The Normal Argument Order of German Experiencer-Object Verbs

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Much of what I will present today is joint work with Johanna Poppek, Tibor Kiss and Katharina Börner. Most parts are published in (Masloch & Poppek & Kiss 2024; 2025)

Abbreviations **BF**: Bayes Factor, **CrI**: 95 % credible interval, **EO**: expereiencer-object, **OS**: object before subject, **SO**: subject before object

1 Introduction

1.1 Experiencer-Object Verbs

- Psych verbs loosely definable as verbs that indicate the mental state of an individual (the experiencer) (cf. Landau 2010: 137).
- Since Belletti & Rizzi's (1988) work on Italian customary to distinguish three classes:
  1. experiencer subject: *lieben* 'to love', *mögen* 'to like',…
  2. accusative experiencer object (EO): *ärgern* 'to annoy', *erheitern* 'to amuse', *wundern* 'to wonder',…
  3. dative EO: *gefallen* 'to appeal to', *imponieren* 'to impress',…
- EO verbs often linked with non-canonical behaviour (Landau 2010)
- Dative and sometimes (some) accusative EO verbs have been argued to be unaccusatives (Belletti & Rizzi 1988; Fanselow 1992; Landau 2010; Hirsch 2018): "subject" originates in object position, is c-commanded by object at some point

I will show that one does not need to adopt this position to explain argument order preferences and reflexive binding behaviour of German EO verbs

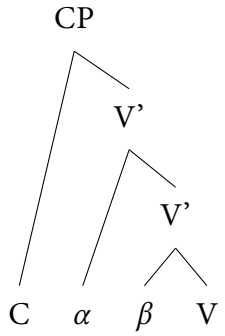
1.2 The German Clause

German is a verb-final verb-second language.
Topic Today:

- Midfield (area between position of complementiser / finite verb in verb-second clauses, and verbal position at end of clause)
- Full NPs, arguments

Assumption: Binary branching (Haider 2010)

(3)



1.3 Normal Order

Linearisation of (full NP) arguments in midfield rather free: All orders strictly speaking grammatical, but not equally felicitous in all contexts.

(4) a. Anna meinte, dass der Tim den Tom getreten hat.
Anna said that the.NOM Tim the.ACC Tom kicked has

b. Anna meinte, dass den Tom der Tim getreten hat.
'Anna said that Tim kicked Tom.'

Normal order: Ordering that is contextually least restricted (comparison set: clauses differing only in order and/or stress). The ordering used when the whole clause is in focus is the normal one (Höhle 2019)

1.4 Base Order

- Base Order: Arises when theories assume that certain elements must combine with head in certain order
- Additional mechanism needed to explain deviations from it
- Frequently assumed that base order is predicate-specific and corresponds to normal order usually observed with predicate (i.a. Haider 1993; Frey 2015)
- Not necessary: base order ≠ normal order (i.a. Müller 1999); free base generation (i.a. Fanselow 2001; 2003)
- Standard view: base order, but Salzmann (2025) shows that many arguments for it inconclusive

I will argue that argument-ordering preferences with EO verbs pose problems for the idea of a predicate-specific base order and that data from reflexive binding into their subject do not suggest that anything but the surface order is relevant.

1.5 Outline

- Forced-choice experiments show:
  - Accusative EO verbs have SO normal order

  - (Some) Dative EO: OS with inanimate subjects, (practically) no preference with animates. Animacy effect ⇒ Properties of elements ordered themselves can interact with thematic properties to determine linearisation

  ⇒ Problematic for approaches that identify normal order with predicate-specific base order (i.a. Frey 1993; Haider & Rosengren 2003)
- Can be captured in model with weighted and potentially conflicting linearisation constraints
- Base order independent from normal order? Acceptability judgment study on reflexive binding into subject shows: surface linearisation decisive (⇒ no evidence for base-order found)

Free base generation in core configurational syntax + system that determines preferred choices by integrating several factors most economic choice

2 Normal Order

2.1 Three Experiments on the Normal Argument Order of EO Verbs

E^{NO}_{inanim} and E^{NO}_{anim} are study A and B from (Masloch & Poppek & Kiss 2024), on which this section is based, E^{NO}_{dat} is a pre-study originally intended for, but not used in (Kiss & Börner & Masloch 2025).

- 3 forced-choice (FC) experiments: participants shown two linearisation variants (SO and OS), had to choose preferred one:
  - E^{NO}_{inanim}: Dative and accusative EO verbs, inanimate subjects
  - E^{NO}_{anim}: Dative and accusative EO and action verbs, animate subjects
  - E^{NO}_{dat}: Dative EO verbs, inanimate and animate subjects
- Target clauses embedded ⇒ no prefield effects (cf. Frey 2006)
- Introductory question making embedded clause answer focus ⇒ Whole target clause in focus ⇒ Normal order (per definition, Höhle 2019)
- Other factors influencing linear order (definiteness, weight,…) controlled for.

