Verb class effects on word order
Evidence from corpora

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Introduction

Object experiencer verbs with a [–agentive] stimulus behave like unaccusative verbs, i.e., they have a lower stimulus:

\[ \text{e.g. Belletti & Rizzi 1988, Landau 2010} \]

(1) \[
[ \text{agent} \quad \text{(NOM)}] \quad [ \text{patient} \quad \text{V} \quad \text{–NOM}]\]

(2) \[
[ \text{experiencer} \quad \text{–NOM}] \quad [ \text{stimulus} \quad \text{V} \quad \text{NOM}]\]

Only \textit{bracketing} (not \textit{labeling}) is relevant for the predictions on linearization.

Syntactic phenomena supporting these assumptions:
properties of experiencer verbs in nominalization, reflexivization, passivization, extraction possibilities, binding
(see e.g. Bayer 2004, Fanselow 2000, Grewendorf 1989, Wunderlich 1997 on German)
Predictions for linearization

These assumptions about constituent structure motivate predictions for the linearization. Under neutral contextual conditions (i.e., if operations due to discourse features such as ‘topic’ do not apply,) we expect:

(1) \( \text{NOM} \prec \text{–NOM} \)
for transitive verbs (including experiencer-object verbs with \textit{agentive} stimuli)

(2) \( \text{–NOM} \prec \text{NOM} \)
for unaccusatives (including experiencer-object verbs with \textit{non-agentive} stimuli)

These hypotheses are confirmed by intuitive judgments:

- for dative experiencer verbs such as \textit{gefallen}
  (see Lenerz 1977, Hoberg 1981, Primus 2004 on German)
- with some controversies for accusative experiencer verbs such as \textit{interessieren}
  (see in particular Fanselow 2000, 2003, Haider & Rosengreen 2003)
Empirical challenge

Can we use the methodological advances of current empirical research (corpus, experiment) in order to resolve controversies involved in singular observations/intuitive judgments?

The motivation is apparent:
- corpus/experimental approaches offer techniques to eliminate bias (of the observer) and to warrant replicability of the empirical findings.

This program is a challenge:
- corpus/experimental data involve variation coming from sources that are irrelevant for the question at issue (e.g., contextual variation, speaker variation, variation due to speech production factors such as avoiding ambiguity risks).

However, this program is promising:
- It promises empirically precise statements, disentangling the role of several related factors (e.g., animacy or context) and observation of exact behaviour of single verbs/verb classes.
Experiencer-first effects are reported in several empirical studies (sentence processing, speech production, acceptability judgements, corpus)


Relevance of corpus frequencies

- Basic assumption
deviations from the canonical order of the *arguments* must be motivated by discourse features; the canonical order is expected to be *contextually unrestricted*, i.e., to *appear in a larger array of contexts* than the triggered alternatives. This expectation applies to the order of the arguments and not to every deviation from the basic order (see, e.g., head-movement in V2)

- Limits of the inferences from frequencies to structure
contexts triggering movement may be particularly frequent in discourse (e.g., subject topicalization, etc.).
Experiencer-first: questions

Experiencer-first effects are reported in several empirical studies (sentence processing, speech production, acceptability judgements, corpus)


Independency of experiencer-first

Are the experiencer-first effects in speech production independent from the intervention of other semantic and pragmatic factors?

We know the following dependencies:
experiencer ~ topic & topic ~ first
experiencer → animate & animate ~ topic & topic ~ first

A part of the experiencer-first effects in speech production can certainly be explained by the correlation with topics. Is there another part of experiencer-first that is not reducible to its preference for particular discourse properties?
Experimenter-first: questions

Previous empirical studies do not address the distinction between agentive and non-agentive EO verbs, which is however crucial for the syntactic analysis

**Experimenter-first and agentivity**

Do the experimenter-first effects in speech production relate to the totality of experimenter-object verbs or to the subset of non-agentive EO verbs?
Contents

Method: Corpus study (German)

Question A: Independency of experiencer-first effects

Question B: Experiencer-first effects and agentivity
Method
German: Corpus study

corpus  
W-öffentlich of COSMAS database, Written Language, 2,291,520,000 word forms

extracted  
10 verbs for every verb class (four verb classes)
1000 tokens per verb (randomized): total 40000 tokens
(background: verb as random factor)

valid tokens  
main clauses with two realized arguments (pronouns excluded due to particular rules in German)
total: 40000; valid: 4319

decoding  
order: SO vs. OS
voice: active vs. non-active
field: XV_{fin}Y (prefield), V_{fin}XY (middlefield)
animacy: animate vs. inanimate
definiteness: definite vs. indefinite
Verb classes

Dative Experiencer-Object verbs

*imponieren* ‘impress’, *gefallen* ‘please’, *widerstreben* ‘be reluctant’, etc.

