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Not so peculiar after all: On the normal position of arguments of German experiencer-object verbs

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The present paper argues that seemingly erratic linearisation patterns of experiencer-object verbs in German can be accounted for by considering well-known linearisation constraints. The analysis is based on two Two-Alternative Forced-Choice experiments: The first study tests experiencer-object verbs with inanimate subjects, the second one tests experiencer-object verbs with animate subjects. If the subject is inanimate, experiencer-object verbs selecting a dative object (e.g., *behagen* 'to please') prefer an object-before-subject linearisation while the ones selecting an accusative object (e.g., *bezaubern* 'to charm') lean towards subject before object. With animate subjects, accusative-object experiencer-object verbs prefer subject before object, while there is no clear preference for dative-object experiencer-object verbs. An explorative investigation reveals verb-specific differences that call into question the case-based classes. We argue that linearisation preferences of experiencer-object verbs in German should be analysed by coupling free base generation with violable linearisation constraints. We provide an analysis along these lines, which is based on a semantic distinction and does not require case-based constraints.

1 Introduction

1.1 The normal argument order of German experiencer-object verbs

Both subject-object (SO) and object-subject (OS) serialisations are possible in German. The choice, however, is not arbitrary: there is a normal order, and deviations from this order may affect interpretation (Höhle 2019/1982). Hence, both sentences in (1) are grammatical, but (1a) is contextually relatively unrestricted, while (1b) is restricted to contexts in which *Emma* is focussed.[1]

(1) a. Der Peter hat gesagt, dass die Emma den Dieter gegrüßt hat.
the Peter has said that the.NOM Emma the.ACC Dieter greeted has
'Peter said that Emma greeted Dieter.'

b. Der Peter hat gesagt, dass den Dieter die Emma gegrüßt hat.
the Peter has said that the.ACC Dieter the.NOM Emma greeted has
'Peter said that it was Emma who greeted Dieter.'

Closer scrutiny into verb classes other than transitive action verbs reveals that normal order appears to be predicate-(class-)dependent. In addition, verb-extrinsic properties such as the animacy of the arguments (Müller 1999; Fanselow 2003) are often considered relevant. Hence, argument serialisation appears to be driven by predicate(-class)-specific properties, predicate-extrinsic properties of the individual elements ordered (such as *animacy*, or *weight*), and predicate-extrinsic properties affecting the meaning of the whole clause (such as *focus,* or *scope*).

A particularly problematic class in this respect are experiencer-object (EO) verbs. The normal order of their arguments has been discussed controversially in theoretical and experimental linguistics. EO verbs are a subclass of *psych verbs,* verbs that can be characterised by an entailment about the mental state of an experiencer,[2] namely those that realise their experiencer argument as their object. The subject of EO verbs[3] generally refers to the semantic stimulus of the psychological state. Following the analysis of Italian psych verbs by Belletti & Rizzi (1988), the class of EO verbs is subdivided into *accusative* EO verbs with an accusative object as in (2) and

[1] German is a verb-second OV language: In main clauses, the finite verb follows the first constituent, while the verb-final order is visible in embedded clauses. The midfield ('Mittelfeld') is the area between C (which hosts the finite verb in main clauses) and the verbal complex at the end of the clause. In this text, we will only consider serialisations in the midfield.

[2] This is a working definition. Many verbs usually classified as psych-verbs also have non-psych readings and many verbs usually classified as non-psych may receive a psych-reading in appropriate contexts (see e.g. Bouchard 1995). In our experiments, we only use verbs that occur only rarely or (preferably) not at all in non-psych readings in GerEO (Poppek et al. 2022).

[3] As used in this paper, "subject" always refers to the nominative argument of the verb, "object" to the accusative or dative argument.

dative EO verbs (3). Experiencer-subject (ES) verbs form the third class in their subclassification (e.g. English *fear*). It is widely held that ES verbs are semantically stative and syntactically transitive, and dative EO verbs stative and unaccusative (their object is taken to c-command their subject at some point), while the syntactic and aspectual nature of accusative EO verbs is debated (Rozwadowska & Nowak & Bondaruk 2020; cf. Belletti & Rizzi 1988; Pesetsky 1995; Arad 1998; Reinhart 2002; Landau 2010 among many others).

(2) Leon hat gesagt, dass ein Artikel einen Leser geärgert hat.
Leon has said that a.NOM article a.ACC reader annoyed has
'Leon said that an article annoyed a reader.'

(3) Ali hat gesagt, dass einem Maler ein Selbstporträt gefallen hat.
Ali has said that a.DAT painter a.NOM self-portrait appealed.to has
'Ali said that a painter liked a self-portrait.'

There is a near-consensus that the normal order with dative EO verbs in German is OS (see Lenerz 1977; Fanselow 1992; Wegener 1999; Haider & Rosengren 2003; Hirsch 2018 among others).[4] For accusative EO verbs, however, linearisation properties are debated. Lenerz (1977), Haider & Rosengren (2003), and Primus (2004) exclude agentive readings of some accusative EO verbs from consideration (as these are analysed to prefer the same linearisation as prototypical action verbs, SO) and do not propose differences between accusative and dative EO verbs on the non-agentive reading. From Fanselow's (1992) analysis it seems to follow that accusative EO verbs have an SO normal order, while he later (2003: 204 seq.) proposes that *both* orders are normal for accusative EO verbs (although he argues for OS with *interessieren* 'to interest' (p. 203)). Hirsch (2018) adopts this view for a subclass of accusative EO verbs, namely those he considers stative, and assumes an SO normal order for the others. Primus (2004) assumes a free order for non-causal EO verbs (both accusative and dative).

Previous experimental studies point towards OS for dative verbs and SO for accusative verbs. Most studies agree that accusative EO verbs tend towards SO (although to a lesser extent than action verbs, or verbs with experiencer-subjects) (Scheepers & Hemforth & Konieczny 2000; Temme & Verhoeven 2016; Verhoeven & Temme 2017; Ellsiepen & Bader 2018). While Temme & Verhoeven (2016) conclude that dative EO verbs tend towards OS, Fanselow & Häussler & Weskott (2016) find that OS is preferred with dative EO verbs whose perfect tense auxiliary is *sein* 'be', but both orders are acceptable with those whose perfect tense auxiliary is *haben* 'have'. The animacy of the subject is regarded as a decisive factor with animate subjects pushing towards

[4] When authors controlled for animacy, it has occasionally been noted that both orders are equally acceptable (Lötscher 1981; Barðdal & Eythórsson & Dewey 2014).

SO (Scheepers et al. 2000). In Verhoeven's (2015) corpus study the OS rate was above 50% in the midfield for all kinds of EO verbs, and around 80% for dative EO verbs, if the subject was inanimate, but it dropped to less than 10% if the subject was animate with accusative EO verbs (dative around 50%). In a corpus study presented by Ellsiepen & Bader (2018: 30), accusative EO verbs occur primarily with an SO order.

Three remarkable aspects must be noted about all previous experimental studies: First, there is no experimental study in which accusative and dative EO verbs are compared directly in the same experiment. Given that experimental data are not independent from one another both in terms of the participants and the items presented in a study, this is a major methodological drawback. Secondly, an experimental separation of accusative and dative EO verbs hard-codes the case-based classification instead of experimentally testing its viability. This is exacerbated by the recent observation that verbs assumed to belong to the same class show ample heterogeneity, which raises doubts about taking the case-based classification for granted (Hirsch 2018; Poppek et al. 2021).[5] The classes, of course, must be represented in the statistical analysis of the data if hypotheses are formulated with the classes in mind. An awareness of potential differences between class members, however, should lead to a choice of verbs that facilitates subsequent explorative analyses searching for reflexes of these differences. Thirdly, participants in previous experimental studies (except for Scheepers et al. 2000 and Ellsiepen & Bader 2018) were presented verb-second clauses, where one argument was placed in the prefield. Constituents in the prefield may introduce confounding effects, as they may be used to signal contrastive focus (Frey 2006). Hence, using verb-second clauses is methodologically problematic.

We may thus conclude that there is no consensus regarding the normal order of EO verbs in theoretical linguistics, and that previous studies in experimental linguistics suffer from not comparing the case-based classes directly, from taking them for granted in the first place, and from using structures in the studies that may yield confounding effects.

To address these issues, we have conducted two Two-Alternative-Forced-Choice experiments that target the linearisation preferences of German EO verbs with inanimate (study A) and animate (study B) subjects. Both studies show that a small number of verbs deviates from the general pattern of their case-based class. Study B shows that certain EO verbs with a dative

[5] A reviewer asks for elaboration on the different subclasses of accusative and dative EO verbs. There is no subclassification agreed upon in the literature. Poppek et al. (2021) show that verbs within a group differ regarding the argument structure alternations and syntactic constructions they occur in in corpus data, but they do not propose a classification. Engelberg (2018) comes to a similar conclusion with similar data and proposes a classification, but only for a small number of verbs. Hirsch (2018) focuses on triplets of verbs with the same root (root, prefixed, reflexive, e.g. *ärgern* 'to annoy', *verärgern* 'to upset', *sich ärgern* 'be annoyed') claiming that there are systematic semantic and syntactic differences.

object do not prefer a linearisation at all if both subject and object are animate. This is hard to reconcile with accounts of German constituent order that assume that the normal order is a direct reflection of a single base order (for the distinction between normal order and base order, see section 1.2). Building on the experimental results, we will present an account that uses free base generation in combination with violable linearisation constraints to explain the observed patterns. The account does not rely on the case of the verbs' object, but on a semantic distinction between different kinds of stimulus arguments introduced to the linguistic literature by Pesetsky (1995), namely causers and objects of emotion (see section 4.2).

1.2 Normal order vs. base order

Research on word order variability in German is abundant and cannot be reviewed with due appreciation here (see e.g. Abels 2015; Frey 2015; Salzmann 2023 for overviews). Most importantly, however, the concept *normal order* must be distinguished from the concept *base order*. While the normal order is the order that is contextually least restricted (Höhle 2019/1982), a base order emerges in theoretical works if arguments must be combined in a specific order with the verbal projection.

Most researchers assume a specific order of combination in general, for verb classes, for predicates, or possibly for predicates and constructions, as can be witnessed in Frey (1993), Müller (1999), Haider & Rosengren (2003), among many others. In these approaches (except for Müller's), normal order is taken to reflect a base order, which is the simplest configurational structure derived from the fixed order of combinations. Deviations from this order are taken to be the result of scrambling, i.e. movement to the left. It is important to note that with such an approach, there can only be one base order (in general, per predicate, class, or whatever subdivision is taken to hold), and hence only one normal order. The base order for transitive verbs may differ from verb/predicate/class/… to verb/predicate/class/…, but either the object or the subject is bound to merge first; and if they are found in a different order, at least one element must have moved. If normal orders reflect the base order (in a setting where there are no relevant differences between subject and object), there should thus only be one normal order (for a set of sentences differing only regarding serialisation).[6]

The approach by Fanselow (2001; 2003) reflects a minority view, according to which a head can realise its arguments in (almost) any order. Hence, there is no fixed *base* order. Fanselow presents both conceptual and empirical arguments against the stipulation of a base order. He

[6] Of course, a verb can have more than one linearisation preference in case of polysemy. A reviewer points us to (Haider 2000): In Haider's system, the base order of a predicate depends on its conceptual representation structure, so there can be more than one base order if the conceptual representation "of a lexical item[…] is structurally ambiguous, […] or [if] it involves a commutative predicate"(Haider 2000: 150).

raises doubts on the idea that free word order requires movement, while fixed word order comes for free and provides an analysis where fixed word order follows from movement.