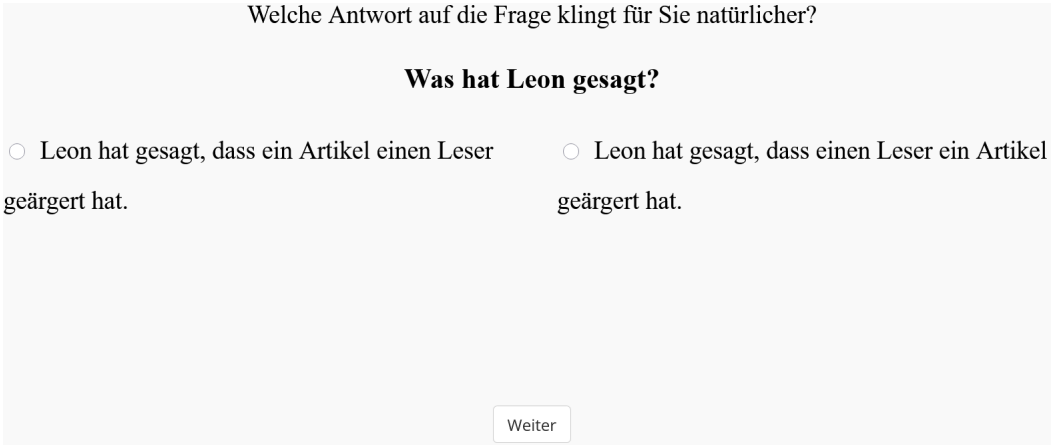


Figure 1: Example item from E^{NO}_{inanim}. Text: 'Which answer to the question sounds more natural to you. What did Leon say? Leon has said that an.NOM article a.ACC reader annoyed has. Leon has said that a.ACC reader an.NOM article annoyed has. Continue.'

2.2 Literature

experimental study, CORPUS STUDY, theoretical work

	SO	OS	no preference
ACC	*(Scheepers & Hemforth & Konieczny 2000; Temme & Verhoeven 2016; Verhoeven & Temme 2017; Ellsiepen & Bader 2018)*, (ELLSIEPEN & BADER 2018; VERHOEVEN 2015: ANIM), (Fanselow 1992; Hirsch 2018: eventive)	(Lenerz 1977; Haider & Rosengren 2003)	(VERHOEVEN 2015: ANIMATE S), (Primus 2004; Hirsch 2018: stative)
DAT		*(Temme & Verhoeven 2016; Fanselow & Häussler & Weskott 2016:* AUX *sein)*, (VERHOEVEN 2015: INANIM), (Lenerz 1977; Fanselow 1992; Wegener 1999; Haider & Rosengren 2003; Hirsch 2018)	*(Fanselow & Häussler & Weskott 2016:* AUX *haben)*, (VERHOEVEN 2015: ANIM), (Lötscher 1981: anim; Barðdal & Eythórsson & Dewey 2014)

Table 1: Literature overview normal order EO

2.3 Verbs Used

Goals:

1. Avoiding noise: Not violating usage preferences etc.
2. Cover potential subclasses (cf. i.a. Hirsch 2018)

- Using GerEO (Poppek & Masloch & Kiss 2022; Masloch et al. 2021) to check for compatibility with (in-)animate subjects, non-psych usages etc.
- Among candidates verbs that take part in different argument structure alternations, have different morphological structures, belong to different classes according to Hirsch (2018) chosen.
- For E^{NO}_{anim}only verbs scoring low on agentivity tests in (Verhoeven 2014; Hirsch 2018).

2.4 Statistics

I will use Bayesian models (introductions aimed at linguists: Vasishth 2023; Franke 2023; Nicenboim & Schad & Vasishth 2025) fit with `Stan` in R via `brms` (Stan Development Team 2022; R Core Team 2023; Bürkner 2017):

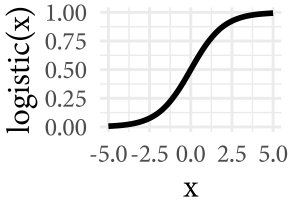


Figure 2: Logistic function

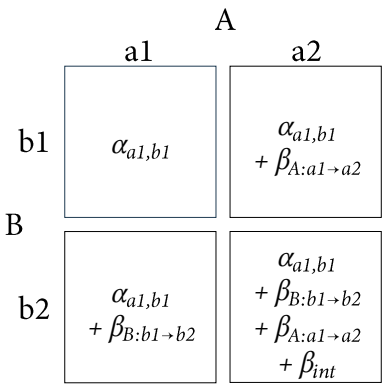


Figure 3: Notational conventions treatment-coded effects exemplified for 2 × 2

- Probability distribution on parameters. POSTERIOR distribution computed from PRIOR (How likely are parameter values a priori?) and LIKELIHOOD function (How likely are data under parameter value)
- Notational conventions description posteriors:
  - $\hat{\beta}$: mean of marginal posterior for parameter β
  - 95 % credible interval: 2.5^{th} and 97.5^{th} percentile of posterior distributions
- Hypothesis testing: Bayes Factors
  - "BF_{12} indicates the evidence that the data provide for $\mathscr{M}_1$ over $\mathscr{M}_2$ [...], which of the two models is more likely to have generated the data" (Schad et al. 2023: 1406)
  - One of models compared will always be null model here: parameter of interest set to point 0.
  - BF_{10}: $> 1 \Rightarrow$ evidence *against* 0
  - $\text{BF} > 3$ / $< \frac{1}{3}$: moderate evidence; > 10 / $< \frac{1}{10}$: strong evidence (Jeffreys 1939)
- Advantage: Possible to quantify evidence *for* 0
- Conditional effects (e.g. value for cell a2,b2 in Figure 3) often interesting

- Computed using `emmeans`, BFs for them with `bayestestR` (Lenth 2023; Makowski & Ben-Shachar & Lüdecke 2019)
- Reminder: Conditional effect of 0 in logistic model corresponds to 50/50 distribution

2.5 $\text{E}^{\text{NO}}_{\text{inanim}}$: Inanimate subjects

Which argument order is preferred with inanimate subjects in a neutral setting once all other factors are controlled for with accusative and dative EO verbs?

(5) FC(ORDER) ~ CASE

- 16 test items (8 lexicalisations for each of the two conditions)
- 6 calibration items, 6 control items, 10 attention items, 34 other filler

(6) Predictions $\text{E}^{\text{NO}}_{\text{inanim}}$:
  a. Accusative: SO preferred
  b. Dative: OS preferred

Temme & Verhoeven (2016) performed similar study (other factors tested, verb-second clauses, definite NPs): 59 % SO with accusative, 68 % OS with dative.

