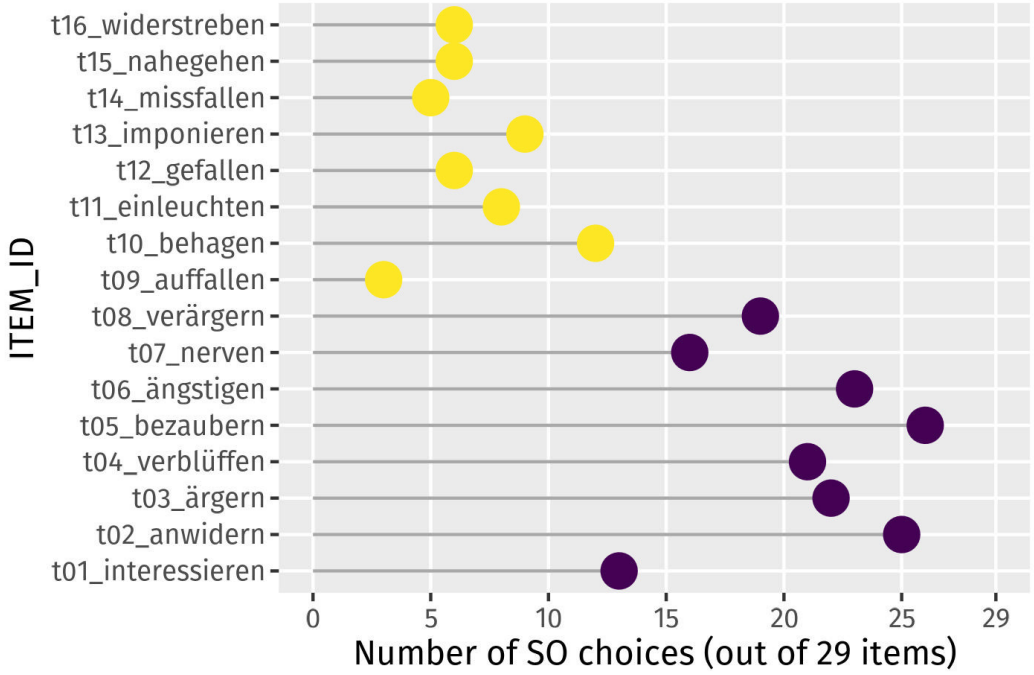
Study A: Inanimate subjects, only EO verbs



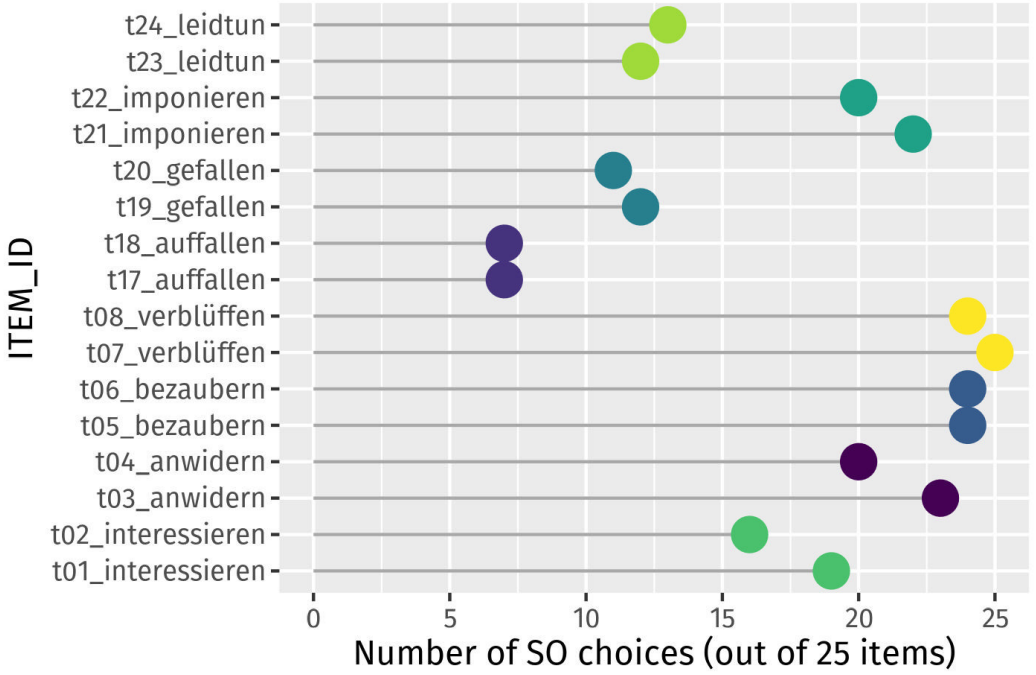
Study B: Animate subjects, EO and action verbs