Another term closely linked to *normal order* is *unmarked order*. In one sense, a sentence is marked if it is contextually more restricted than the other sentence(s) from its comparison set (Höhle 2019/1982, see also ibd. for the intricate difference between *normal* and *unmarked*). In another sense, markedness is equated to suboptimality with regard to a constraint hierarchy (Müller 1999). A long research tradition (e.g. Lötscher 1981; Uszkoreit 1987; Hoberg 1997; Keller 2000; Ellsiepen & Bader 2018) tries to model serialisation in the midfield using constraints encoding some of the factors taken to influence constituent order in German from a descriptive perspective, such as animacy, definiteness or case. Ellsiepen & Bader (2018) provide an overview of this literature and they report on a series of experiments conducted to establish a constraint ranking, or a set of weights. They arrive at the hierarchy in (4):[7]

(4) NOMINATIVE ≺ ACCUSATIVE ≻
ANIMATE ≺ INANIMATE ≻
DEFINITE ≺ INDEFINITE ≻
AGENT ≺ NON-AGENT[8] ≻
NOMINATIVE ≺ DATIVE ≻
DATIVE ≺ ACCUSATIVE ≻
RECIPIENT/GOAL/BENEFECTIVE ≺ THEME

They particularly assume the dominance of a constraint that places nominatives before accusatives. The decisive experiment involves accusative EO verbs and is taken to show that case is more important than thematic roles. In view of our experiments and the semantic distinction between causers and objects of emotion introduced by Pesetsky (1995), we argue that the postulation of case-based constraints is not necessary to capture the linearisation preferences of EO verbs.

For our experiments, it is essential that all factors not exclusively depending on the predicate be controlled for as far as possible, one of the most important ones being focus. According to Höhle (2019), a sentence that allows a focus projection from one constituent to maximal focus has normal order. If we can ensure a maximal focus interpretation, the variant with normal order should thus be preferred.

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[7] In fact, they propose a constraint ranking as well as an ordering of constraint weight (p. 28). The hierarchy in (4) follows the latter one, omitting the weights (which are not directly comparable to the ones we will present in section 4.3 due to differences in modelling and encoding) and replacing Ellsiepen & Bader's (2018) constraint names by the notation we will use in section 4.3. ≺ stands for "precedes", ≻ for "is more important than" here.

[8] For Ellsiepen & Bader (2018), "agent" also includes non-intentional, inanimate causers.

1.3 The roadmap

The analysis presented in section 4 will follow Fanselow (2001) in assuming that arguments of a verb can be discharged in any order, thus yielding free word order in principle. We also follow most research on German syntax in assuming a strictly binary-branching midfield. Furthermore, we concur with Haider (2010) that there are no functional projections in German clause structure between V and C. However, we assume that the structures are subject to violable and potentially conflicting, weighted linear precedence (LP) rules, and we assume competition between alternative structures.

We will see that the distinction between accusative and dative EO verbs hides a semantic distinction, namely the one between *causers* and *objects of emotion* (as introduced by Pesetsky 1995). We propose three LP rules, as illustrated in (5).

(5) a. ACTOR ≺ NON-ACTOR
b. CAUSER ≺ NON-CAUSER
c. ANIMATE ≺ INANIMATE

The analysis rests on the results of two studies on the preferred argument order of EO verbs considering both accusative *and* dative EO verbs in single studies. An important result of study B is that a subset of EO verbs allows more than one normal order. This is in line with the idea of regulative LP rules but cannot easily be analysed in terms of scrambling as movement based on a fixed base order if this fixed base order is equated with the normal order.

The experimental studies will be presented in section 2, section 3 discusses their theoretical implications, and section 4 presents the analysis.

2 Experimental studies

Two-Alternative Forced-Choice (FC) experiments consist in presenting pairs of examples that only differ in a single property. We conducted two FC experiments in which participants chose between an SO and an OS variant of a sentence in a context that should favour the normal order.

In study A, we compared 8 accusative and 8 dative EO verbs with inanimate subjects. The use of inanimate subjects avoids certain problems, such as interfering agentive readings for many accusative EO verbs, or a lack of suitable dative EO verbs that take animate subjects. However, it introduces an asymmetry in animacy between subject and object that may influence order. Study B, where subjects were animate, takes this into account. In this experiment, we compared the behaviour of EO verbs and action verbs directly. All materials related to the studies (analysis scripts, the raw data (items and results), documents describing the power analyses and the verb selection, and additional materials) are available from an OSF directory (see section Data availability/Supplementary Files).

2.1 Test environment

The target sentences were constructed as verb-final sentences embedded in matrix clauses to avoid prefield effects. According to Höhle (2019/1982), a sentence that allows a focus projection from one constituent to maximal focus has normal order. To ensure a maximal focus interpretation, each pair of sentences was displayed with an introductory question, as illustrated in example (6). Participants were asked to choose the answer that they perceive as more natural.

(6) Was hat Leon gesagt?
What has Leon said
'What did Leon say?'

a. SO order:
Leon hat gesagt, dass ein Artikel einen Leser geärgert hat.
Leon has said that a.NOM article.NOM a.ACC reader.ACC annoyed has
'Leon said that an article annoyed a reader.'

b. OS order:
Leon hat gesagt, dass einen Leser ein Artikel geärgert hat.
Leon has said that a.ACC reader.ACC a.NOM article.NOM annoyed has
'Leon said that an article annoyed a reader.'

Each participant saw and judged all items in a pseudo-randomised order subject to some constraints, e.g. no subsequent test items without at least one filler item in between. Both variants of the sentence were presented simultaneously, the horizontal alignment of choices (SO or OS right or left) was pseudo-randomised. A screenshot of an item from study B can be found in the OSF directory.

Since factors like animacy, constituent weight and definiteness are known to influence linear order in German, they had to be controlled for. We only used indefinite subjects and objects, singular NPs containing only the noun and the indefinite article and aimed for differences in length of maximally one syllable (for the whole NP).

In study A, subjects are inanimate, and objects animate, while in study B both are animate. Experiencer objects, of course, must be animate – at least in a wider sense.[9] All object NPs (in study B also the subjects) in the test items were masculine because feminine and neuter NPs would have led to ambiguities or processing difficulties due to case syncretism.

Test items were constructed based on corpus examples following the procedure of *Modified Stimulus Composition* (Börner & Pieper & Kiss 2019), both from the GerEO database (Masloch

[9] The objects may also refer to institutions etc. and they may be metaphorical or metonymical. We avoid such cases here.

et al. 2021; Poppek et al. 2022) for sentences containing an EO verb and the DWDS corpora (Berlin-Brandenburgische Akademie der Wissenschaften n.d.) for some of the filler items and the sentences containing an action verb in study B.

The verbs used in both studies were carefully vetted for two reasons: to avoid interference effects and to represent potential subclasses. Corpus findings show that accusative EO verbs differ with respect to the syntactic patterns they partake in (Poppek et al. 2021) and it has been proposed that EO verbs belong to several different verb classes (Hirsch 2018). Verbs from various potential subclasses were included. We selected the EO verbs for both studies based on their behaviour in annotated corpus data. For this, we used GerEO, which contains syntactic and semantic annotations for ca. 10,000 sentences (up to 200 per verb) containing one of 64 German verbs – 16 selecting the dative, 48 the accusative – that occur as an EO verb (Masloch et al. 2021; Poppek et al. 2022). Verbs that possess a frequent reading in the database in which the verb does not refer to a mental state were avoided. In both studies, the verbs co-occur with an experiencer object and a stimulus subject, but some verbs are frequently used in other syntactic patterns, e.g., a reflexive one, where the experiencer is the subject and the stimulus is expressed in a PP (if expressed at all). We computed the share of occurrences in the transitive and an object-drop pattern (where the experiencer is not expressed overtly and receives an arbitrary interpretation) and used only verbs that regularly displayed these patterns. Other exclusion criteria include frequent usage within a collocation or idiomatic expression and the overall frequency of the verb, see the documents describing the selection process in the article's data directory (see section Data availability/Supplementary Files). Regarding the stimulus argument, both studies required different criteria: Since the agentive readings, which many accusative EO verbs possess in combination with animate subjects, are taken to have SO normal order (even by authors who argue for OS with accusative EO verbs otherwise), we included only verbs in study B that had a decent share of animate subjects in GerEO and scored low on the agentivity test rating studies by Verhoeven (2014) and Hirsch (2018). Agentivity is not an issue in study A, because stimuli are inanimate there. All other criteria being fulfilled, we aimed for the inclusion of verbs with different morphological structures as well as verbs that belong to different classes according to Hirsch (2018) or that displayed different distributional properties in corpus data (Poppek et al. 2021). Full lists of the verbs used in the experiments are provided in **Table 1** and **Table 2**.

2.2 Implementation

Participants were recruited via the survey tool Prolific (*www.prolific.com*). We conducted Monte Carlo power simulations that estimated power at $> 90\%$ ($\alpha = 0.05$) for relevant effects and the intended statistical models and expected parameter values based on 25 participants. Since some of the parameters of the models are hard to estimate (e.g. by-participants random effect correlations), we opted for a larger number of participants.

accusative object	**dative object**
anwidern 'to disgust'	*auffallen* 'to strike'
ängstigen 'to frighten'	*behagen* 'to please'
ärgern 'to anger'	*einleuchten* 'to be evident (to sb.)'
bezaubern 'to charm'	*gefallen* 'to appeal to'
interessieren 'to interest'	*imponieren* 'to impress'
nerven 'to bother'	*missfallen* 'to displease'
verärgern 'to annoy'	*nahegehen* 'to afflict'
verblüffen 'to baffle'	*widerstreben* 'to oppose'

Table 1: Verbs used in study A.

EO dative	**EO accusative**
auffallen 'to strike'	*anwidern* 'to disgust'
gefallen 'to appeal to'	*bezaubern* 'to charm'
imponieren 'to impress'	*interessieren* 'to interest'
leidtun 'to feel sorry'	*verblüffen* 'to baffle'
action dative	**action accusative**
applaudieren 'to applaud'	*betrügen* 'to deceive'
antworten 'to answer'	*anrufen* 'to call sb.'
danken 'to thank'	*informieren* 'to inform'
zujubeln 'to cheer'	*verhaften* 'to arrest'

Table 2: Verbs used in study B.

To identify non-cooperative or distracted participants as well as participants who provided their answers implausibly fast, we implemented attention and control items and used the response times for a latency-based ReMFOD analysis (see Pieper & Börner & Kiss to appear).

We also asked participants to guess the topic of the study and excluded (the few) participants who guessed correctly or displayed substantial linguistic background knowledge.

2.3 Study A: inanimate stimuli

Study A was designed to determine the normal constituent order with accusative and dative EO verbs, an inanimate stimulus and an animate experiencer, using a total of 16 EO verbs (see **Table 1**).

2.3.1 Design and Procedure

Study A has a simple design:

(7) FC(ORDER) ~ CASE

The dependent variable ORDER has the levels SO and OS. CASE represents the EO verb's object's case, accusative or dative, and is manipulated within participants (who judge both kinds of sentences) and between items (the sentences may either contain an accusative or a dative EO verb. There is no synchronic object case alternation with EO verbs having a subject in German). The random factors included are participants and items. Using 8 lexicalisations per condition resulted in 16 test items. In addition, we used 66 filler items, among them 10 attention items (5 related), 16 control items (8 related) and 6 calibration items (3 related; used to familiarise participants with the setting). Each participant saw the same items.

All filler items resembled the test items in consisting of a question and two sentences of the form "*Person* has *Verb*-ed that [perfect-tense verb-last clause]". Filler items contained a fully acceptable sentence and a sentence of reduced acceptability, the degree of acceptability of the less acceptable sentence varying between items.[10]

2.3.2 Hypotheses and predictions

If accusative EO verbs possess SO, and dative EO verbs OS normal order, we should expect participants to prefer the SO variant with the former and the OS variant with the latter. However, the stimuli in this experiment contain an asymmetry in animacy between subject and object. Temme & Verhoeven's (2016) studies indicate that accusative EO verbs do not lean as much towards SO as action or ES verbs, while dative EO verbs do not lean as much towards OS as prototypical unaccusatives. Based on their data, we expect only a mild preference for SO for accusative EO verbs. For dative EO verbs, we expect a stronger preference for OS. Together, this should lead to a medium-sized effect of CASE.