40 participants, 11 surveys excluded

Model:

- `Order ~ 0 + Intercept + case + (1 + case | workerId) + (1 | ITEM_ID)`
- Priors (relatively broad, based on Temme & Verhoeven's (2016) results): $\alpha_{acc} \sim \mathcal{N}(-0.36, 1)$, $\beta_{\text{CASE:ACC}\to\text{DAT}} \sim \mathcal{N}(1.12, 1)$, SDs group-level effects $\sim \mathcal{N}_+(0, 1)$, correlations group-level effects $\sim LKJcorr(1)$

- *Moderate SO preference with accusatives*: $\hat{\alpha}_{acc} = -0.91$ $[-1.46, -0.35]$, corresponding to ca. 70 % of choices [59.8 %, 85 %]. $BF_{10} = 27$ ($BF_{10} < 1$ for some models with priors assuming that all EO verbs have OS preference in sensitivity analysis.)
- *Difference between classes*: $\hat{\beta}_{\text{CASE:ACC}\to\text{DAT}} = 2.18$ $[1.42, 2.93]$ $BF_{10} > 1000$.
- *OS with dative*: ca. 78 % [66.9 %, 87.6 %]. Model with dative as reference level has $\hat{\alpha}_{dat} = 1.18$ $[0.62, 1.75]$, $BF_{10} = 139$

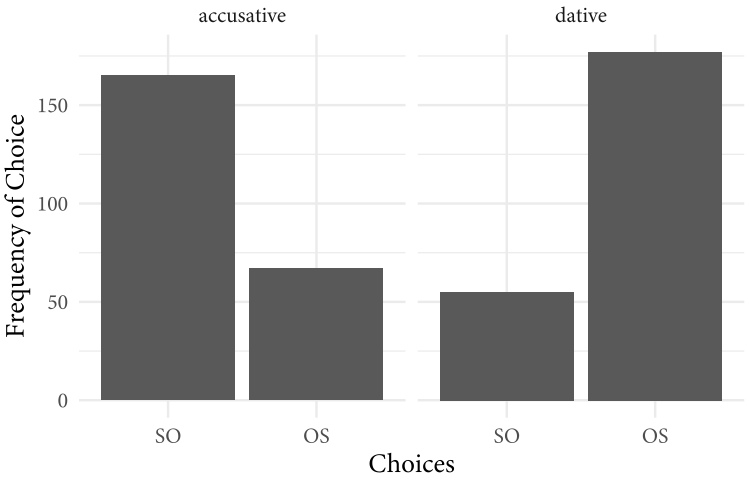


Figure 4: Empirical distribution choices E^{NO}_{inanim}

2.6 E^{NO}_{anim}: Animate Subjects

How do verbs behave once *all* factors equalled out?

- Possible to include agent-patient verbs (animate subjects) as comparison classe
- Agentive readings to be avoided: Only verbs scoring low on agentivity tests in (Verhoeven 2014; Hirsch 2018) used

(7) FC(ORDER) ~ AGENTIVITY × CASE

- ORDER: SO / OS
- AGENTIVITY: EO / action (within participants, between items)
- Object CASE: accusative / dative (within participants, between items)

- 8 lexicalisations per condition, 32 test items in total.
- Low number of suitable verbs ⇒ Each used in *two* test items

(8) Predictions E^{NO}_{anim}:

a. Accusative EO: SO
b. Dative EO: OS.
c. Action: SO

32 participants, 25 surverys entered analysis

Model:

- `answer ~ 0 + Intercept + case * agentivity + (1 + case * agentivity | workerId) + (1 | verb/ITEM_ID)`
- Priors (mildly informative, based on E^{NO}_{inanim}): $\alpha_{dat,EO} \sim \mathcal{N}(-1, 1)$, $\beta_{\text{CASE:ACC}\to\text{DAT}} \sim \mathcal{N}(2, 1)$, $\beta_{\text{AG:EO}\to\text{ACT}} \sim \mathcal{N}(3, 1)$, $\beta_{\text{CASE}\times\text{AG}} \sim \mathcal{N}(-2, 1)$, SDs group-level effects $\sim \mathcal{N}_+(0, 1)$, correlations group-level effects $\sim LKJcorr(1)$

