

GerEO: A Large-Scale Resource on the Syntactic Distribution of German Experiencer-Object Verbs

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Abstract

Although studied for several decades, the syntactic properties of experiencer-object (EO) verbs are still under discussion, while most analyses are not supported by substantial corpus data. With GerEO, we intend to fill this lacuna for German EO-verbs by presenting a large-scale database of more than 10,000 examples for 64 verbs (up to 200 per verb) from a newspaper corpus annotated for several syntactic and semantic features relevant for their analysis, including the overall syntactic construction, the semantic stimulus type, and the form of a possible stimulus preposition, i.e. a preposition heading a PP that indicates (a part/aspect of) the stimulus. Non-psych occurrences of the verbs are not excluded from the database but marked as such to make a comparison possible. Data of this kind can be used to develop and test theoretical hypotheses on the properties of EO-verbs, aid in the construction of experiments as well as provide training and test data for AI systems.

Keywords: experiencer-object verbs, psych verbs, database, corpus data, German

1. Introduction

Psych verbs and their properties in multiple languages have ignited discussions among linguists for several decades. Usually, the term ‘psych verb’ is used in the literature for verbs where one argument expresses the experiencer of some psychological state, see e.g. Landau (2010).

Experiencer-object (EO) verbs are those psych verbs whose experiencer argument is linked to the object position in the canonical case. Despite several proposed analyses, the properties of EO verbs remain under discussion (for a short overview of the literature, see Rozwadowska et al. (2020)). This holds also for the question whether they display distinctive characteristics that distinguish them from ‘regular’ transitive verbs. Since Belletti and Rizzi (1988), psych verbs are often considered syntactically deviant, although this has occasionally been called into question (e.g. by Grafmiller (2013) and Żychliński (2016)).

In the canonical pattern, the role of the stimulus (STM) is assigned to the subject, and the role of the experiencer (EXP) is assigned to the object. Verbs that are known to occur in this particular setting are classified as EO verbs, although some of them are known to also license other syntactic patterns, e.g. the reflexive one described in section 4.1. Argument structure alternations have been a matter of debate from the beginning in the case of the passive, and especially the reflexive pattern has stirred interest recently (Alexiadou and Iordăchioaia, 2014; Pijpops and Speelman, 2017; Hirsch, 2018; Rott et al., 2020, among others).

However, there is only little corpus-based work on the topic and, to our knowledge, little to non available datasets containing larger portions of annotated data on the matter. We intend to fill this lacuna for German by presenting a resource, the **German EO** verbs dataset

(**GerEO**), which provides examples for a large number of German EO verbs annotated for their syntactic pattern, semantic stimulus type, form of possible stimulus prepositions as well as a number of other features.

Data of this kind can be used to review, develop, and falsify theoretical hypotheses on the properties of EO verbs. Further usage may include the usages as gold standard data for the training and evaluation of AI systems.

Originally, the resource was developed to aid the design of experiments in experimental syntax by making the researcher aware of properties of potential (test) verbs that may cause interference effects (e.g. the frequent presence of a non-psych reading,¹ the fact that a verb predominantly occurs in a specific pattern etc.) and by allowing them to search for sentences with specific properties that can be turned into experimental stimuli using the methodology of *modified stimulus composition* developed by Börner et al. (2019).

This paper subsequently describes the main aspects of both data and annotation as well as key features of the resource. The full database presented here is publicly available under a Creative Commons license via: https://github.com/Linguistic-Data-Science-Lab/German_EO_verbs.

2. Related Work

To the best of our knowledge, there is no corpus featuring syntactic and semantic annotations for a larger number of German psych verbs yet. Existing corpus

¹The GerEO data contains annotation information on semantic readings that we consider ‘non-psych’. Several verbs frequently cited as denoting mental or emotional states display larger proportions of non-psych readings in the data.

studies for German are either limited to a specific phenomenon (e.g. Verhoeven (2015) looks at 30 verbs, but she focuses on word-order differences only, Möller (2015) contents himself with the past participles of the verbs) or to a small number of verbs or sentences (Engelberg, 2018; Cosma and Engelberg, 2014; Becker and Guzmán Naranjo, 2020).

The latter is problematic because there may be class-internal variation that goes unnoticed if only verbs belonging to one subclass are included or the selection is overly imbalanced. In the theoretical literature, it has recently been proposed by Hirsch (2018) that German psych verbs can be further divided into different subclasses beyond those related to their case selection preferences. However, these subclasses may only be visible within a larger set of candidate verbs.