2.3.3 Results

40 native speakers of German participated in the study, but 11 surveys were excluded following the exclusion criteria. The remaining 29 participants judged 16 test items each, resulting in a total of 464 observations. **Figure 1** shows the empirical distribution of choices for both conditions.

[10] Fillers contained sentences with different degrees of acceptability. To detect uncooperative participants, we need some items containing clearly ungrammatical sentences and we do not want them to stand out. What is more, we found some verbs in study B for which both orders are equally acceptable in the context given, which was not expected when we designed the experiments. Instead, we expected a single normal order for each verb and a contextual marking of the reverse ordering (yielding incompatibility with the maximal-focus environment).

We see that OS is preferred with dative EO verbs (177 OS, 55 SO), and SO is preferred with accusative EO verbs (165 SO, 67 OS).

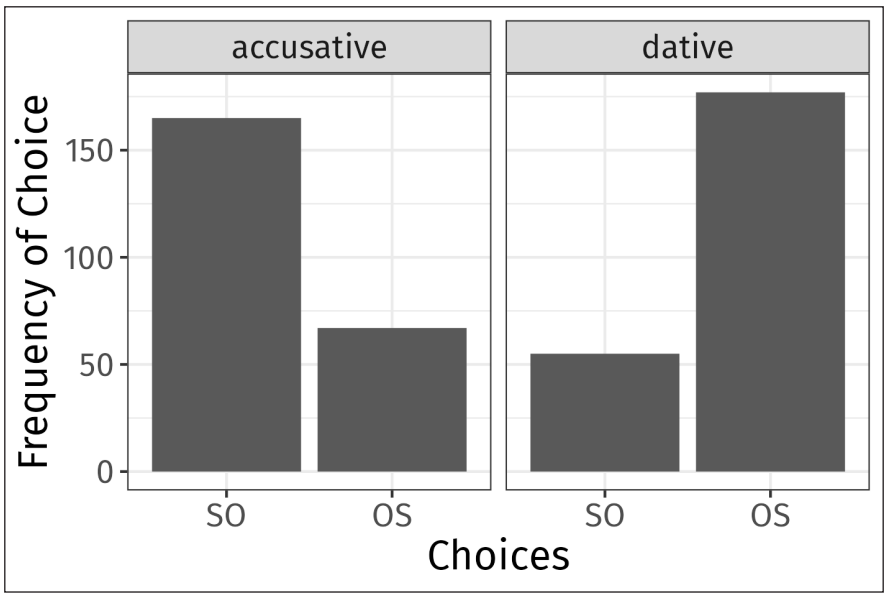

Figure 1: Empirical distribution of choices in study A.

We analyse the data using a binomial (logit) generalised linear mixed model (GLMM) using the R environment (R Core Team 2023) and the package *lme4* (Bates et al. 2015). This means that (as in all models we use) the influence of the factors manipulated on the independent variable ORDER is modelled via a linear predictor incorporating the factors manipulated treatment-coded (one level is coded as 0, the other one as 1) to which the logistic function $logit^{-1}$ is applied to yield the probability of a specific order. Here, we only have a fixed effect of CASE (and an intercept), and all variables are treatment-coded, the reference levels being SO and dative. Hence:

$$P\left(order = OS\right) = logit^{-1}\left(\beta_0 + case \times \beta_{case}\right) \quad \text{(eq. 1)}$$

However, equation 1 only covers the fixed effects of the model. In addition, we include random intercepts for participants and items as well as a random slope for CASE for participants (a random slope for CASE for items would not be meaningful since CASE is manipulated between items). This means that we assume individual effects for items and participants stemming from normal distributions with the fixed effect as their mean. The width of the distribution is a parameter estimated in the model, as is the correlation between the participants' random effects. The intercept β_0 captures the situation in the dative condition (where $case = 0$) here: If it were 0, the distribution of choices predicted by the model for this condition would be 50% SO, 50%

OS. The fixed effect of case (β_{case}), on the other hand, represents the change to the accusative condition. If it were 0, the distribution expected by the model in this condition would be the same as the one in the dative condition. An accessible introduction to GLMMs in linguistics can be found in (Winter 2020).

We observe significant effects for the intercept ($\hat{\beta} = 1.34$, 95% confidence interval (CI): [0.77, 1.9], $p < 0.001$[11]) as well as for CASE ($\hat{\beta} = -2.41$, 95% CI: $[-3.18, -1.63]$, $p < 0.001$). The positive effect of the intercept indicates that for dative EO verbs the preferred order is OS ($logit^{-1}$ (1.34) = 79.25% probability of OS). The negative effect of CASE implies that dative and accusative EO verbs differ, the latter having a stronger tendency towards SO ($logit^{-1}$ (1.34 – 2.41) = 25.54% probability of OS). Both effects exceed the expectations.

Regarding the random effects, we find relatively high standard deviations for the items' ($\widehat{SD} = 0.52$) and the participants' ($\widehat{SD} = 0.69$) random intercepts as well as for the participants' random slope for CASE ($\widehat{SD} = 0.9$). The negative correlation of -0.56 for the participants' random effects indicates that higher intercepts come with lower slopes, i.e., the stronger a participants' comparative tendency towards OS with dative EO verbs, the stronger their comparative tendency towards SO with accusative EO verbs.

Since we used treatment coding in the model, we also build a model with accusative as the reference level. While all other parameters of this model are similar to the model with dative as the reference level, it displays a significant negative intercept ($\hat{\beta} = -1.07$, 95% CI: $[-1.63, -0.51]$, $p < 0.001$), indicating that the accusative EO verbs' tendency towards SO is also significant.

2.3.4 Discussion

We take these results to mean that accusative and dative EO verbs differ in their linearisation preferences and that the normal order (with inanimate subjects and all other factors equalled out) is OS with dative EO verbs and SO with accusative EO verbs. Since the items had to contain an unresolvable asymmetry in animacy, the observed SO tendency for accusative EO verbs is worth noting. However, we observed relatively high standard deviations for the random effects. A short explorative investigation of the items' random effects in **Figure 2** illustrates the frequencies of SO choices for the individual items grouped by CASE, purple for items containing an accusative EO verb (t01–t08) and yellow for dative EO verbs (t09–t16). While 29 judgments per verb are a small sample and individual properties of the items besides the verb might have added to the results, we note that some verbs appear not to comply with the general pattern of their classes.

[11] p-values for this model were determined using likelihood ratio tests comparing the model with and without the respective effect. We use hats (ˆ) for estimates.

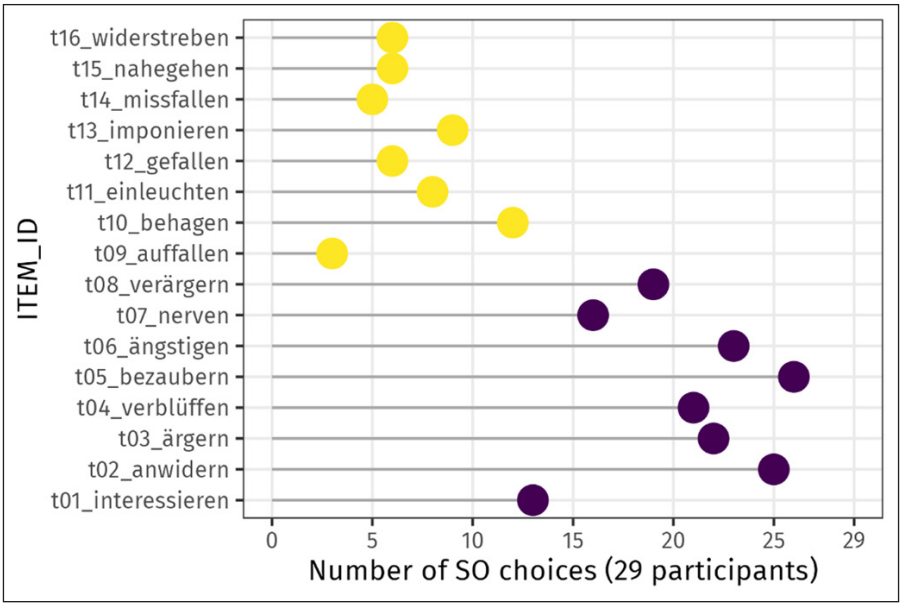

Figure 2: Number of SO choices for individual items in study A.

While most verbs display a rather clear preference in this setting, *interessieren* 'to interest' shows a very mild tendency towards OS, which fits previous accounts that argue for OS normal order for this verb (e.g., Haider & Rosengren 2003). Yet, its behaviour is generally untypical for an accusative EO verb (the same holds for *nerven* 'to annoy'). Among the dative EO verbs, *behagen* 'to please' stands out, which closely resembles *interessieren* in its distribution. However, the tendencies of both verbs towards any order are so weak that they might point either towards no actual preferences on the participants' side or to idiolectal variation.

2.4 Study B: animate stimuli

Study B was conducted to shed light on animacy effects in study A. Since animacy differences were inherent to the design of study A, study B was designed to contain only animate subjects and objects. This has the disadvantage that some verbs may display an agentive reading with animate subjects – which is standardly assumed to behave like an action verb –, but it has the additional advantage that it allows us to directly compare EO verbs to action verbs as a contrasting verb class with generally non-controversial linearisation behaviour.

2.4.1 Design

The study was designed as an FC, this time using a 2 × 2 design:

(8) FC(ORDER) ~ AGENTIVITY × CASE
- ORDER: SO or OS.
- AGENTIVITY: action verb or EO verb
  - within participants (participants see sentences containing both kinds of verbs)
  - between items (sentences contain either an action or an EO verb)
- CASE of the object: accusative or dative
  - within participants (participants see sentences containing both kinds of objects)
  - between items (sentences contain either an accusative or a dative object)

The study contained a total of 32 test items in 8 lexicalisations per condition. The number of EO verbs suitable for an experiment with two animate NPs is severely restricted by selectional preferences of the verbs. Out of the 16 dative EO verbs in GerEO, only four remained after excluding all verbs that have frequent non-psych readings and are not (or only hardly) compatible with animate stimuli in the relevant reading. Markedness in combination with an animate stimulus was not an issue with accusative EO verbs. However, many accusative EO verbs may receive an agentive reading with animate subjects. Since these readings are usually taken to lack any special psych-properties (and assumed to have SO normal order even in theoretical analyses that normally assume OS for accusative EO verbs), we used only accusative EO verbs that received low scores for agentivity tests in the rating studies by Verhoeven (2014) and Hirsch (2018). To counter these problems, we included only four accusative and four dative EO verbs but used two items per verb for each condition (the rest of the lexical material in the sentences still differs).[12] This also allowed us to conduct a subsequent explorative analysis of differences between items. All verbs used in this study are listed in **Table 2** and all items are available from the OSF directory.

In addition to the test items, participants judged 64 filler items (containing the same number of attention, control, and calibration items as in study A). To mask the duplicate verbs in the test items, we also doubled all verbs in the filler items.

2.4.2 Hypotheses and predictions

If action verbs and accusative EO verbs have SO normal order, participants should choose the SO alternative in a considerable majority of cases. If dative EO verbs have OS normal order, participants should choose the OS alternative in a considerable majority of cases.

[12] E.g., in the dative EO condition there is one item whose OS variant is *Julia hat erzählt, dass einem Polizisten ein Autoknacker aufgefallen ist* 'Julia told that a car burglar caught the attention of a policeman' and another item *David hat gehört, dass einem Wachmann ein Passagier aufgefallen ist* 'David heard that a passenger caught the attention of a security guard', both containing the verb *auffallen* 'to catch someone's attention'.