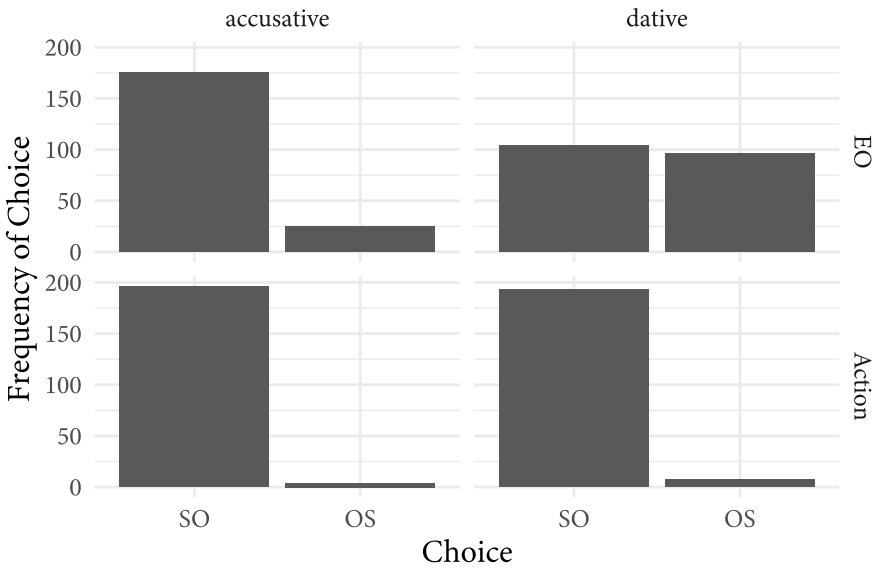


Figure 5: Empirical distribution choices E^{NO}_{anim}

- *No preference with dative EO verbs*: $\hat{\alpha}_{dat,EO} = 0.04\,[-0.79, 0.86]$ corresponding to 50.9 % [31.1 %, 70 %] predicted SO choices. $BF_{10} = 0.25$ (ca. 0.5 to 0.25 in sensitivity analysis): anecdotal to moderate evidence for *absence* of an ordering preference
- *Clear difference between acc and dat EO*: $\hat{\beta}_{\text{CASE:DAT}\to\text{ACC}} = 2.4\,[1.33, 3.53]$, $BF_{10} = 176$.
- *Strong SO preference for accusative EO*: 91.2 % [83.1 %, 97.8 %], $BF_{10} > 1000$
- *Clear difference between dative EO and action verbs*: $\hat{\beta}_{\text{AG:EO}\to\text{ACT}} = 3.74\,[2.57, 4.95]$, $BF_{10} > 1000$.
- *Clear SO preference with dative action verbs*: 97.4 % [94.3 %, 99.6 %] predicted, $BF_{10} > 1000$
- Wide credible intervals and BF around 1 for interaction. Clear *SO preference with accusative action verbs*: 98.7 % [96.8 %, 99.9 %], $BF_{10} > 1000$
- *Strong evidence for a difference between accusative EO and action verbs*: BF_{10} based on comparison of conditional means: 22 (> 9 for all models in sensitivity analysis)
- Large SD of verbs' group-level intercept: $\hat{\sigma} = 1\,[0.52, 1.64]$, but SD for items nested within them much smaller: $\hat{\sigma} = 0.24\,[0.01, 0.76]$.

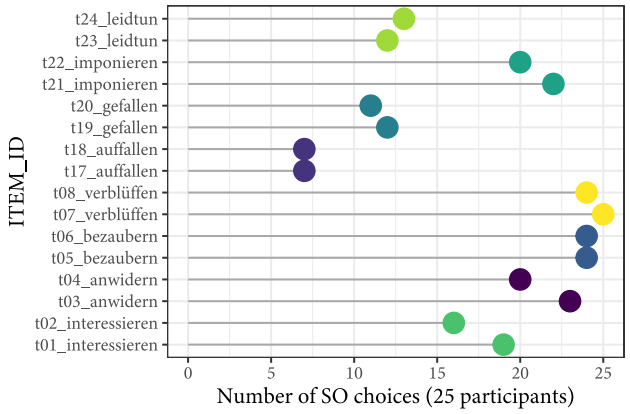


Figure 6: SO choices individual items E^{NO}_{anim}

- Items containing same verb behave similarly
- *gefallen* 'to appeal to' and *leidtun* 'to feel sorry for' lack preference, *Imponieren* 'to impress' SO preference (agentive reading!), *auffallen* 'to strike' OS (perfect tense auxiliary *sein*, cf. Fanselow & Häussler & Weskott 2016)
- Not (solely) due to variation between speakers (but maybe for *imponieren*, *interessieren*)

2.7 E^{NO}_{dat}: Individual Verbs

Are there really verbs that lack an ordering preference with animate subjects and does animacy really make a difference?

Differences between verbs: Individual verb as factor

(9) FC(ORDER) ~ ANIMACY × VERB

- ORDER: SO / OS
- ANIMACY: animate / inanimate subject (within participants, between items)
- VERB: *gefallen* 'to appeal to', *missfallen* 'to displease', *behagen* 'to please', *fehlen* 'to miss' (within participants, between items)

- 4 lexicalisations per condition, 32 test items in total, 2 lists ⇒ each participant saw each verb twice in each animacy condition (4 times in total).
- 64 filler items, among them 6 calibration, 10 attention, 10 control
- Verbs chosen from nonagentive dative EO verbs selecting *haben* as perfect tense auxiliary by lowering inclusion criteria. *Leidtun* 'to feel sorry' not used: May be different predicate with inanimate (≈ 'to regret') than with animate subjects (≈ 'to feel sorry for')
- 59 participants whose data passed eligibility screening (30 rejected)