3. Resource Overview

GerEO contains annotations for 64 German EO verbs. The candidate verbs were selected based on previous experimental and corpus studies (Rääts, 2011; Temme and Verhoeven, 2017; Hirsch, 2018; Engelberg, 2018, among others) and should be acceptable in a transitive EO construction by a naïve judgement of all three German native-speaker annotators and/or cited frequently as EO verbs in relevant publications. Semantically, the verb should display psych predicate properties by clearly referring to the emotional or mental state of an experiencer on the relevant reading (for this criterion, see Landau (2010)).

Verb selection was also guided by an intent to balancing on overall corpus frequency, case preference (dative and accusative, dative EO-verbs are more rare in German²), morphological structure, and perfect tense auxiliary selection preference (*sein* ‘be’ vs. *haben* ‘have’). We also aimed for the inclusion of morphological minimal pairs of root and prefixed verbs, like *wundern* ‘to wonder’ and *verwundern* ‘to astonish’ or *ärgern* ‘to anger’ and *verärgern* ‘to annoy’ since it has been postulated that there are systematic differences between them (Hirsch, 2018).

3.1. Database

The sentences included in the database stem from a newspaper corpus containing the 1993–1999 volumes of the *Neue Zürcher Zeitung*, a German language newspaper from Switzerland, that is described in Kiss et al. (2010). For each of the candidate verbs, up to 200 samples were randomly extracted from this corpus. Roughly one third of these 64 verbs did not yield complete samples of 200 sentences due to their low corpus frequencies. For a complete overview of verbs and sample sizes, cf. Figure 3 in the Appendix.

²Case is not annotated separately, but included in the respective syntactic pattern, however, verbs were chosen on the basis of their case selection in the transitive pattern. There is no object case alternation between accusative and dative with German EO verbs.

3.2. Annotation Process

All samples were divided among three native speakers of Standard German possessing linguistic background knowledge. The annotation was performed individually, and the annotation scheme was developed in several steps, alluding to the MATTER method established by Pustejovsky and Stubbs (2013) for annotation projects on natural language data, and subsequently modified. This was necessary because some phenomena and patterns occur only with a small number of verbs and could not be expected prior to annotation.

After the first annotation stage was completed, each of the samples was revised by at least one further annotator in a subsequent adjudication step to decide on problematic cases. Instead of computing a classic inter-annotator agreement, we verified every annotation (unless unanimous) by at least a simple majority decision among the annotators. For the complete and detailed annotation guidelines, please refer to the independently published annotation manual (Masloch et al., 2021).

The annotation resulted in a dataset with a total of 10,290 annotated examples.

3.3. Format

All annotations of GerEO are sentence-based, where each row contains an extracted example with ID, its parsing data and the complete annotation.

The parsing data are automatic annotations of the sentence in CoNLL-U format for word ID, word, lemma, universal part-of-speech tag, STTS tag, morphological features, ID of syntactic head, dependency relation between the word and its head (Universal Dependencies, see de Marneffe et al. (2021)) generated with Stanza 1.2.3 (Qi et al., 2020) using the default models for German trained on the gsd corpus (McDonald et al., 2013). The most important of our hand-annotated features are represented as columns (mostly x or left blank), while some additional features are encoded as comments in a separate comment column.

Another column (*Misc*) contains possible additional information and remarks by the respective annotator in prose. The data is presented in CSV-Format with one separate file for each verb containing the full sample.

4. Features

The following sections will illustrate the main points of the annotation that form the body of the data. For particularly relevant aspects, example sentences are provided.

4.1. Syntactic Patterns

The core of the distributional annotation are the first columns that each represent one syntactic pattern. Annotated syntactic patterns include the prototypical EO transitive pattern (X-STM V Y-EXP), as in (1), as well as the intransitive (X-STM V) pattern without a syntactically realised EXP (which receives an arbitrary interpretation semantically), as in (2).

- (1) Die Aura der
the.NOM aura.NOM the.GEN
Stararchitekten bezaubert neuerdings
star.architects.GEN charms recently
die Welt.
the.ACC world.ACC
'The aura of star architects re-
cently charms the whole world.'
(ID NZZ_1995_11_28_a97_seg3_s1)
- (2) Die musikalischen Leistungen
the.NOM musical.NOM performances.NOM
imponierten fast durchweg.
impressed almost throughout
'The musical performances impressed al-
most without exception/the entire time.'
(ID NZZ_1994_08_24_a85_seg3_s10)

Pattern	Frequency
X-STM V Y-EXP	4201
X-STM V	1552
(non-psych)	1376
X V refl	1047
sein V-PII	426
(excl. for other reasons)	424
X lassen refl V	300
NoAux V-PII	274
werden V-PII	271
EXP V refl Gen-STM	134
Nom-EXP V	91
refl V-PII zeigen	72
Acc/Dat-EXP V	65
X-CAUS V Y-EXP PP	20
wirken/scheinen V-PII	19
sein zu-Inf	11
tough	7

While there is no overt object on the X-STM V pattern, there are also examples without a (phoric) subject as in (3). This pattern is called Acc/Dat-EXP V. Some verbs – e.g. *ekeln* 'to disgust' – do not need a nominative argument, with others an otherwise obligatory subject may undergo topic-drop in spoken language. A comment is used to mark the potential presence of a non-phoric *es* 'it'.