The following effects are predicted considering our hypotheses for the model described below:

- a strong positive effect of CASE
- a strong positive effect of AGENTIVITY
- a medium or strong negative interaction of the two
- a small to medium negative effect of the intercept

2.4.3 Results

33 native speakers of German participated in the study. However, 8 surveys had to be excluded, so that data from 25 participants remained. Each participant provided a judgment for 32 test items, resulting in 800 data points. **Figure 3** depicts the empirical distribution of choices for the four conditions.

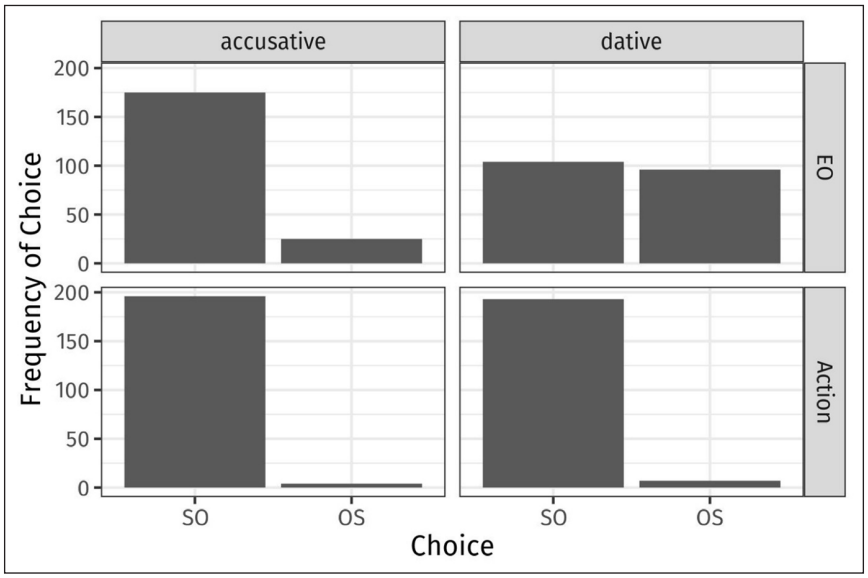

Figure 3: Empirical distribution of choices in study B.

We fitted a binomial (logit) generalised linear mixed model to the data, including CASE, AGENTIVITY and their interaction as fixed effects, random intercepts for items and participants and random slopes for CASE, AGENTIVITY and their interaction for participants. The model formula for the fixed effects part is:

$$P\left(order = OS\right) = logit^{-1}\left(\beta_0 + case \times \beta_{case} + ag \times \beta_{ag} + case \times ag \times \beta_{case \times ag}\right) \quad \text{(eq. 2)}$$

All factor variables were treatment-coded with SO, dative, and EO as reference levels. The intercept of the model therefore reflects the dative EO condition, while CASE and AGENTIVITY

are not the main effects of CASE and AGENTIVITY but the effects of changing from the reference level to the other one along that dimension. So, we can obtain the model's expected proportions of choices for the accusative EO condition by adding the effect of CASE to the intercept (and applying the inverse logit to the result), and we will have to add the intercept, both effects and the interaction ($\beta_{case \times ag}$) to get the expectations for the accusative agentive condition. The random effects capture the individual variability around the fixed effects.

The observed effects generally match the expected ones: There is a significant strong positive effect of CASE ($\hat{\beta} = 2.28$, 95% CI: [1.17, 3.39], $p < 0.001$[13]) and a significant strong positive effect of AGENTIVITY ($\hat{\beta} = 4.61$, 95% CI: [2.09, 7.13], $p < 0.001$), which – given our setting – shows that dative EO verbs differ strongly both from accusative EO verbs as well as from dative action verbs. The interaction effect ($\hat{\beta} = -2.58$, 95% CI: $[-5.68, 0.53]$, $p = 0.1$) is negative (as expected) and not significant. The estimate could be taken to counter the effect of CASE, in the sense that the difference between the dative EO condition and the accusative action condition roughly equals the difference between the dative EO condition and the dative action condition, but the effect is not significant and at this end of the scale, a change of -2.58 in the linear predictor translates only into a very small change in predicted probabilities (ca. 1%).[14] Surprisingly, the intercept is smaller than expected and not significant ($\hat{\beta} = 0.12$, $p = 0.74$). One could take this to indicate that there is no preferred order with dative EO verbs (note that the null hypothesis here would correspond to a 50/50 distribution of choices between the two orders), but we will discuss differences between the verbs below.

To see whether the difference between accusative EO and action verbs is also significant, we fitted an additional model that differed from the original one only in having accusative as the reference level of CASE. Indeed, the effect of AGENTIVITY is significant then ($\hat{\beta} = -2.03$, 95% CI: $[-3.82, -0.24]$, $p < 0.05$). The intercept of this model is also rather large, negative and significant ($\hat{\beta} = -2.4$, 95% CI: $[-3.31, -1.50]$, $p < 0.001$), which means that accusative EO verbs tend towards SO.[15] We will switch back to the first model in the following.

Concerning the random effects, participants do not differ that much in their judgments ($\widehat{SD} = 0.46$). Also, there is not much variation in how participants change their behaviour from dative to accusative EO verbs ($\widehat{SD} = 0.28$). However, the variance of the items' random intercepts is

[13] Despite serious efforts, we did not get the additional models needed to perform likelihood ratio tests to converge, so the p-values reported here are based on the z-value of the respective effect in the model.

[14] We are not interested in a possible difference between dative and accusative action verbs here, and hence have not tested a possibly significant difference in a further model.

[15] Recall that we use treatment coding, so AGENTIVITY in a model with dative and EO as reference levels is the effect of changing from the dative EO condition to the dative action condition. In a model with accusative as the reference level of CASE, AGENTIVITY is the effect of changing from the accusative EO to the accusative action condition. Given the design of the study, no choice of reference levels is inherently preferable to the others, but each provides a different perspective on the data.

more notable ($\widehat{SD} = 0.89$): Items differ in which variant is preferred even if all other factors are considered (recall that the SD of ca. 0.9 is on the same scale as the fixed effects). We will explore these differences below and see that they are likely linked to the verbs. The variances of the participants' random slopes for AGENTIVITY ($\widehat{SD} = 1.75$) and the interaction ($\widehat{SD} = 1.65$) are huge, and they have a considerable negative correlation (-0.78), mainly caused by five participants with high values for the interaction and huge negative slopes for AGENTIVITY, who also chose OS for some dative action verbs.

2.4.4 Discussion

As the effects of CASE and AGENTIVITY illustrate, accusative EO verbs and dative action verbs differ significantly from dative EO verbs. This cannot be attributed to agentive readings of the accusative EO verbs since those used in this study scored low on agentivity tests with animate subjects. Given the observed proportion of choices, we can assume an SO normal order for action verbs. The same holds for accusative EO verbs, although their tendency towards SO is weaker (but see below).

The results for dative EO verbs, however, are unexpected. The model even predicts a slight preference for SO (53%) for them. This is surprising since dative EO verbs are almost universally taken to have OS normal order (see section 1.1). Another interesting aspect is the high variation of the items' random intercepts. Items must differ within the conditions. With action verbs SO is virtually always chosen, so the observed high variance must thus be rooted in the judgments for EO verbs.

An explorative view on the individual verbs sheds light on the matter. **Figure 4** shows the number of SO choices per item for EO verbs with dative EO verbs on top (IDs t17–t24) and accusative EO verbs below (t01–t08). Clearly, the verb appears to be the decisive factor since differences between the individual items for each verb are small. We observe differences within the case-based classes: Among the dative EO verbs, there is no clear linearisation preference for *leidtun* 'to feel sorry' and *gefallen* 'to appeal to', while *imponieren* 'to impress' leans towards SO and *auffallen* 'to strike' towards OS. *Auffallen* is the only verb in this study that uses *sein* 'to be' instead of *haben* 'to have' as its perfect auxiliary. *Imponieren* seems to have an agentive reading: We are not aware of a discussion of agentive readings with dative EO verbs in the literature, but we find examples like (9) in GerEO. (9) contains an impersonal *lassen*-middle. Since agentivity of the implicit argument is a core feature of middles (see Pitteroff 2014: 43 sqq. and the literature cited there), *imponieren* must have an agentive reading (and it is clearly interpreted this way here). Arguably, (10) shows that *imponieren* must also have a change-of-state reading independent of animacy since it contains *imponieren* in the adjectival/stative passive and it has been argued that an adjectival passive is only possible in German with verbs that have such a reading (Gehrke 2015). However, the acceptability of examples like (10) is subject to idiolectal variation and they

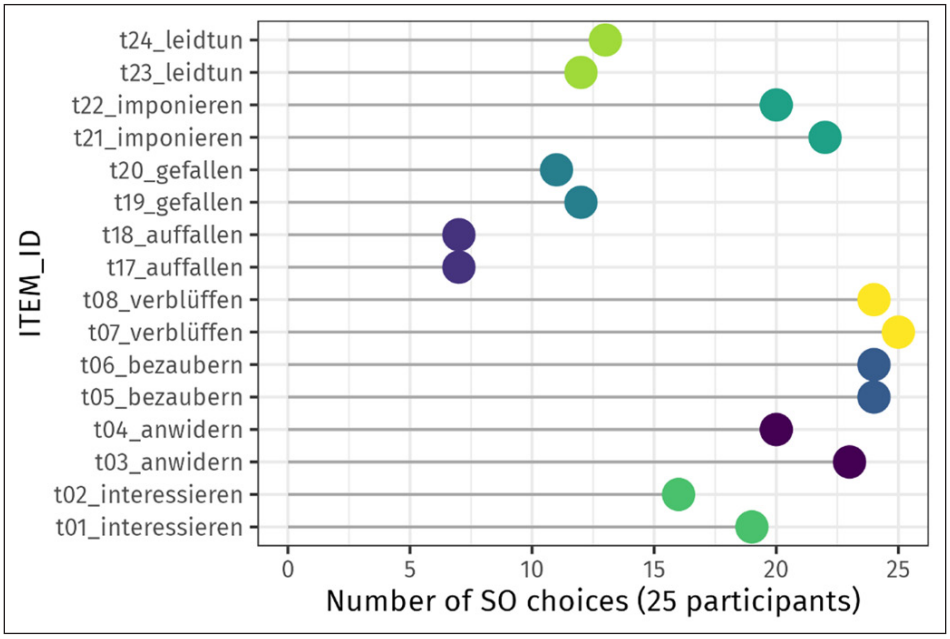

Figure 4: Number of SO choices per item for experiencer-object verbs in study B.

are rejected by many (probably most) speakers.[16] DeReKo (Kupietz et al. 2010), also contains occasional examples of *imponieren* in the verbal passive on its agentive reading (11).

(9) NZZ_1996_02_23_a187_seg4_s4 in GerEO
[…]Mit ihnen lässt sich trefflich imponieren.
with them lets REFL splendidly impress
'With them, it's easy to impress'

(10) NZZ_1994_05_25_a98_seg7_s13 in GerEO
[…] dass Vertreter der Europäischen Union […] von der
that representatives the.GEN European. GEN Union.GEN by the
Wahlfreiheit imponiert gewesen seien.
freedom.of.choice impressed been were.SBJV
'that representatives of the European Union were impressed by the freedom of choice'

(11) (U07/JUN.04350 Süddeutsche Zeitung, 26.06.2007)
Wem soll wohl damit imponiert werden?
who shall MP with.this impressed become
'Who is supposed to be impressed by this?'

[16] A reviewer remarks that they consider adjectival passive with *imponieren* a clear grammatical mistake.

Among the accusative EO verbs, *interessieren* ‘to interest’, displays a much weaker tendency towards SO than the other accusative EO verbs (this was already the case in study A).