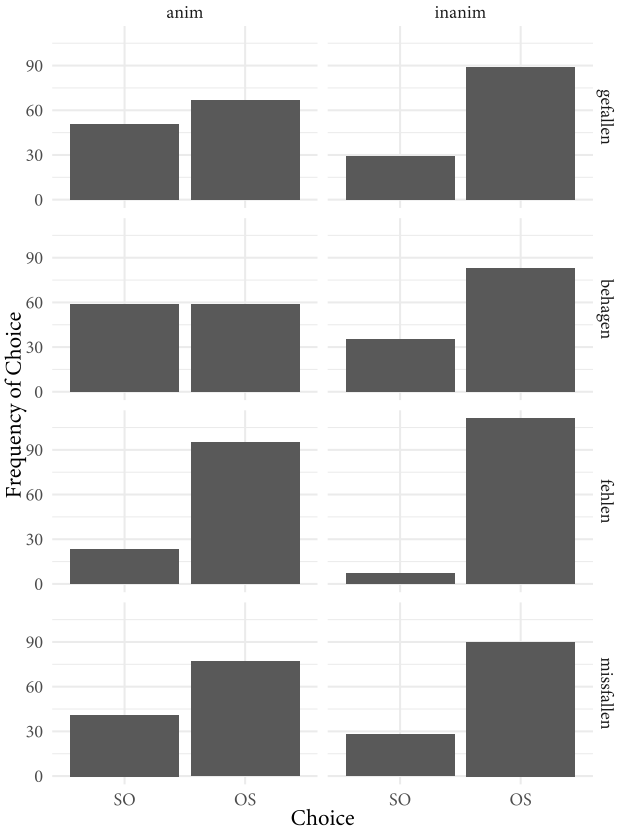


Figure 7: Empirical distribution choices E^{NO}_{dat}

VERB	ANIMACY	estimate	CrI	BF_{10}	sensitivity
gefallen	*animate*	41.4 %	[31.8 %, 50.9 %]	1.85	0.2–3.7
behagen	*animate*	49.5 %	[38.1 %, 61 %]	0.26	0.05–0.32
missfallen	*animate*	37 %	[26.1 %, 48.2 %]	3.5	0.93–5.13
fehlen	*animate*	16.4 %	[9.4 %, 23.8 %]	> 1000	all > 1000
gefallen	*inanimate*	19.8 %	[12.1 %, 27.9 %]	> 1000	all > 847
behagen	*inanimate*	25.6 %	[15.6 %, 35.7 %]	272	all > 10
missfallen	*inanimate*	17.1 %	[9.7 %, 24.9 %]	> 1000	all > 635
fehlen	*inanimate*	6.5 %	[2.9 %, 10.3 %]	> 1000	all > 1000

Table 2: Conditional effects model E^{NO}_{dat}. Sensitivity analysis with 81 models (informative priors based on E^{NO}_{anim} & E^{NO}_{inanim}, priors assuming OS throughout, neutral priors)

(10) Predictions E^{NO}_{dat}:

a. No preference in animate condition for all verbs

b. Effect of animacy (ca. 1 on logit scale)

Model:

- `answer ~ 0 + Intercept + animacy + verb + (1 + animacy + verb | workerId) + (1 | ITEM_ID)` Reference levels *gefallen*, animate. (Including Interaction would make interpretation more complicated and does not make model better according to Leave-one-out cross-validation)
- Informative priors based on E^{NO}_{inanim} and E^{NO}_{anim}: $\alpha_{animate,gefallen} \sim \mathcal{N}(0, 0.5)$, $\beta_{\text{ANIMACY:ANIM}\rightarrow\text{INANIM}} \sim \mathcal{N}(-1, 0.6)$, $\beta_{\text{VERB}:gefallen\rightarrow behagen}$, $\beta_{\text{VERB}:gefallen\rightarrow missfallen}$, $\beta_{\text{VERB}:gefallen\rightarrow fehlen} \sim \mathcal{N}(0, 0.7)$, $\mathcal{N}(0, 1)$ for SDs of group-level effects, $LKJcorr(1)$ for correlation parameters

- OS preference with inanimate subjects (all verbs)
- Evidence *against* preference with *behagen* 'to please' with animate subjects
- Data do not provide evidence for or against existence of *some* preference with *gefallen* 'to appeal to', but only values corresponding to an at most very small preference are plausible
- *fehlen* 'to miss / lack': Issue with some items
- *Weak* preference for OS with *missfallen* 'to displease', but evidence anecdotal at best

2.8 Discussion

Challenge for approaches assuming predicate-dependent base-order corresponding to normal order (e.g. Haider & Rosengren 2003; Frey 1993):

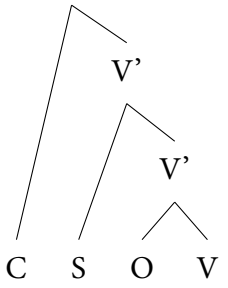
- Animacy, a feature of elements ordered independent of predicate, influences linearisation in neutral setting
- No (strong) preference at all with animate subjects for some verbs (two base orders to be expected under certain well-defined circumstances in Haider 2000: but these do not hold here and there should be no animacy effect then)
- Differences in strength of linearisation preference even between classes with same general tendency (accusative EO vs. action)

⇒ Results fit better with theories that do not assume ordering preference in neutral context to be determined by predicate-dependent base order, but where properties of elements ordered themselves are can influence even normal order.
Possible while assuming fixed base-order (as in i.a. Müller 1999) or free base-generation.

2.9 Analysis

- Ordering preferences are determined by violable and interacting linearisation constraints (cf. i.a. Uszkoreit 1986; Jacobs 1988; Müller 1999; Ellsiepen & Bader 2018)
- Background assumptions:
  - No functional projections between V and C (Haider 2010)
  - Binary branching (Haider 2010)
  - No fixed base order

(11) a.



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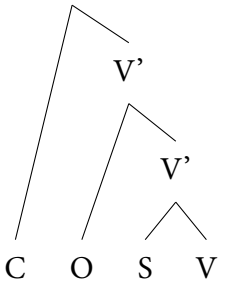

- Maximum-Entropy Grammar (Goldwater & Johnson 2003; Hayes 2022) is a probabilistic variant of Optimality Theory / Harmonic Grammar.
- Harmony Values compared across candidates to compute probabilities:

(12) (Goldwater & Johnson 2003: 114)

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

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

- x: context, $\mathcal{Y}(x)$: a set of candidates, m: number of constraints w_i: weight of constraint f_i, $f_i(y,x)$: number of violations of f_i by candidate y in x
- Long research tradition on factors influencing linearisation in German (i.a. Lenerz 1977; Lötscher 1981; Uszkoreit 1986; Jacobs 1988; Hoberg 1997; Müller 1999; Ellsiepen & Bader 2018)

- Constraints here:

  AG agent ≺ non-agent
  CAUS causer ≺ non-causer
  ANIM animate ≺ inanimate
  SEIN object of verb selecting *sein* as its perfect tense auxiliary ≺ subject of verb selecting *sein* as its perfect tense auxiliary

- Subject is agent with action verbs
- Subject is causer with accusative (except for *betrügen* 'to deceive'), but not dative action verbs (but this will not really make a difference)
- German accusative but not dative EO verbs are causative (i.a. Rothmayr 2009; Marelj 2013; Hirsch 2018)
- Causers and objects of emotion to be distinguished (Kenny 1963; Pesetsky 1995):

(13) Die Nachrichtensendung hat Anna gefallen.
the news.broadcast.NOM has Anna.DAT appealed.to
'Anna liked the news broadcast.' [news broadcast is object of the emotion]

(14) Die Nachrichtensendung hat Anna geängstigt.
the news.broadcast.NOM has Anna.DAT frightened
'The news broadcast frightened Anna.' [news broadcast can be mere causer of the emotion]

- For (14) to be true, Anna need not be afraid of news broadcast. Suffices if she fears coming of war after watching news.
- Anna needs to evaluate news broadcast itself in (13) (see also Fanselow 1992: 292).

A Maximum-Entropy Grammar is essentially a multinomial / binomial logistic regression model

Weights computed based on experimental data (without data for *imponieren* 'to impress', *interessieren* 'to interest', *fehlen* 'to miss') with Bayesian logistic regression model:

- `answer ~ -1 + agent + causer + sein + anim + (0 + agent + causer + sein + anim | workerId) + (1 | example)`
- mildly informative neutral priors: $Student\_t_7(0, 1.7)$ for population-level effects (i.e. constraint weights. Has 95 % credible interval $\approx [-4, 4]$.), $\mathcal{N}(0, 1)$ for SDs of group-level effects, $LKJcorr(1)$ for correlations.

(15) AG: −3.34 [−4.32, −2.62]
CAUS: −2.43 [−2.88, −2.02]
ANIM: −1.2 [−1.53, −0.9]
SEIN: −0.99 [−1.77, −0.34]

- Group-level intercept items: idiosyncratic properties of items may influence linearisation
- Group-level slopes participants: participants may differ in constraint weightings ⇒ individual Maximum Entropy Grammar for everyone, model provides comparison of variation: only for ANIM serious ($\hat{\sigma}_{u_3} = 0.90$ [0.58, 1.24])

Example:

(16) dass ein Artikel einen Leser geärgert hat
that a.NOM article a.ACC reader annoyed has
'that an article annoyed a reader'

	Ag	Caus	Anim	Sein	Σ	e^{Σ}	P
	−3.34	−2.43	−1.2	−0.99			
dass ein Artikel einen Leser geärgert hat			1		−1.2	0.3	0.77
dass einen Leser ein Artikel geärgert hat		1			−2.43	0.09	0.23

Table 3: Example order determination accusative EO (16)

Condition	marginal estimate	lower CrI	upper CrI	%	lower CrI	upper CrI	% observed
accusative action	5.77	4.87	6.73	99.69	99.24	99.88	98
dative action	3.34	2.55	4.21	96.59	92.75	98.54	96.5
accusative EO animate	2.43	2.01	2.86	91.91	88.19	94.59	93.33
accusative EO inanimate	1.23	0.79	1.67	77.35	68.72	84.13	74.88
dative haben EO animate	0			50			43.83
dative haben EO inanimate	−1.20	−1.52	−0.90	23.11	17.91	28.97	25.85
dative sein EO animate	−0.99	−1.72	−0.31	27.05	15.17	42.29	28
dative sein EO inanimate	−2.19	−2.97	−1.49	10.03	4.86	18.47	15.52

Table 4: Conditional predictions of model on logit and percentage scale (predicted share of SO responses) together with observed percentages in dataset used to train model. (No CrIs displayed for *dative haben EO animate* because linear predictor there 0 by design since no constraints applicable and no intercept.

2.10 Excursus: 'Word Order Freezing'

We (hopefully) saw (in a short informal experiment not mentioned in this handout) that in sentences without formal marking, interpretational ambiguities arise with *gefallen* 'to appeal to', while there is a preference to interpret two NPs unmarked for case as SO with *treten* 'to kick'.

Fanselow (2015): Where ambiguities might arise due to case syncretism, preferred order is the one that would also be preferred without it

Independent evidence for lack of ordering preference with *gefallen* 'to appeal to' with animate subjects

3 Binding

This section is based on (Masloch & Poppek & Kiss 2025)

3.1 Base Order ≠ Normal Order? Reflexive Binding

Argument order may be fixed in configurational syntax, but additional mechanism determines preferred order (cf. Reape 1994; Müller 1999)

I will use data from reflexive binding to argue against that.

Will binding data be helpful?

- Usual assumption: Scrambling does not reconstruct for binding ⇒ surface positon counts (Haider 2017)
- Minority opinion: Scrambling reconstructs for binding, a c-command requirement can be fulfilled at an early (or any) (Müller 1999; Grewendorf & Sabel 1999)

Müller (1999), who assumes that there is fixed base order, uses binding data to argue for it.

3.2 Backward binding with EO verbs

EO verbs may be special: Long-standing debate about so-called BACKWARD BINDING into the subject of EO verbs (i.a. Belletti & Rizzi 1988; Bouchard 1995; Pesetsky 1995; Pollard & Sag 1992; Cheung & Larson 2015).

(17) Italian (Belletti & Rizzi 1988: 312)

a. Questi pettegolezzi su di sé preoccupano Gianni più di ogni altra cosa.
'These gossips about himself worry Gianni more than anything else.'

b. * Questi pettegolezzi su di sé descrivono Gianni meglio di ogni biografia ufficiale.
'These gossips about himself describe Gianni better than any official biography.'