- (3) Tut mir leid!
feel.sorry.3SG me.DAT PRT³
'I'm sorry.' (ID NZZ_1999_02_05_a160_seg6_s33)

We further annotated both verbal (*werden* V-PII, cf. (4) and adjectival (*sein* V-PII, (5)) passive, which can easily be distinguished in German on the basis of their auxiliaries (*werden* 'become' for verbal passive, *sein* 'be' for adjectival passive).

- (4) Wer soll eingeschüchtert werden?
who.NOM shall intimidated become
'Who is to be intimidated?'
(ID NZZ_1993_06_03_a3_seg7_s1)
- (5) Auch Staehelin ist deprimiert.
also Staehelin.NOM is depressed
'Staehelin is also depressed.'
(ID NZZ_1996_11_04_a18_seg8_s5)

Another major pattern is the reflexive one (X V refl), where the verb is used as a reflexive verb, the experienter is the subject and the stimulus may be expressed in a PP (if it is present at all).

- (6) [...] Der Kongress amüsiert sich.
The congress amuses REFL
'The congress enjoys itself.'
(ID NZZ_1994_02_12_a183_seg21_s7)

A rare construction where the subject is a causer causing the object experienter to be in the emotional state denoted by the verb towards an oblique object of emotion (X-CAUS V Y-EXP) is exemplified in (7).

- (7) [...] der [...] eine Henne [...] für
who.NOM a.ACC hen.ACC for
seinen Hort begeistern konnte.
his nest enthuse could
'who was able to make a hen like his nest'
(ID NZZ_1994_02_12_a183_seg21_s7)

Other patterns include constructions based on the past/perfect participle (*Partizip II*), where the status as a verb is rather doubtful (the same applies to the stative passive), like embedding of the participle under reflexive *zeigen* 'to show' or comparable verbs such as *fühlen* 'to feel' or *erklären* 'to declare' (refl V-PII *zeigen*), embedding of the participle under a verb like *wirken* 'to appear' or *scheinen* 'seem' (*wirken/scheinen* V-PII), or the use of the participle (phrase) as an adverbial (NoAux V-PII), as well as constructions involving a reflexive *lassen* 'let' (X *lassen* refl V), and a pattern that looks similar to the reflexive one but uses *ablaut* instead of reflexivisation (Nom-EXP V). Furthermore, there are patterns for modal infinitives with *sein* 'to be', i.e. infinitives embedded under *sein* 'to be', which receives a modal interpretation then, and the *tough*-construction.

Table 1 contains the overall frequencies of the patterns on the examples not marked as non-psych (cf. section 4.2) or excluded for other reasons (cf. section 4.5.3). There is huge variation between verbs in terms of the patterns they may enter and the frequency they enter them.

4.2. Non-psych Readings

Verbs selected for the database due to their assumed psych reading may also possess other readings, e.g. *bewegen* 'to move' (which can be spatial or emotional), *zusetzen* 'to nag', but also 'to add', or *guttun* 'to do sb. good', 'to benefit'. Such examples are annotated as

³Verbal particle

Pattern	Frequency
inanimate	3498
animate	1399
anim_proxy	271
propositional	1050
ambiguous	495
clash of coordinations	19

Table 2: Distribution of Stimulus Types

non-psych, but the syntactic pattern is annotated nevertheless, so that a comparison of behaviour on different readings is possible.

If the sentence is ambiguous between a psych and a non-psych reading, the more prominent one is annotated and a comment is used. In total, 1376 examples are annotated as non-psych; 232 of those are considered psych-ambiguous and there are 253 ambiguous examples annotated as psych.