The question arises whether mixed judgments for certain verbs are caused by variation between participants or by the same participants not preferring either option. **Figure 5** suggests that the latter is the case: Very often, participants chose the SO variant only once. For *gefallen* ‘to appeal to’ and *leidtun* ‘to feel sorry’, the choices are almost exactly what is expected if participants are forced to choose between two alternatives they like equally well. However, we will also assume some degree of individual variation, particularly for *imponieren* ‘to impress’ and *interessieren* ‘to interest’ (see section 4.3). Naturally, these considerations are speculative to some degree since each participant only saw two sentences for each verb. However, the conclusion remains that *gefallen* ‘to appeal to’ and *leidtun* ‘to feel sorry’ appear not to enforce a specific linearisation in this setting.

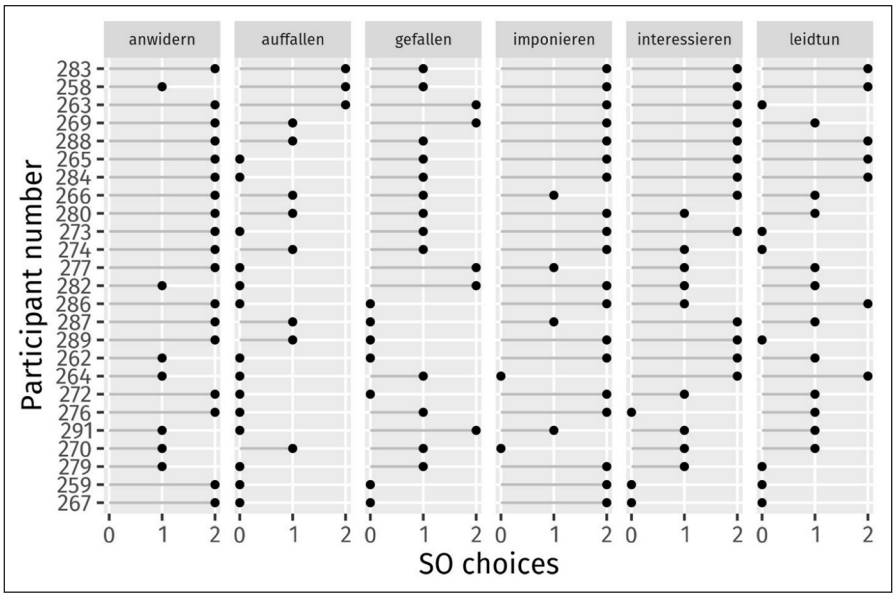

Figure 5: Number of SO choices of each participant for noticeable verbs in study B (with all other verbs, SO is almost always chosen).

3 Theoretical implications

In this section, we will discuss theoretical implications of our studies, both for the syntax of EO verbs and for general accounts of the linearisation of arguments in German.

We take study B to show that at least some verbs have more than one normal order in the given setting. This is hard to reconcile with an account identifying the normal order with a configurationally real (predicate-dependent) base order from which other orders are derived via scrambling. Proponents of such accounts must provide an explanation why a “lower” subject should scramble with dative EO verbs (in approximately half of the cases and without any

obvious reason), but a lower object does not do so with action verbs, or show that there are actually two different readings of the verbs that can be viewed as predicates with different linearisation properties.[17] Also, a comparison of the results of study A and B suggests that animacy is crucial (which is in line with the results of Scheepers et al. (2000)).[18] The strategy to reduce apparent animacy effects to ambiguity of the verb and different thematic roles (see e.g. Haider & Rosengren 2003: 218 sqq.; Frey 2015: 531) seems inviable here. This criticism does not apply to approaches that assume a base order but take linearisation to be the result of potentially competing constraints (e.g. Müller 1999) since only strictly configurational data can count as evidence against them, e.g. data on possible binding configurations. The analysis we will present in the next section will lead to clear predictions for binding possibilities when combined with a theory of binding. Masloch & Poppek & Kiss (submitted) show that binding into the subjects of EO verbs in German is generally possible only if the antecedent precedes (and thus c-commands) the reflexive in surface structure, which challenges accounts in which linear order is detached from configurational structure à la (Reape 1994) or binding constraints are fulfilled at D-structure as in (Müller 1999).

As mentioned in section 1.1, it is a widespread assumption that dative EO verbs are unaccusative (their experiencer argument c-commanding the stimulus on some syntactic level),

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[17] As mentioned in footnote 6, a verb can have more than one base order in Haider's (2000) system if it has more than one conceptual representation. Haider discusses some ditransitives and points out that there are crosslinguistic similarities such that verbs with the same conceptual representations also allow two different base orders in Icelandic, which lacks scrambling. Interestingly there is an Icelandic predicate, *falla í geð* 'like, be to sb.'s liking', that has two neutral orders according to Barðdal et al. (2014) and may have a conceptual representation similar to *gefallen* 'to appeal to', which allows both orders in our study B. One may argue that *gefallen* has a structurally ambiguous conceptual structure and hence allows both orders. However, we find that *gefallen* behaves differently with inanimate subjects (study A) and prefers an OS order then, which indicates that the normal order cannot be solely determined by predicate-specific properties in German. *Falla í geð* has an inanimate nominative argument in Barðdal et al.'s (2014: 59) examples.

[18] Building on the observation that the subjects may receive a specific interpretation in some of the test sentences, a reviewer remarks that they "do not see why DAT-NOM EO verbs should not be analysed as having DAT-NOM base order with specific indefin[i]tes being allowed to scramble as long as both indefinites are animate". While we did not explicitly control for specificity, we do not think that a reading in which one of the NPs is interpreted as specific but the other one is not is the most salient one for most of the test items. In addition, both items for a given verb in study B behave remarkably similar (so one would have to assume that a specific interpretation of the subject was always possible or impossible for both of them by chance), and with dative-object action verbs almost always the SO variant (which would follow the assumed base order) is chosen, although with some of them an interpretation in which the object is specific is the most salient one (e.g. in *Anna hat berichtet, dass ein Aktivist einem Spender gedankt hat.* 'Anna reported that an activist thanked a donor.'). So, why should a specific indefinite 'lower' subject with *gefallen* 'to appeal to' scramble, but a specific indefinite 'lower' object with *danken* 'to thank' not? Also, since a specific interpretation is also possible in the base position (Haider 2017: 2581 sqq.), why should participants choose the scrambled variant? Finally, given that specifics should only scramble under the reviewer's suggestion when both arguments are animate, the restriction is ad hoc. Of course, this is not to deny that there is a relation between the positioning of an indefinite and its interpretation.

while unaccusativity is less often proposed for accusative EO verbs. Assuming fixed base orders, one could directly link linearisation preferences to unaccusativity: An OS preference would be expected to result from an unaccusative structure, where the experiencer-object c-commands the (surface) subject. However, study B shows that this is not what is found once all factors are controlled for. Thus, one cannot link the linearisation properties of EO verbs to unaccusativity directly. As discussed in this section, the data from study B are most naturally explained by accounts that either do not assume a fixed base-order at all or that assume it but take other factors to determine the preferred order even in a neutral context. Since on the latter accounts an unaccusative structure could still be compatible with a preference for SO or the absence of a preference in a neutral setting, our findings do not speak against the unaccusativity analysis directly. The explorative analysis in section 2.4.4 indicates that dative EO verbs are more heterogeneous than usually assumed. At least, they differ in their linearisation preferences.

In the following section, we will propose an analysis that explains the experimental data.

4 Analysis

4.1 Syntactic framework

We follow Haider (2010) in assuming that there are no functional projections between C and the maximal verbal projection in German, that this verbal projection is binary branching with the verb on the right and that the subject is contained in the maximal verbal projection. Furthermore, we assume that arguments and adjuncts may combine with the verb in any order, but that their ordering is subject to violable and interacting constraints. Therefore, we need a model of constraint interaction. For concreteness, we will make use of Maximum Entropy Grammar (Goldwater & Johnson 2003; Hayes 2022), a probabilistic variant of Optimality Theory (Prince & Smolensky 2004) assuming weighted constraints (however, any model providing the means for constraint cumulation is possible in principle). Using a probabilistic model has the advantage that we can account for the observation that participants do not choose one variant or both in equal proportions, as expected if there were a set of winners (containing usually only one element). As the grammatical backbone providing the structures to be compared, any framework within the limits mentioned above is applicable given some level on which surface order constraints can be checked, e.g. a list containing all non-head daughters within a projection (as in Kiss & Pieper & Börner in preparation).[19] Having access to all features of the relevant elements, linearisation constraints can apply to this list.[20] (13) contains a partial analysis of a fragment of one of the test sentences (repeated in (12)). We only indicate animacy here, but all elements will have many other (possibly irrelevant)

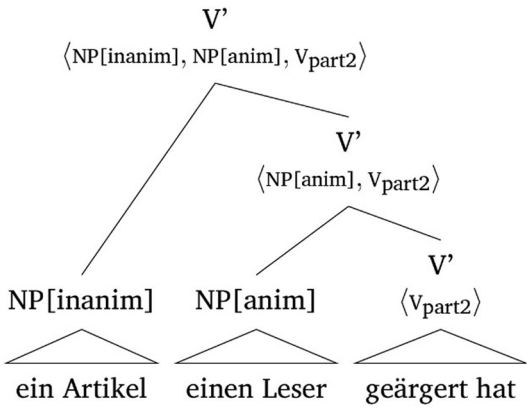
[19] We do not attempt to deal with cases where scrambling (apparently) splits an NP, PP or AP here.

[20] We will assume that they are checked at sentence level for simplicity here, but our experimental results are compatible with (repeated) optimisation at several possible levels.

features. NPs have case, and φ-features, but we will also assume that the verbal projections carry features for argument structure and semantics. They may hence impose certain features on their arguments (via feature sharing or some other mechanism).

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

(13)



Ordering constraints will take the form ANIMATE ≺ INANIMATE, meaning that animate elements should precede inanimate ones. We assume that syntactic and semantic structures are built up in parallel, so that we do not have to replicate semantic information in the syntax.

In Maximum Entropy Grammar, the probability of a candidate y given a context/input x is as in equation 3 (Goldwater & Johnson 2003: 114):

$$P(y|x) = \frac{1}{Z(x)} \exp\left(\sum_{i=1}^{m} w_i f_i(y,x)\right), \text{ where}$$
$$Z(x) = \sum_{y \in Y(x)} \exp\left(\sum_{i=1}^{m} w_i f_i(y,x)\right) \qquad \text{(eq. 3)}$$

This is to be understood as follows (see Hayes 2022 for a conceptual motivation): There is a set of weighted constraints $C = \{c_1,\ldots,c_m\}$. We can think of Y as the generator function, which represents the inviolable part of the grammar. It takes some input x, the nature of which won't concern us here, and returns all candidates (in our case, these will be the two alternatives compared in the experiments). $f_i(y,x)$ is candidate y's number of violations of c_i in context x, either 0 or 1 in all cases we will consider here. w_i is the weight of c_i. We sum over the weighted constraint violations and rescale the sum by exponentiating it. Dividing this value by the sum of the corresponding values for all candidates mainly serves two purposes: 1. Comparing candidates.

2. Pressing the real-valued weighted-constraint-violation-profile sums into the interval [0,1], as required for a probability.

4.2 Causation

Before we introduce the pertinent constraints, we take a step back to consider the nature of emotions. Although it is subject to ongoing debate in philosophy and psychology (see e.g. Deigh 2009; Scarantino & de Sousa 2021 for overviews), an important tradition views "emotions as intentional states of mind, that is, states of mind that are directed at or toward some object" (Deigh 2009: 17). That being said, the verbs called "psych verbs" do not necessarily denote these states: E.g. Marín & McNally (2011) argue that a certain class of Spanish reflexive psych verbs denotes only the beginning of a state, not the state itself. Pesetsky (1995) points to a distinction among the arguments of psych verbs one may naively describe as stimuli or themes. Some of them are the objects of emotion (which can further be subdivided into targets of emotion and subject matters), while others are mere causers. He shows that they can be distinguished by truth conditional differences:

(14) Target vs. causer (Pesetsky 1995: 56)
   a. Bill was very angry at the article in the *Times*.
   b. The article in the *Times* angered/enraged Bill.