Explanations in the literature:

- Unaccusativity of (some subclasses of) EO verbs: (i.a. Belletti & Rizzi 1988; Cheung & Larson 2015)
  - Subject originates *below* object
  - C-command *does* hold at some level of representation / during derivation
  - This suffices for c-command constraint to be fulfilled
- Logophoric / point-of-view-based binding, exempt anaphors: Reflexives in the relevant examples are not subject to the classical Principle A, but this is *not* due to a special property of EO verbs. (e.g. Pollard & Sag 1992; Bouchard 1995)

Logophoric binding or exemption from Principle A not attested with German reflexive *sich* (Kiss 2012).

3.3 Backward binding with German EO Verbs

- If Backward binding with EO verbs only due to logophoricity/exemption
  ⇒ *not* possible in German.
- If it *is* possible, unaccusativity (⇒ OS base order) could provide an explanation if reconstruction is possible

Predictions for acceptability of binding into subject in SO clause:

	unaccusative	not unaccusative
base-generation or no reconstruction	×	×
fixed base-order OS + reconstruction	✓	×

- Acceptability of examples analogous to (17a) disputed (cf. Kiss 2012; Platzack 2012; Fischer 2015; Temme & Verhoeven 2017).
- Fischer (2015): effect of linear order

(18) (Kiss 2012: 161) (b. acceptable according to Fischer (2015))

a. * Ich glaube, dass die Bilder von sich den Kindern gefielen.
I believe that the.NOM pictures.NOM of REFL the.DAT children.DAT appealed.to

b. */✓ Ich glaube, dass den Kindern die Bilder von sich gefielen.
I believe that the.DAT children.DAT the.NOM pictures.NOM of REFL appealed.to
'I believe that the children liked the pictures of themselves'

3.4 E^B

Is reflexive binding into subject of EO verbs possible in German?

2 × 2 Acceptability rating study

- ORDER: SO, OS (within items, between participants)
- CASE: of object. Accusative or dative. (between items, within participants)

Participants see each item in one ordering condition only, but each of them rates the same number of SO and OS sentences.

Criteria items:

- Verb-final clause of interest embedded in matrix clause
- Inanimate NP subject containing embedded PP containing *sich*
- NPs selected based on analysis of frequent NP-PP combinations
- Object as only possible antecedent

- 8 test items containing accusative-object EO verb, 8 containing dative EO verb
- 64 (related and unrelated) filler items (6 calibration items, 16 control items, 10 attention items)

Figure 8: Example item from E^B. Text: It can be assumed that the.DAT President.of.Parliament.DAT the.NOM reporting.NOM about REFL disliked has 'It can be assumed that the President of Parliament disliked the reports about himself', Answer options: 'completely unnatural', 'rather unnatural', 'no tendency', 'rather natural', 'completely natural'. 'Continue'

Hypotheses & Predictions:

- Given sentence structure assumed, possible antecedent can only c-command reflexive if it precedes it in linear order.
- Reflexive is always embedded in subject and object is only possible antecedent.

(19) Main Hypothesis
In the German midfield, the object of an experiencer-object verb cannot bind a reflexive embedded in a subject preceding it.

	dative	accusative
OS	high	medium
SO	low/medium	low

- OS: Reflexive c-commanded by antecedent. Linearisation preference violated with accusative verbs
- SO: Reflexive *not* c-commanded. Maybe cooperative participants are willing to give a mediocre rating if if example would be grammatical in 'correct' order (dative EO)

If base order OS and c-command constraint can be fulfilled anywhere: Everything should be acceptable (but order may have influence).

90 participants, 48 surveys entered analysis

- Bayesian cumulative generalised linear mixed model with logit link and flexible thresholds:
  `ANSWER ~ case * order + (1 + case * order | workerId) + (1 + order | ITEM_ID)`
- Mildly informative priors (all βs $\sim \mathcal{N}(0, 4)$)
- Factors sum-coded: *dative* and *OS* as 1, *accusative* and *SO* as -1:
  - β_{ORDER}: overall effect of ORDER

- β_{Case}: overall difference between accusative and dative
- $\beta_{\text{Order×Case}}$: positive value would correspond to preference for normal order irrespective of other factors including binding constraints (−1 for *dative SO*, *accusative OS*; 1 for *dative OS* and *accusative SO*)