LDSL
Linguistic Data Science Lab

Individual items



Study A: Inanimate subjects, only EO verbs



Study B: Animate subjects, EO and action verbs (only EO shown, action almost always SO)

LDSL
Linguistic Data Science Lab

Discussion

- At least some verbs have more than one normal order (not impossible to implement, but prima facie unexpected on base-order theories equating base and normal order)
- Animacy seems to be a crucial factor, but the strategy to reduce apparent animacy effects to ambiguity of the verb and different thematic roles (cf. e.g. Haider & Rosengren 2003: 218 sqq.; Frey 2015: 531) seems inviable here
- differences between classes: accusative EO causative, dative EO not (see e.g. Rothmayr 2009, Marelj 2013, Hirsch 2018). Rather, their subject is an object of emotion in Pesetsky's (1995) terms.
- There seem to be exceptions to this (*interessieren* 'to interest', *imponieren* 'to impress')

Modelling the data

- The model
- Constraints and their weights

The model

Basic assumptions

- Binary-branching verbal projection, no functional projections between C and maximal verbal projection, which contains the subject (Haider 2010)
- Arguments and adjuncts may combine with the verb in any order in principle
- Ordering subject to violable and interacting constraints

To model constraint interactions, we will use Maximum Entropy Grammar (Goldwater & Johnson 2003), a probabilistic variant of Optimality Theory / Harmonic Grammar assuming weighted constraints

Maximum Entropy Grammar

(10) (Goldwater & Johnson 2003: 114)

summing over all constraints

weight of the ith constraint

y's number of violations of the ith constraint in x

probability of candidate y in context / input x

$$P(y|x) = \frac{1}{Z(x)} \exp\left(\sum_{i=1}^{m} w_i f_i(y,x)\right), \text{where}$$

$$Z(x) = \sum_{y \in Y(x)} exp\left(\sum_{i=1}^{m} w_i f_i(y,x)\right)$$

sum of the values of all candidates

candidate set

Constraints

We assume the following constraints to be among the linear precedence constraints of German:

- ACTOR ≺ NON-ACTOR (ACT)
- CAUSER ≺ NON-CAUSER (CAUS)
- ANIMATE ≺ INANIMATE (ANIM)
- NP ≺ PP (NPPP)
- (OBJECT OF UNACCUSATIVE VERB ≺ SUBJECT OF UNACCUSATIVE VERB (UNACC))

Weights

EO argument order studies: participants could choose between all relevant alternatives, factors influencing argument order not inherent to the design controlled for ⇨ We can use data to compute constraint weights:

- ACT: 3.4
- CAUS: 2.4
- ANIM: 1.1
- UNACC: 0.8

Adverbial modification studies: some possible (but clearly unacceptable) options not presented to the participants. Computing weights from the missing values is only possible by stipulating values. Ranking is possible:

- ACT (+CAUSE) > NPPP > ANIM

Summary

Motivated by the observations that...

- the linearization of adverbials is not completely free and adverbials do not have fixed base positions: if an adverbial takes over a thematic role, this influences its linearization,
- animacy influences linearization even where postulating polysemy of the predicate seems implausible,
- some verbs do not have a preferred argument order in a neutral setting,

we argued for a model in which clause-level constituents are freely base-generated, but orders are subject to violable linearization constraints and compete with each other.

Open questions/future directions

- Where does optimization take place? Each node, each full phrase, sentence,...?
- full list of factors
- scope, variable binding
- focus

References

Barðdal, J., Eythórsson, T., & Dewey, T. K. (2014). Alternating Predicates in Icelandic and German: A Sign-Based Construction Grammar Account. *Working Papers in Skandinavian Syntax*, *93*, 51–101.