(15) Subject matter vs. causer (Pesetsky 1995: 57)
   a. John worried about the television set.
   b. The television set worried John.

The PPs in (14a) and (15a) indicate objects of emotion while the subjects in (14b) and (15b) are causers of the emotion. Pesetsky points out that example (14b) is compatible with a situation in which Bill considers the article itself great but is angry at e.g. the government, whose corruption the article exposes. This is not possible in (14a): The object of the anger must be the article itself. In (15b), the television set need not be the subject matter of John's worries but only needs to cause them: If John is a detective, a television set owned by a purportedly blind man can make John worry about completely different things. In (15a), however, the television set must be the subject matter of John's worries.

Since we will propose below that causers push towards the beginning of the clause, the causer/object-of-emotion distinction is crucial. As shown above, causer subjects with EO verbs can be identified by finding a context in which a pure causer reading is possible, i.e., the subject is not the object of emotion. E.g., in (16a) my fear need not be directed towards the news broadcast, it is fully compatible with a situation in which I watched the news and am afraid of nuclear war afterwards. This is in stark contrast to (16b): For (16b) to be true, I must have

assessed the qualities of the news broadcast itself and found it appealing (see also Fanselow 1992: 292).[21]

(16) a. Die Nachrichtensendung ängstigte mich.
the.NOM news.broadcast.NOM frightened me.ACC
'The news broadcast frightened me.'

b. Die Nachrichtensendung gefiel mir.
the.NOM news.broadcast.NOM appealed.to me.DAT
'I liked the news broadcast.'

In the appendix, we list a sentence and a context for each verb used in our studies in which a pure causer reading is salient, if possible, and we discuss some crucial cases where it is not possible. In general, there is a strong correlation between object case and nature of the subject such that the accusative EO verbs used in our experiments have causer subjects and the dative EO verbs object of emotion objects. This comes as no surprise since causation plays a major role in most major accounts of psych verbs (see the overview in Rozwadowska 2017) and it is often assumed that accusative EO verbs are causative. E.g., their causativity has been taken to explain their linking behaviour in comparison to ES verbs (see i.a. Grimshaw 1990; Reinhart 2002). The assumption that German accusative, but not dative EO verbs are causative is widespread in the literature (see e.g. Rothmayr 2009; Marelj 2013; Hirsch 2018). However, we were unable to find or to come up with an example in which the subject of (accusative EO) *interessieren* 'to interest' is not an object of emotion,[22] and the subject of (dative EO) *imponieren* 'to impress' seems to license a pure causer interpretation in (17). In our judgment, (17) allows a line of argumentation parallel to the one for (15b).

(17) Das Bücherregal imponierte ihm.
the.NOM book.shelf.NOM impressed him.DAT
'The bookshelf impressed him.'

However, there may be some degree of (idiolectal) variation for these judgments: As discussed in section 2.4.4, *imponieren* 'to impress' may enter the adjectival/stative passive, indicating a change-of-state reading (which would fit well with a causer subject, although causation is possible without a change of state, see footnote 26), but many native speakers reject the adjectival passive with *imponieren* 'to impress'.

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[21] It may be possible to coerce the subject into another reading so that it is e.g. the content of the broadcast or the fact that that content is broadcasted and not the broadcast itself that is evaluated (we thank David Wirthmüller for pointing us to such an example), but whatever it is, it has to be the object of the emotion.

[22] Except for cases in which the object of the interest is realised in an additional PP headed by *für* 'for' as in *jemanden für etwas interessieren* 'get sb. interested in sth.'. The subject is interpreted as a causer then.

4.3 Constraints

We assume the following constraints to be among the linear precedence rules of German. None of them is new or should be too controversial (see e.g. Lötscher 1981; Frey 2015).

(18) Linearisation constraints
  a. ACTOR ≺ NON-ACTOR (ACT)
  b. CAUSER ≺ NON-CAUSER[23] (CAUS)
  c. ANIMATE ≺ INANIMATE[24] (ANIM)

From the results presented in section 2, it follows that ACT must be weighted strongly (accounting for the behaviour of action verbs in study B), while CAUS and ANIM must be ranked lower and in this order of importance. Using Maximum Entropy Grammar, however, we do not have to resort to stipulation. Instead, we can learn the weights almost directly from the data.

The formula for the Maximum Entropy Grammar in equation 3 corresponds to a logistic regression model. In order to fit it using common software, one can subtract the constraint violation profile of the OS variant from the one of the SO variant (see appendix). If there are only two candidates x and y, the probability of x is (we drop the input to the generator function here since all alternatives are listed):

$$P(x) = \frac{exp\left(\sum_{i=1}^{m} w_i f_i(x)\right)}{exp\left(\sum_{i=1}^{m} w_i f_i(y)\right) + exp\left(\sum_{i=1}^{m} w_i f_i(x)\right)} = logit^{-1}\left(\sum_{i=1}^{m} w_i \left(f_i(x) - f_i(y)\right)\right) \quad \text{(eq. 4)}$$

We can then encode our experimental data in an appropriate way and feed it to logistic regression models to obtain the constraint weights. However, we must discuss which constraints apply to which items first. We take the accusative-object action verbs used in study B (*anrufen* 'to call sb.', *informieren* 'to inform', *verhaften* 'to arrest') except for *betrügen* 'to deceive', but not the dative-object action verbs (*applaudieren* 'to applaud', *antworten* 'to reply', *danken* 'to thank', *zujubeln* 'to cheer') to be causative (see appendix).[25] Of course, the subject is an actor for all of them. With EO verbs, all accusative EO verbs except for *interessieren* 'to interest' are taken to be causative,[26]

[23] One may take causal relations to hold between propositions, events or the like. What we mean with "causer" here is the argument associated with the causing sub-eventuality.

[24] We do not claim that animacy in a biological sense is relevant grammatically in German. Rather, we assume that there is a grammatically relevant property that we call animacy here because animate beings are typical instantiations of it.

[25] The weight computation script in the OSF directory contains models in which either all or no accusative-object action verbs from the experiments are treated as causative. The resulting weights are similar to the ones reported here.

[26] One may note that almost all accusative EO-verbs preferring an SO order involve change in their semantics, while the verbs preferring an OS order do not, so one may be tempted to suggest that the decisive factor is not causativity

all dative EO verbs except for *imponieren* ‘to impress’ not (but see below) following the discussion in section 4.2. The only EO verb used in our studies that we take to have a reading on which the subject is an actor is *imponieren* ‘to impress’ (see the discussion in section 2.4.4.). To explain the OS preference with *auffallen* ‘to strike’, we will need an additional constraint. Since *auffallen* is the only verb in study B selecting *sein* ‘to be’ as its perfect tense auxiliary, we will assume (19) here (which also affects *nahegehen* ‘to affect deeply’ from study A).[27]

(19) OBJECT OF VERB SELECTING SEIN AS ITS PERFECT TENSE AUXILIARY ≺ SUBJECT OF VERB SELECTING SEIN AS ITS PERFECT TENSE AUXILIARY (SEIN)

A summary of the constraint violation profiles assumed is contained in the appendix. As discussed above, we re-encode the constraint violation profile by subtracting the vector for the OS variant from the one for the SO variant. In a simple model, the linear predictor (i.e. the part within $logit^{-1}$ () in eq. 4) will then look as follows:

$$\beta_{act} \times act + \beta_{caus} \times caus + \beta_{anim} \times anim + \beta_{sein} \times sein \quad \text{(eq. 5)}$$

However, we will complicate this slightly by adding varying intercepts for items and varying slopes for participants. The former means that each item will be allowed to have its own tendency towards SO. The inclusion is helpful because there may be properties of individual items that we failed to control for properly. The latter means that each participant will receive their own constraint weights. Once linearisation constraints are assumed to be weighted, it seems plausible that speakers of a language may differ in the weights they assign to them. By adding the random slopes, it becomes possible to assess the degree of variability of each constraint.[28] However, since each participant saw at most two items for which SEIN is relevant, we do not include a random slope for SEIN. We assume that the random slopes for the other constraints are uncorrelated.[29] We call this model *M_base*. We fitted *M_base* to our experimental data (code available via the OSF directory). However, we did not include the data for all items containing *imponieren* ‘to impress’ or *interessieren* ‘to interest’ in the model. We discuss several models where they are included in the constraint-weight-computation script available on OSF, but at this point we

but change of state. However, as extensively discussed by Hirsch (2018), *ärgern* ‘to annoy’ is causative but stative and does not involve a change of state.

[27] Of course, this is ad hoc. We will take (19) as a placeholder for a semantic criterion. As mentioned in section 1.1, a difference in the linearisation preferences of dative EO verbs selecting *sein* and *haben* has been reported by Fanselow & Häussler & Weskott (2016).

[28] One may assume that only the non-violable constraints are grammatical in a strict sense, while the violable ones reflect universal cognitive preferences and should not differ thus. However, not all ordering constraints are universal: E.g., heavy constituents tend to come at the end of the sentence in German, but at the beginning in Korean (Choi 2009).

[29] There are no participants who saw items in which ANIM is relevant (only used in study A) as well as items in which ACT is relevant (only used in study B).

exclude them for the following reason: As discussed in section 2, we have to assume individual variation for these verbs. Specifically, we suspect that speakers differ in whether they consider their subjects causers or not. Additionally, *imponieren* 'to impress' has an agentive reading (as discussed in section 2.4.4), but also a non-agentive one. There could also be variation between speakers in whether they assume the agentive or the non-agentive reading (which will differ in their constraint violation profiles) more often. Thus, whatever constraint violation profile we assume, it won't be appropriate for all speakers. There is no way to feed this information to the model. The random intercept for items can in principle absorb this bias to a certain degree, but it will still have an impact on the constraint weights we are primarily interested in here, so we exclude the data for these two verbs. *M_base* offers outstanding discrimination on its training data (Somers' D = 0.82, concordance index = 0.91). Its constraint weights are presented in (20).

(20) Linearisation constraint weights (rounded):
   a. ACT: −3.6
   b. CAUS: −2.4
   c. ANIM: −1.1
   d. SEIN: −0.9

The higher the absolute value, the more dominant the constraint. It will be helpful to see how the values in (20) capture the data (see also Table 2 in the appendix): In study A, there was an asymmetry in animacy such that objects were animate and subjects inanimate. The only constraint applicable to the items with dative EO verbs (minus the *sein*-selecting ones and *imponieren*) is ANIM, which explains why they prefer OS: ANIM is violated with the SO variant, but not the OS variant, thus $f_{anim}(SO) - f_{anim}(OS) = 1$. It is the only constraint relevant, so the predicted $P(order = SO) = logit^{-1}(0 \times -3.6 + 0 \times -2.4 + 1 \times -1.1 + 0 \times -0.9) \approx 0.25$. Accusative EO verbs, however, have a causer subject. SO is preferred for these verbs even though it violates ANIM since only OS violates CAUS, which is dominant ($logit^{-1}(-1 \times -2.4 + 1 \times -1.1) \approx 0.79$). In study B, where animacy does not interfere, no constraint pushes an argument in any direction with *gefallen* 'to appeal to' and *leidtun* 'to feel sorry', so participants should not have a preference ($logit^{-1}(0) = 0.5$). With *auffallen* 'to strike', SEIN leads to a preference for OS ($logit^{-1}(-0.9) \approx 0.29$). For accusative EO verbs, only CAUS (violated by OS) is relevant ($logit^{-1}(2.4) \approx 0.92$). With action verbs, ACT (and with the accusative-object ones also CAUS) leads to the strong preference for SO ($logit^{-1}(3.6) \approx 0.97$, $logit^{-1}(3.6 + 2.4) \approx 0.998$).