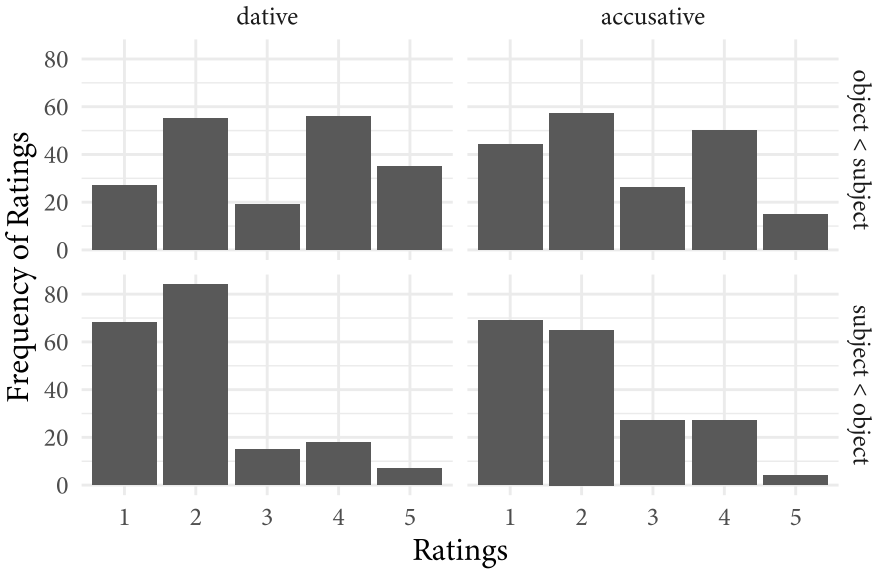

Figure 9: Distribution of responses E^B

- Population-level effects:
  - $\hat{\beta}_{\text{Order}} = 0.79$ [0.47, 1.12], $\text{BF}_{10} = 126.7$: *Ratings are better if binding not backward*
  - $\hat{\beta}_{\text{Case}} = 0.16$ [−0.24, 0.57], $\text{BF}_{10} = 0.074$: Evidence against effect of case.
  - $\hat{\beta}_{\text{Order×Case}} = 0.23$ [−0.06, 0.52], $\text{BF}_{10} = 0.138$. Evidence against interaction effect.
- Group-level intercepts:
  - *Participants differ strongly*: 1.57 [1.22, 2]. (Explorative investigation of data: 12 Participant reject (almost) all test items.)
  - Items also seem to differ: 0.74 [0.45, 1.18]. (Explorative investigation: Some items receive almost only low scores in *both* conditions)

3.5 Discussion

- Main Hypothesis confirmed:
  Binding into the subject of German of EO verbs is licit only if it is *not* backward
  ⇒ No need to postulate a peculiar syntactic structure for German EO verbs to account for their (reflexive) binding behaviour.
- No evidence for reconstruction. Binding patterns follow surface order.
  ⇒ No need to assume fixed base order to explain patterns.
  (Caveat: If fixed base-order is SO and Principle A anywhere condition, data compatible)

4 Conclusion

- Linearisation preferences with EO verbs in German even more complex than previously assumed
- Pose challenges for accounts of German clausal syntax that assume predicate-dependent fixed base-orders and equate them with normal order (influence of animacy, lack of preference for some verbs, fine-grained differences)
- Data can be explained using violable weighted constraints
- Data from reflexive binding do not provide evidence for fixed base order or unaccusativity

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Model Analysis Normal Order

$$
\begin{aligned}
\textsc{order}_n \sim\ & \mathit{Bernoulli}(\mathit{logit}^{-1}(w_{\mathit{item}[n]} + \\
& \textsc{ag} \times (\beta_{\textsc{ag}} + u_{\mathit{part}[n],1}) + \\
& \textsc{caus} \times (\beta_{\textsc{caus}} + u_{\mathit{part}[n],2}) + \\
& \textsc{anim} \times (\beta_{\textsc{anim}} + u_{\mathit{part}[n],3}) + \\
& \textsc{sein} \times (\beta_{\textsc{sein}} + u_{\mathit{part}[n],4})))
\end{aligned}
$$

$$
\beta_{\textsc{ag}}, \beta_{\textsc{caus}}, \beta_{\textsc{anim}}, \beta_{\textsc{sein}} \sim \mathit{Student\_t}(7, 0, 1.7)
$$

$$
w \sim \mathcal{N}(0, \sigma_w)
$$

$$
\sigma_w \sim \mathcal{N}_+(0, 1)
$$

$$
\begin{pmatrix} u_{i,1} \\ u_{i,2} \\ u_{i,3} \\ u_{i,4} \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} u_{i,1} \\ u_{i,2} \\ u_{i,3} \\ u_{i,4} \end{pmatrix}, \Sigma_u \right)
$$

$$
\Sigma_u = \begin{pmatrix} \sigma_{u_1}^2 & \varrho_{u1,u2}\sigma_{u_1}\sigma_{u_2} & \varrho_{u1,u3}\sigma_{u_1}\sigma_{u_3} & \varrho_{u1,u4}\sigma_{u_1}\sigma_{u_4} \\ \varrho_{u1,u2}\sigma_{u_1}\sigma_{u_2} & \sigma_{u_2}^2 & \varrho_{u2,u3}\sigma_{u_2}\sigma_{u_3} & \varrho_{u2,u4}\sigma_{u_2}\sigma_{u_4} \\ \varrho_{u1,u3}\sigma_{u_1}\sigma_{u_3} & \varrho_{u2,u3}\sigma_{u_2}\sigma_{u_3} & \sigma_{u_3}^2 & \varrho_{u3,u4}\sigma_{u_3}\sigma_{u_4} \\ \varrho_{u1,u4}\sigma_{u_1}\sigma_{u_4} & \varrho_{u2,u4}\sigma_{u_2}\sigma_{u_4} & \varrho_{u3,u4}\sigma_{u_3}\sigma_{u_4} & \sigma_{u_4}^2 \end{pmatrix}
$$

$$
\sigma_{u_1}, \sigma_{u_2}, \sigma_{u_3}, \sigma_{u_4} \sim \mathcal{N}_+(0, 1)
$$

$$
\begin{bmatrix} 1 & \varrho_{u1,u2} & \varrho_{u1,u3} & \varrho_{u1,u4} \\ \varrho_{u1,u2} & 1 & \varrho_{u2,u3} & \varrho_{u2,u4} \\ \varrho_{u1,u3} & \varrho_{u2,u3} & 1 & \varrho_{u3,u4} \\ \varrho_{u1,u4} & \varrho_{u2,u4} & \varrho_{u3,u4} & 1 \end{bmatrix} \sim \mathit{LKJcorr}(1)
$$

Factors coded by subtracting constraint violation profile of OS variant from the one of the SO variant. E.g., factor for Anim coded 1 for items with inanimate subject (because SO violates it but OS not), and 0 for items with animate subject because neither variant violates it, while the factor Ag is coded −1 with agentive verbs because only OS variant violates it.