Belletti, A., & Rizzi, L. (1988). Psych-verbs and θ-theory. *Natural Language & Linguistic Theory*, *6*(3), 291–352. https://doi.org/10.1007/BF00133902

Choi, H.-W. (1999). *Optimizing Structure in Context: Scrambling and Information Structure*. CSLI Publications.

Diesing, M. (1992). *Indefinites*. MIT Press.

Ellsiepen, E., & Bader, M. (2018). Constraints on Argument Linearization in German. *Glossa*, *3*(1), 1–36. https://doi.org/10.5334/gjgl.258

Ernst, T. (2001). *The Syntax of Adjuncts*. Cambridge University Press.

Fanselow, G. (1992). „Ergative" Verben und die Struktur des deutschen Mittelfelds. In L. Hoffmann (Ed.), *Deutsche Syntax: Ansichten und Aussichten* (pp. 276–303). de Gruyter.

Fanselow, G. (2001). Features, θ-Roles, and Free Constituent Order. *Linguistic Inquiry*, *32*(3), 405–437. https://doi.org/10.1162/002438901750372513

References

Fanselow, G. (2003). Free Constituent Order: A Minimalist Interface Account. *Folia Linguistica*, *37*(1–2), 191–232. https://doi.org/10.1515/flin.2003.37.1-2.191

Frey, W. (1993). *Syntaktische Bedingungen für die semantische Interpretation*. Akademie Verlag.

Frey, W. (2003). Syntactic conditions on adjunct classes. In E. Lang, C. Maienborn, & C. Fabricius-Hansen (Eds.), *Modifying Adjuncts* (pp. 163–209).

Frey, W. (2015). Word Order. In T. Kiss & A. Alexiadou (Eds.), *Syntax—Theory and Analysis* (Vol. 1, pp. 514–562). De Gruyter Mouton. https://doi.org/10.1515/9783110377408.514

Frey, W., & Pittner, K. (1998). Zur Positionierung der Adverbiale im deutschen Mittelfeld. *Linguistische Berichte*, *176*, 489–534.

Goldwater, S., & Johnson, M. (2003). Learning OT constraint rankings using a Maximum Entropy model. In J. Spenader, A. Eriksson, & Ö. Dahl (Eds.), *Proceedings of the Stockholm Workshop on 'Variation Within Optimality Theory'* (pp. 113–122).

Haider, H. (2000). Adverb placement – convergence of structure and licensing. *Theoretical Linguistics*, *26*, 95–134.

References

Haider, H. (2010). *The Syntax of German*. Cambridge University Press.

Haider, H., & Rosengren, I. (2003). Scrambling: Nontriggered Chain Formation in OV Languages. *Journal of Germanic Linguistics, 15*(3), 203–267. https://doi.org/10.1017/S1470542703000291

Hayes, B. (2022). Deriving the Wug-Shaped Curve: A Criterion for Assessing Formal Theories of Linguistic Variation. *Annual Review of Linguistics, 8*, 473–494. https://doi.org/10.1146/annurev-linguistics-031220-013128

Hetland, J. (1992). *Satzadverbien im Fokus*. Narr.

Hinterhölzl, R. (2004). Scrambling, Optionality and Non-Lexical Triggers. In A. Breitbarth & H. van Riemsdijk (Eds.), *Triggers* (pp. 173–204). De Gruyter Mouton. https://doi.org/10.1515/9783110197433.173

Hirsch, N. (2018). *German psych verbs – insights from a decompositional perspective* [PhD Thesis]. Humboldt-Universität zu Berlin.

Hoberg, U. (1997). Die Linearstruktur des Satzes. In G. Zifonun, L. Hoffmann, & B. Strecker (Eds.), *Grammatik der deutschen Sprache* (pp. 1495–1680). De Gruyter.