The standard deviation of the random intercepts for items, which is on the same scale as the constraint weights in (20), is estimated at 0.22. So, our constraints seem to capture the factors at play in the test items well (except for *imponieren* 'to impress' and *interessieren* 'to interest' of course). The estimates for the standard deviations of the random slopes for participants are 0.65 (ANIM), 0.24 (CAUS), 1 (ACT), so it seems that participants differ quite substantially in their

constraint weightings, especially for ACT (although one has to keep in mind that differences at the extremes of the linear predictor translate into lower differences on the probability scale than comparable differences around 0).

Note that this analysis does not need to postulate case-based or grammatical-role related constraints (except for SEIN; see below on ES verbs). Indeed, while it would be generally compatible with a (low weighted) constraint NOMINATIVE ≺ ACCUSATIVE, it is incompatible with constraints that demand nominatives to precede datives because such a constraint would destroy the equilibrium with dative EO verbs and animate subjects (unless counterbalanced by another constraint). A model *M_int* that differs from *M_base* only in having an intercept (whose inverse corresponds to a constraint SUBJECT ≺ OBJECT since it would be violated in all OS but no SO examples, so f_{SO} (*SO*) – f_{SO} (*OS*) would always be -1) has a worse AIC (Akaike information criterion) and BIC (Bayesian Information Criterion) than *M_base* (so the latter is the preferable model). Its estimate for the intercept is close to 0 and not significant. Thus, we assume that there is no constraint like SUBJECT ≺ OBJECT.

We will now look at the two misbehaving verbs: In study B with the animate subjects, the SO variant of the two examples with *imponieren* 'to impress' was chosen by 20 and 22 of the 25 participants respectively (80/88%), in study A with the inanimate subjects, it was 9 out of 29 (31%). In section 4.2 we argued that *imponieren* has a causer subject, in section 2.4.4 that it has an agentive reading. The data from study A is only explainable if we assume that for most participants *imponieren* does not have a causer subject (predicted probability of SO for verbs with a causer subject in this study: $logit^{-1}(2.4 - 1.1) \approx 0.79$). In study B (with different participants), however, *imponieren* clearly differed from the other dative EO verbs. This could also be due to the agentive reading. However, we cannot extrapolate from the experiments which participants assumed an agentive reading in which example, and since an agentive interpretation should lead to a strong preference for SO in the given setting, the source of the SO preference cannot be identified with certainty. With *interessieren* 'to interest' an agentive reading is not possible. In section 4.2, we suggested that it does not have a causer subject. In study B, the SO variant was chosen 19 and 16 times (out of 25, 76/64%), in study A it was chosen 13 times (out of 29, 45%). If it did not have a causer subject, we would expect an SO rate of 50% in study B and of ca. 25% in study A, so we suspect that it may have a causer subject for some participants (but not for all since there is still a striking difference to the values predicted for causative EO verbs mentioned above).

Having dealt with the linearisation preferences of EO verbs, we will now briefly comment on the behaviour of experiencer-subject verbs like *mögen* 'to like': Their preferred argument linearisation is universally taken to be SO. Yet, there is also a (near-)consensus that they are not causative. How can this preference come about if we do not want to assume case- or grammatical-role-based LP rules? While we cannot dive further into this topic here, we note that ES verbs are

often taken to be individual-level predicates (see e.g. Pylkkänen 2000 on Finnish; Fábregas & Marín 2015 on Spanish). If such an analysis is feasible for German, too, as recently argued for by Sommer (2023), one could argue that the subject of an ES verb is thus a very likely aboutness topic (see Krifka 2008 on this notion), and topics are usually assumed to precede comments in linear order (see e.g. Siewierska 1993 among many others).[30]

An obvious question is why almost all accusative EO verbs fall into one class and almost all dative EO verbs into the other. Since it would require a discussion of many grammatical properties of EO verbs whose empirical basis is far from clear, we cannot provide linking constraints here. Nevertheless, we may speculate that the constraints governing linking are mostly similar or equal to some of the ones governing linearisation, one difference being that linking constraints apply to lexical items while linearisation constraints apply to structures that are built on the fly. This would explain why idiosyncrasies are possible with the former, but not the latter. Accusative case on the object of *interessieren* 'to interest' could be such an idiosyncrasy, at least in the grammar of some speakers. The reason for the close resemblance of these constraints might be that they reflect general cognitive preferences. If Haider (2020) is correct in assuming that scrambling comes about as the utilisation of a syntactic potential by other grammatical subsystems, we may assume that among the factors determining the ordering are also general cognitive preferences, some of which are also at work in linking/argument selection (Dowty 1991). Since (by assumption) the demands of the other subsystems, which make use of the syntactic potential, may stand in conflict to each other, one will need some system of managing conflicting constraints anyway. The difference between a fixed-base-order-plus-movement and a free-base-generation account is then at which point broadly speaking thematic features become relevant: "before" syntax, when a base order is determined, within syntax via functional heads that syntactify thematic notions, or later as an important criterion when choosing between available structures? While our data cannot decide the issue, it seems to be more naturally explained by a free-base-generation approach (see section 3). A further point in case comes from the behaviour of comitative adverbials, which are not listed on argument structure representations. As shown by Kiss et al. (in preparation), they adhere to ACT if (and only if) they link their internal argument to an actor (an affirmative comitative takes over the role of a c-commanding antecedent and is subject to the

[30] While Temme & Verhoeven (2016) suggest that the OS preference of dative EO verbs they found in FC experiments with inanimate subjects reflects hierarchical structure, they also assume that experiencers are likely aboutness topics. Of course, an inherent topicality also present in all-new contexts may be at play also in the studies reported here, and it may be the case that some part of ANIM's strength should be allocated to a topicality constraint. Crucially, however, in the examples with dative EO verbs in our study B, both subject and object seem to be equally likely aboutness topics (which fits well with Sommer's (2023) experimental data showing that for plural subjects of German dative EO verbs a generic reading is strongly preferred, which is why she treats them as i-level predicates), but with experiencer-subject verbs, the subject seems to be a more likely aboutness topic even with animate objects.

same constraints then), so that postulating linearisation constraints on a higher level is necessary on independent grounds.

5 Conclusion

We presented two studies investigating the normal argument order with German experiencer-object verbs. Study A shows that with inanimate stimuli, object before subject is the preferred linearisation for dative experiencer-object verbs, while the accusative ones show a preference for subject before object. With the animate stimuli in study B, however, preferences change. Accusative EO verbs (even without an agentive reading) display a clear tendency towards SO while we observe no tendency at all for dative EO verbs. Explorative investigations of the data indicate that there are verb-specific differences (also within the class of dative EO verbs usually taken to be rather homogeneous), which cannot be attributed solely to idiolectal variation.

We argued that the patterns observed, particularly for the dative EO verbs with animate subjects in study B, are hard to reconcile with the widespread accounts of German sentence structure that assume a (predicate-dependent) base order (except for accounts that also assume violable linearisation constraints). We suggested that this pattern and the influence of animacy may be most easily captured in a constraint-based framework and presented an analysis along these lines assuming free base generation of arguments. Building on the semantic distinction between causers and objects of emotion, it was not necessary to postulate linearisation constraints making reference to cases or grammatical roles.

Abbreviations

3SG = third person singular, ACC = accusative, ACT = ACTOR ≺ NON-ACTOR, AIC = Akaike information criterion, ANIM = ANIMATE ≺ INANIMATE, BIC = Bayesian Information Criterion, CAUS = CAUSER ≺ NON-CAUSER, DAT = dative, CI = confidence interval, EO = experiencer-object, ES = experiencer-subject, FC = forced choice, GEN = genitive, MP = modal particle, NOM = nominative, OS = object before subject, REFL = reflexive, SBJV = subjunctive, SD = standard deviation, SEIN = OBJECT OF VERB SELECTING SEIN AS ITS PERFECT TENSE AUXILIARY ≺ SUBJECT OF VERB SELECTING SEIN AS ITS PERFECT TENSE AUXILIARY, SO = subject before object

Data availability/Supplementary files

All analysis scripts, the script used to compute the constraint weights, the raw data (items and results), documents describing the power analyses and the verb selection and additional materials are available from https://osf.io/9nqjc/?view_only=dad5d9cdac2b4d9f90916a9d40a58162. Additionally, there is an appendix containing the supplementary data referred to in the text (DOI: https://doi.org/10.16995/glossa.10150.s1).

Ethics and consent

All experiments reported were conducted as part of the project *The grammar of Experiencer-Object verbs: theoretical, computational and experimental approaches towards reflexive binding in German*. The Deutsche Forschungsgemeinschaft approved the whole project proposal without an ethic committee's statement on individual studies. Participants gave their informed consent to participate in the studies.

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Competing interests

The authors have no competing interests to declare.

References

Abels, Klaus. 2015. Word Order. In Kiss, Tibor & Alexiadou, Artemis (eds.), *Syntax – Theory and Analysis*, Vol. 2, 1400–1448. Berlin, Munich, Boston: De Gruyter Mouton. DOI: https://doi.org/10.1515/9783110363708-017

Arad, Maya. 1998. *VP-Structure and the syntax-lexicon interface*. University College London dissertation.

Barðdal, Jóhanna & Eythórsson, Thórhallur & Dewey, Tonya Kim. 2014. Alternating Predicates in Icelandic and German: A Sign-Based Construction Grammar Account. *Working Papers in Scandinavian Syntax* 93. 51–101.

Bates, Douglas & Mächler, Martin & Bolker, Ben & Walker, Steve. 2015. Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software* 67(1). DOI: https://doi.org/10.18637/jss.v067.i01

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

Berlin-Brandenburgische Akademie der Wissenschaften (ed.). n.d. DWDS – Digitales Wörterbuch der deutschen Sprache. Das Wortauskunftssystem zur deutschen Sprache in Geschichte und Gegenwart. Retrieved from https://www.dwds.de/

Börner, Alicia Katharina & Pieper, Jutta & Kiss, Tibor. 2019. Corpus Data in Experimental Linguistics. In *Proceedings of Linguistic Evidence 2018: Experimental Data Drives Linguistic Theory*. Tübingen: University of Tübingen. Retrieved from https://publikationen.uni-tuebingen.de/xmlui/handle/10900/87132

Bouchard, Denis. 1995. *The Semantics of Syntax: A Minimalist Approach to Grammar*. Chicago, IL: The University of Chicago Press.

Choi, Hye-Won. 2009. Ordering a Left-branching Language: Heaviness vs. Givenness. *Language and Information* 13(1). 39–56. DOI: https://doi.org/10.29403/LI.13.1.3

Deigh, John. 2009. Concepts of Emotions in Modern Philosophy and Psychology. In Goldie, Peter (ed.), *The Oxford Handbook of Philosophy of Emotion*. Oxford: Oxford University Press. DOI: https://doi.org/10.1093/oxfordhb/9780199235018.003.0002

Dowty, David R. 1991. Thematic Proto-Roles and Argument Selection. *Language* 67(3). 547–619. DOI: https://doi.org/10.2307/415037

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

Engelberg, Stefan. 2018. The argument structure of psych-verbs: A quantitative corpus study on cognitive entrenchment. In Boas, Hans C. & Ziem, Alexander (eds.), *Constructional Approaches to Syntactic Structure in German*, 47–84. Berlin, Boston: De Gruyter Mouton. DOI: https://doi.org/10.1515/9783110457155-002

Fábregas, Antonio & Marín, Rafael. 2015. Deriving individual-level and stage-level psych verbs in Spanish. *The Linguistic Review* 32(2). 167–215. DOI: https://doi.org/10.1515/tlr-2014-0022

Fanselow, Gisbert. 1992. „Ergative“ Verben und die Struktur des deutschen Mittelfelds. In Hoffmann, Ludger (ed.), *Deutsche Syntax: Ansichten und Aussichten*, 276–303. de Gruyter. DOI: https://doi.org/10.1515/9783110622447-012

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

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

Fanselow, Gisbert & Häussler, Jana & Weskott, Thomas. 2016. Constituent order in German multiple questions: Normal order and (apparent) anti-superiority effects. In Featherston, Sam & Versley, Yannick (eds.), *Quantitative approaches to grammar and grammatical change*, 33–50. De Gruyter. DOI: https://doi.org/10.1515/9783110401929-004

Frey, Werner. 1993. *Syntaktische Bedingungen für die semantische Interpretation*. Berlin: Akademie Verlag.