Accusative Experiencer-Object ±agentive verbs

*nerven* ‘bother’, *überraschen* ‘surprise’, *ärgern* ‘annoy’, etc.

Accusative Experiencer-Object non-agentive verbs

*interessieren* ‘concern’, *wundern* ‘astonish’, *freuen* ‘give pleasure’, etc.

Canonical transitive verbs

*beeinträchtigen* ‘impair’, *behindern* ‘hinder’, *schützen* ‘protect’, etc.

(particular subclass of canonical verbs with include animacy configurations similar to EO verbs; the question is whether EO effects are restricted to experiencers and not to achieve generalizations about the behaviour of all canonical transitive verbs)
Acceptability study

Agentivity test frame with control verbs: 
\( X \text{ entschied}, Y \text{ zu } V \), 'X decided to V Y'

Agent-oriented adverb:
\( X \text{ V Y absichtlich }, X \text{ V Y on purpose}'

scalar acceptability judgments
(1: non-acceptable; 7: acceptable)

\( n \) of speakers: 32
Acceptability study

Where does the gradience in this data come from?

Agentivity is not scalar. A verb either allows for an agentive reading or not.

The scalar judgments reflect the possibility to imagine a context in which the verb is used as agentive. If this is true, the gradience should correlate with the likelihood of such contexts in speech production.

Can we predict the frequencies of OS by means of the agentivity judgments?
Independency of experiencer-first
Questions

A. Do **verb classes** have an **influence on word order**?
A1. (If yes) is this influence independent from other factors (animacy/definiteness)?
A2. (If yes) where is the locus of the influence?
   - thematic relation of the **undergoer**: patient vs. experiencer
   - thematic properties of the **actor**: agentive/non-agentive
   - **case**: dative vs. accusative

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<tr>
<th>patient</th>
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<tr>
<td>accusative</td>
<td>dative</td>
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<tr>
<td>± agentive</td>
<td>non-agentive</td>
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V-classes:
- canonical
- E.ACC ±ag
- E.ACC –ag
- E.DAT
Examined factors

<table>
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<th>Category</th>
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<tr>
<td>verb class</td>
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<tr>
<td>clausal domain</td>
<td>middlefield (basic configuration)</td>
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<td>prefab (derived configuration)</td>
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<tr>
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<td>disharmonic (definite O &amp; indefinite S)</td>
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<td>other permutations</td>
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<td>random factor</td>
<td>verb</td>
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Cases of interest

**SX order, prefied**

*Der Versuch reizt den Trainer jedenfalls.*
‘The attempt appeals to the trainer anyway.’ (NUN06/APR.02092)

**SX order, middlefield**

*Und jedes Mal entsetzten die jugendlichen Täter die Richter mit ihrer Kaltschnäuzigkeit.*
‘And every time the adolescent delinquents appalled the judges with their coolness. (RHZ01/MAI.13687)

**XS order, prefied**

*Den Regisseur interessiert von nun an eine Frage.*
‘From now on, the director is interested in one question.’ (SOZ06/AUG.00423)

**XS order, middlefield**

*Und ohnehin interessierten das erfreulich junge Publikum weniger die Ehrengäste...*  
‘And anyway, the young public was less interested in the guests of honor...’
Animacy and clausal domain

middlefield
(total = 452 clauses)

prefield
(total = 2424 clauses)
Agentivity and OS

Is agentivity a good predictor for the choice of OS in the middle field?

Statistic results
An effect of agentivity on word order is obtained in GLMM (−.4, i.e., increasing acceptability in the tests correlates with decreasing OS frequency). However, this effect does not reach the significance level.
Results I: verb-class contrasts

Comparison of all models (fourfold, threefold, twofold contrasts) reveals that the maximal goodness of fit is reached by "Canonical vs. E.ACC vs. E.DAT" (Log-likelihood test comparing this model with the full model: not significant).

Calculations with the function `glmer` of the R-package `lme4` (Bates et al. 2011)
Results II: confirmed effects

definiteness

main effect and interaction effects not statistically confirmed (LLT: not significant).

verb class: animacy

log-likelihood test: $\chi^2(2) = 13.4, p < .01$

canonical verbs: no animacy effect
EO.ACC: experiencer fronting with disharmonic animacy
EO.DAT: experiencer fronting independent of animacy

source of the case effect: blocking effect with ACC&harmonic

verb class: field

log-likelihood test: $\chi^2(2) = 13.9, p < .001$

larger effects of class in the middle field than in the pref field

relevance: assumptions about German syntax; previous findings (Bader & Häussler 2010)

animacy: field

log-likelihood test: $\chi^2 (1) = 9.1, p < .01$

larger effect of disharmonic animacy in the middle field.
Thematic role ambiguity

Is the difference between accusative and dative verbs due to the high potential of thematic role ambiguity of acc/nom?