References

Höhle, T. N. (2019). Explikationen für „normale Betonung" und „normale Wortstellung". In S. Müller, M. Reis, & F. Richter (Eds.), *Beiträge zur deutschen Grammatik: Gesammelte Schriften von Tilman N. Höhle* (2nd ed., pp. 107–191). Language Science Press. Original publication 1982 in W. Abraham (Ed.), Satzglieder im Deutschen. Vorschläge zur syntaktischen, semantischen und pragmatischen Fundierung, 75–153. Tübingen: Narr.

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

Kempen, G., & Harbusch, K. (2003). A corpus study into word order variation in German subordinate clauses: Animacy affects linearization independently of grammatical function assignment. In T. Pechmann & C. Habel (Eds.), *Multidisciplinary Approaches to Language Production* (pp. 173–181). Mouton de Gruyter. https://doi.org/10.1515/9783110894028.173

Kiss, T., Pieper, J., & Börner, A. K. (under review). *Word order constraints on event-internal modifiers*. https://lingbuzz.net/lingbuzz/006319/

Lenerz, J. (1977). *Zur Abfolge nominaler Satzglieder im Deutschen*. Gunter Narr.

Lötscher, A. (1981). Abfolgeregeln für Ergänzungen im Mittelfeld. *Deutsche Sprache, 9*, 44–60.

References

Maienborn, C. (2001). On the position and interpretation of locative modifiers. *Natural Language Semantics, 9*, 191–240.

Maienborn, C. (2003). Event-internal modifiers: Semantic underspecification and conceptual interpretation. In E. Lang, C. Maienborn, & C. Fabricius-Hansen (Eds.), *Modifying Adjuncts* (pp. 475–509). de Gruyter.

Marelj, M. (2013). Experiencing linking: Psych verbs at the interface. In E. van Gelderen, M. Cennamo, & J. Barðdal (Eds.), *Argument Structure in Flux: The Naples-Capri Papers* (pp. 135–168). John Benjamins.

Masloch, S., Poppek, J. M., & Kiss, T. (under review). *Not so peculiar after all: On the normal position of arguments of German experiencer-object verbs*. https://ling.auf.net/lingbuzz/007118

Müller, G. (1999). Optimality, markedness, and word order in German. *Linguistics, 37*(5), 777–818. https://doi.org/10.1515/ling.37.5.777

Pesetsky, D. M. (1995). *Zero syntax: Experiencers and Cascades*. MIT Press.

Pittner, K. (2004). Where syntax and semantics meet. Adverbial positions in the German middle field. In J. R. Austin, S. Engelberg, & G. Rauh (Eds.), *Adverbials: The Interplay Between Meaning, Context, and Syntactic Structure* (pp. 253–287). John Benjamins.

References

Rothmayr, A. (2009). *The Structure of Stative Verbs*. John Benjamins.

Salzmann, M. (2023). *Word order in the German middle field – scrambling*. https://ling.auf.net/lingbuzz/006866

Scheepers, C., Hemforth, B., & Konieczny, L. (2000). Linking Syntactic Functions with Thematic Roles: Psych-Verbs and the Resolution of Subject-Object Ambiguity. In B. Hemforth & L. Konieczny (Eds.), *German Sentence Processing* (pp. 95–135). Springer Netherlands. https://doi.org/10.1007/978-94-015-9618-3_4

Struckmeier, V. (2017). Against information structure heads: A relational analysis of German scrambling. *Glossa*, *2*(1), 1–29. https://doi.org/10.5334/gjgl.56

Temme, A., & Verhoeven, E. (2016). Verb class, case, and order: A crosslinguistic experiment on non-nominative experiencers. *Linguistics*, *54*(4), 769–813. https://doi.org/10.1515/ling-2016-0018

Wegener, H. (1999). Zum Bedeutungs- und Konstruktionswandel bei psychischen Verben. In H. Wegener (Ed.), *Deutsch kontrastiv: Typologisch-vergleichende Untersuchungen zur deutschen Grammatik* (pp. 171–210). Stauffenburg.

An integrative constraint-based account of constituent linearization in the German midfield

Thank you for your attention!

Alicia Katharina Börner, Simon Masloch, Tibor Kiss

alicia.boerner/simon.masloch/tibor.kiss@rub.de

LDSL
Linguistic Data Science Lab