Frey, Werner. 2006. Contrast and movement to the German prefield. In Molnár, Valéria & Winkler, Susanne (eds.), *The Architecture of Focus*, 235–264. Berlin, New York: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110922011.235

Frey, Werner. 2015. Word Order. In Kiss, Tibor & Alexiadou, Artemis (eds.), *Syntax – Theory and Analysis*, Vol. 1, 514–562. Berlin, Munich, Boston: De Gruyter Mouton. DOI: https://doi.org/10.1515/9783110377408.514

Gehrke, Berit. 2015. Adjectival participles, event kind modification and pseudo-incorporation. *Natural Language & Linguistic Theory* 33(3). 897–938. DOI: https://doi.org/10.1007/s11049-015-9295-7

Goldwater, Sharon & Johnson, Mark. 2003. Learning OT constraint rankings using a Maximum Entropy model. In Spenader, Jennifer & Eriksson, Anders & Dahl, Östen (eds.), *Proceedings of the Stockholm Workshop on 'Variation Within Optimality Theory'*, 113–122. Stockholm.

Grimshaw, Jane. 1990. *Argument Structure*. Cambridge, MA: MIT Press.

Haider, Hubert. 2000. Branching and Discharge. In Coopmans, Peter & Everaert, Martin & Grimshaw, Jane (eds.), *Lexical Specification and Insertion*, 135–164. Amsterdam: Benjamins. DOI: https://doi.org/10.1075/cilt.197.08hai

Haider, Hubert. 2010. *The Syntax of German*. Cambridge: Cambridge University Press. DOI: https://doi.org/10.1017/CBO9780511845314

Haider, Hubert. 2017. Mittelfeld phenomena: Scrambling in Germanic. In *The Wiley Blackwell companion to syntax, second edition*, 2573–2645. John Wiley & Sons, Ltd. DOI: https://doi.org/10.1002/9781118358733.wbsyncom048

Haider, Hubert. 2020. A null theory of scrambling. *Zeitschrift Für Sprachwissenschaft* 39(3). 375–405. DOI: https://doi.org/10.1515/zfs-2020-2019

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

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

Hirsch, Nils. 2018. *German psych verbs – insights from a decompositional perspective*. Humboldt-Universität zu Berlin dissertation.

Hoberg, Ursula. 1997. Die Linearstruktur des Satzes. In Zifonun, Gisela & Hoffmann, Ludger & Strecker, Bruno (eds.), *Grammatik der deutschen Sprache*, 1495–1680. Berlin: De Gruyter. DOI: https://doi.org/10.1515/9783110872163.1495

Höhle, Tilman N. 2019. Explikationen für „normale Betonung“ und „normale Wortstellung“. In Müller, Stefan & Reis, Marga & Richter, Frank (eds.), *Beiträge zur deutschen Grammatik: Gesammelte Schriften von Tilman N. Höhle*, 2nd ed., 107–191. Berlin: Language Science Press. Original publication 1982 in Abraham, Werner (ed.), *Satzglieder im Deutschen. Vorschläge zur syntaktischen, semantischen und pragmatischen Fundierung*, 75–153. Tübingen: Narr

Keller, Frank. 2000. *Gradience in Grammar: Experimental and Computational Aspects of Degrees of Grammaticality*. Edinburgh: University of Edinburgh dissertation.

Kiss, Tibor & Pieper, Jutta & Börner, Alicia Katharina. in preparation. *Word order constraints on event-internal modifiers*. Bochum. Retrieved from https://lingbuzz.net/lingbuzz/006319/current.pdf?_s=vJcrYu6PReXt_ILj

Krifka, Manfred. 2008. Basic Notions of Information Structure. *Acta Linguistica Hungarica* 55(3–4). 243–276. DOI: https://doi.org/10.1556/ALing.55.2008.3-4.2

Kupietz, Marc & Belica, Cyril & Keibel, Holger & Witt, Andreas. 2010. The German Reference Corpus DeReKo: A primordial sample for linguistic research. In *Proceedings of the 7th conference on International Language Resources and Evaluation (LREC 2010)*, 1848–1854. Retrieved from http://www.lrec-conf.org/proceedings/lrec2010/pdf/414_Paper.pdf

Landau, Idan. 2010. *The Locative Syntax of Experiencers*. Cambridge, MA: MIT Press. DOI: https://doi.org/10.7551/mitpress/8387.001.0001

Lenerz, Jürgen. 1977. *Zur Abfolge nominaler Satzglieder im Deutschen*. Tübingen: Gunter Narr.

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

Marelj, Marijana. 2013. Experiencing linking: Psych verbs at the interface. In van Gelderen, Elly & Cennamo, Michela & Barðdal, Jóhanna (eds.), *Argument Structure in Flux: The Naples-Capri Papers*, 135–168. Amsterdam: John Benjamins. DOI: https://doi.org/10.1075/slcs.131.06mar

Marín, Rafael & McNally, Louise. 2011. Inchoativity, change of state, and telicity: Evidence from Spanish reflexive psychological verbs. *Natural Language & Linguistic Theory* 29(2). 467–502. DOI: https://doi.org/10.1007/s11049-011-9127-3

Masloch, Simon & Poppek, Johanna M. & Kiss, Tibor. submitted. On the (im-)possibility of reflexive binding into the subject of German experiencer-object Verbs. Retrieved from https://lingbuzz.net/lingbuzz/008161

Masloch, Simon & Poppek, Johanna M. & Robrecht, Amelie & Kiss, Tibor. 2021. Syntactic pattern distribution analysis of experiencer-object psych verbs: An annotation manual. *Studies in Linguistics and Linguistic Data Science* 4. i–51. Retrieved from https://ling.auf.net/lingbuzz/006368

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

Pesetsky, David Michael. 1995. *Zero syntax: Experiencers and Cascades*. Cambridge, MA: MIT Press.

Pieper, Jutta & Börner, Alicia Katharina & Kiss, Tibor. to appear. Identifying non-cooperative participation in web-based elicitation of Acceptability Judgments: How to get rid of noise in your data. *Journal of Research Design and Statistics in Linguistics and Communication Science*. Retrieved from https://ling.auf.net/lingbuzz/006514

Pitteroff, Marcel. 2014. *Non-Canonical lassen-Middles*. Universität Stuttgart dissertation. Retrieved from https://elib.uni-stuttgart.de/bitstream/11682/5413/1/Pitteroff_2014_Non_canonical_lassen_middles.pdf

Poppek, Johanna M. & Masloch, Simon & Kiss, Tibor. 2022. GerEO: A large-scale resource on the syntactic distribution of German experiencer-object verbs. In *Proceedings of the language resources and evaluation conference*, 3391–3397. Marseille, France: European Language Resources Association. Retrieved from https://aclanthology.org/2022.lrec-1.362

Poppek, Johanna M. & Masloch, Simon & Robrecht, Amelie & Kiss, Tibor. 2021. A Quantitative Approach towards German Experiencer-Object Verbs. In *Proceedings of the second workshop on quantitative syntax (quasy, SyntaxFest 2021)*, 84–94. Sofia, Bulgaria: Association for Computational Linguistics. Retrieved from https://aclanthology.org/2021.quasy-1.8

Primus, Beatrice. 2004. Protorollen und Verbtyp: Kasusvariation bei psychischen Verben. In Kailuweit, Rolf & Hummel, Martin (eds.), *Semantische Rollen*, 377–401. Tübingen: Gunter Narr.

Prince, Alan & Smolensky, Paul. 2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Oxford: Blackwell. DOI: https://doi.org/10.1002/9780470759400

Pylkkänen, Lina. 2000. On Stativity and Causation. In Tenny, Carol & Pustejovsky, James (eds.), *Events as Grammatical Objects: The Converging Perspectives of Lexical Semantics and Syntax*, 417–444. Stanford, CA: CSLI Publications.

R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/

Reape, Mike. 1994. *A Formal Theory of Word Order: A Case Study in West Germanic*. Edinburgh: University of Edinburgh dissertation.

Reinhart, Tanya. 2002. The Theta System – an overview. *Theoretical Linguistics* 28(3). 229–290. DOI: https://doi.org/10.1515/thli.28.3.229

Rothmayr, Antonia. 2009. *The Structure of Stative Verbs*. Amsterdam: John Benjamins. DOI: https://doi.org/10.1075/la.143

Rozwadowska, Bożena. 2017. Psychological Verbs and Psychological Adjectives. In Everaert, Martin & van Riemsdijk, Henk (eds.), *The Wiley Blackwell Companion to Syntax*, 3383–3408. John Wiley & Sons. DOI: https://doi.org/10.1002/9781118358733.wbsyncom040

Rozwadowska, Bożena & Nowak, Arkadiusz & Bondaruk, Anna. 2020. Psych verbs: Setting the scene. In Rozwadowska, Bożena & Bondaruk, Anna (eds.), *Beyond Emotions in Language: Psychological verbs at the interfaces*, 1–21. Amsterdam: John Benjamins. Retrieved from https://doi.org/10.1075/la.263.01roz

Salzmann, Martin. 2023. *Word order in the German middle field – scrambling*. Retrieved from https://ling.auf.net/lingbuzz/006866

Scarantino, Andrea & de Sousa, Ronald. 2021. Emotion. In Zalta, Edward N. (ed.), *The Stanford encyclopedia of philosophy*, Summer 2021. Metaphysics Research Lab, Stanford University. Retrieved from https://plato.stanford.edu/archives/sum2021/entries/emotion/

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

Siewierska, Anna. 1993. On the Interplay of Factors in the Determination of Word Order. In Jacobs, Joachim & von Stechow, Arnim & Sternefeld, Wolfgang & Vennemann, Theo (eds.), *Syntax: An International Handbook of Contemporary Research*, Vol. 1, 826–846. De Gruyter Mouton. DOI: https://doi.org/10.1515/9783110095869.1.13.826

Sommer, Livia. 2023. *Aspectual composition and effects of definiteness in German and English stative psychological verbs: An empirical investigation*. Berlin: Humboldt-Universität zu Berlin dissertation. https://doi.org/10.18452/27850

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

Uszkoreit, Hans. 1987. *Word Order and Constituent Structure in German*. Stanford, CA: CSLI Publications.

Verhoeven, Elisabeth. 2014. Thematic prominence and animacy asymmetries. Evidence from a cross-linguistic production study. *Lingua* 143. 129–161. DOI: https://doi.org/10.1016/j.lingua.2014.02.002

Verhoeven, Elisabeth. 2015. Thematic Asymmetries Do Matter! A Corpus Study of German Word Order. *Journal of Germanic Linguistics* 27(1). 45–104. DOI: https://doi.org/10.1017/S147054271400021X

Verhoeven, Elisabeth & Temme, Anne. 2017. Word Order Acceptability and Word Order Choice. In Featherston, Sam & Hörnig, Robin & Steinberg, Reinhild & Umbreit, Birgit & Wallis, Jennifer (eds.), *Proceedings of Linguistic Evidence 2016: Empirical, Theoretical, and Computational Perspectives*. Tübingen. Retrieved from https://publikationen.uni-tuebingen.de/xmlui/handle/10900/77066

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

Winter, Bodo. 2020. *Statistics for Linguists: An Introduction Using R*. New York: Routledge. DOI: https://doi.org/10.4324/9781315165547