- Relevant in this respect are the clauses without disharmonic animacy.
- Structural ambiguity is more frequent with accusative (25.2%) than with dative (2.9%) verbs
- All structurally ambiguous clauses are disambiguated in favour of a nom-first clause.
- However, the role of ambiguity does not explain the different frequencies of OS order: In the subset of nonambiguous clauses, the OS order is significantly more frequent with dative verbs (38.5%) than with accusative verbs (4.9%); $\chi^2=42.3$, $p<.001$.

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<td>38.5</td>
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Table 1. Ambiguity and word order (prefield & middlefield)
Conclusions

Agentivity (i.e. the distinction between ±agentive and non-agentive) does not have a significant impact on corpus frequencies:

The effect of agentivity does not relate to the lexical entry, but to the non-agentive reading!

**disharmonic cases:** non-agentive reading (for all EO verbs)

**non-disharmonic cases:** agentive and non-agentive readings are possible; an asymmetry in frequencies would be possible; however, almost exclusively NOM-ACC order (possibly for independent reason)
Experiencer-first and animacy
Experiencer-first and animacy

Independency of experiencer-first

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A part of the experiencer-first effects in speech production can certainly be explained by the correlation with topics. Is there another part of experiencer-first that is not reducible to its preference for particular discourse properties?

The analysis so far (generalized mixed logit model) confirmed the effect of ANIMACY and the effect of VERB CLASS. We also need to assess the effects of these factors on each other, in order to examine whether VERB CLASS has an effect that is independent from ANIMACY.
Dependencies between factors

Probabilistic dependency between VERB CLASS, ANIMACY, and WORD ORDER: we fitted Bayesian networks in order to find the dependency model that displays the maximal goodness of fit.

Method:
pairwise comparisons of each class of experincer-object verbs with the baseline (canonical verbs): presentation of the midfield data
(calculations made with the additive Bayesian network algorithm, Lewis 2013, R-package abn)
The effect of EO verbs on word order is an epiphenomenon.

Word order is only influenced by verb class.

EO verbs and animacy influence word order independently of each other.

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**Log-marginal likelihood** (higher values indicate better fit)

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<th>Model 3</th>
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<td>EO dat</td>
<td>−385.1</td>
<td>−383.8</td>
<td>−415.9</td>
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<td>EO acc (–ag)</td>
<td>−240.5</td>
<td>−247.1</td>
<td>−251.6</td>
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<tr>
<td>EO acc (±ag)</td>
<td>−336.3</td>
<td>−352.3</td>
<td>−343.9</td>
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EO acc, –ag

most probable
directed acyclic graph (DAG)
calculated with the additive Bayesian network algorithm, Lewis (2013); R: "abn"

log marginal likelihood for model: –240.5

dish. an.

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OS

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<td>EO</td>
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Model 1

V → A

V → O

A → O

V → o
most probable
directed acyclic graph (DAG)
calculated with the additive Bayesian network algorithm, Lewis (2013); R: "abn"

log marginal likelihood for model: $-383.8$

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$\text{V} \rightarrow \text{A}$

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<tr>
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$\text{V} \rightarrow \text{O}$
Conclusion

Independency of experiencer-first

Are the experiencer-first effects in speech production independent from the intervention of animacy?

- Yes, the experiencer-first effect in the middlefield is not reducible to animacy, i.e., it is not epiphenomenal.

- The fact that this also holds true for EO ±agentive verbs is in line with the view that these verbs most frequently occur as non-agentive in speech production.

- Difference between dative and accusative EO verbs:

  An effect of animacy is cumulated to the experiencer-first effect with accusative verbs. It is not necessary to assume an additional effect of animacy for dative EO verbs: precisely, such an effect is descriptively visible, but a model involving this effect does not have a better goodness-of-fit.
Conclusion

Implications for the syntax of EO verbs

Under the assumption that corpus frequencies are informative for the necessity of licensing noncanonical word order the results show:

- Dative psych verbs:
  Preferential experiencer < stimulus linearization with dative psych verbs (across animacy conditions) is compatible with assumptions about an unaccusative syntax of this verb group (see similar results in the acceptability study in Temme & Verhoeven 2014)

- Accusative psych verbs:
  No significant effect of agentivity
  Taking into account (a) that all verbs in the disharmonic data are non-agentive and (b) there are probably some independent reason banning ACC-NOM linearizations in the non-disharmonic data, the observed frequencies do not allow conclusions for the unaccusativity question.
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