4.3. Stimulus Type

We have included a variable for semantic information on the stimulus since the proposed deviant syntactic behavior of EO-verbs is often assumed to be absent on agentive usages of these verbs (Landau, 2010; Hirsch, 2018; Temme, 2018, among many others)

Because agentivity is very hard to annotate directly, we follow the lead of Engelberg (2018), Levin and Grafmiller (2013), and Pijpops and Speelman (2017) and annotate animacy instead. However, a comment is used to mark examples with an animate but clearly non-agentive stimulus. This feature may have the following values: *animate*, *inanimate*, *ambiguous* (this is mostly used for pronouns that cannot be disambiguated from the given context), *anim_proxy* (organisations, institutions and similar stimuli that are not animate in a narrower sense) and *propositional* (in order to avoid difficulties in distinguishing this category from *inanimate*, only clauses and pronouns referring to propositions are included here).

We further added *clash of coordinations* to annotate cases where the stimulus argument consists of a coordinative construction with conjuncts that differ in animacy. The full distribution of annotated stimulus types is provided in Table 2.⁴

4.4. Stimulus PP

The form of a possible stimulus PP – i.e. a PP whose internal argument refers to (part of) the stimulus causing the experiencer’s emotion – is annotated for examples where a nominal or clausal stimulus is overtly present, as well as for examples where this is not the case (as e.g. in passive sentences).

⁴Note that not all patterns feature an overt stimulus. Since the stimulus type was annotated only where possible, the frequencies in Table 2 do not sum up to 10,290.

- (8) Sie fielen durch eine unsichere
they struck through an insecure
Fahrweise auf.
style.of.driving PRT
‘They attracted attention due to their insecure way of driving.’
(ID NZZ.1996.11.28.a170_seg12.s4)

The data contains observed stimulus PPs as an annotation of the respective German preposition in a separate column. Roughly a quarter of all examples (2430) contains a stimulus PP and is annotated with the respective preposition accordingly.

4.5. Additional Features

Besides the key features syntactic pattern, stimulus type and stimulus PP, we have included the related features *Other Stimulus Adjunct* and *Control* as well as a number of other stimulus-, experiencer-, or sentence-related features we subsumed in a comment column. The following sections will provide an overview of these additional annotation features.

4.5.1. Other Stimulus Adjuncts

Sometimes an adjunct stimulus clause is used on a pattern where a stimulus can normally only occur as a PP, as in (9)⁵.

- (9) Gate Gourmet wäre [...] interessiert,
Gate Gourmet is.SBJV interested
diese vollständig zu übernehmen.
these.ACC completely to take.over
‘Gate Gourmet would be interested in taking them over completely.’
(ID NZZ.1995.06.12.a65_seg4.s15)

While similar examples are sometimes taken to contain a covert pronominal adverb (which can be viewed as a PP) – see Gunkel and Hartmann (2020) and the literature cited there –, we do not treat them as stimulus PPs since it is not possible to annotate the form of a covert preposition.⁶

There are 103 sentences containing an *other stimulus adjunct* in our dataset, 75 of which on the reflexive pattern. Also, verbs differ greatly in how often they come with an *other stimulus adjunct*: While most verbs never do, we find 36 (of 200) occurrences with *wundern* ‘to wonder’ and 22 (of 200) with *freuen* ‘to please, be glad’.

⁵If the phrase indicating the stimulus were nominal, it would have to be embedded in a PP headed by *an* ‘at’ in this example.

⁶While (as a reviewer remarks) there is typically only one choice of preposition possible, this is not true for all the verbs: *ängstigen* ‘to frighten’ occurs with pronominal adverbs containing *über* ‘over’ as well as ones containing *vor* ‘before, of’ in our dataset and it is not possible in all cases to say that only one of them was the intended one.

4.5.2. Control

If the EO verb is non-finite and has a silent subject controlled from outside its clause, this can go along with uncertainties about the stimulus type since the stimulus is usually represented syntactically by the subject with our verbs. For this reason, such cases are marked within an extra column. In total, 606 examples are annotated as control constructions.

4.5.3. Comments

To keep the number of columns to a manageable level, we included a number of other features that might apply to smaller sets of example sentences in a single *Comment* column as a categorical variable. Multiple comments may apply to one example which are separated by a comma, if necessary. We annotated verb-based semantic features like polysemy, psych ambiguity (see 4.2) as well as sentence-based characteristics: (dialectal) variation, idiomatic usage etc. Some examples had to be marked as *not of interest* in a separate column, e.g. because they were fragmentary. In these cases, a comment is used to indicate the reason of exclusion.

Comments are also used for some special constructions, e.g. if the verb is used as a verb of utterance (which does not necessarily imply that it is non-psych) as in (10), if the object is not the experiencer but a (sometimes non-physical) part or a property of them as in (11), or if in a construction without overt experiencer, the experiencer is indicated via an adjunct as in (12).

- (10) «Ich riskierte etwas zu viel», ärgerte
I risked a.bit too much annoyed
er sich.
he.NOM REFL
“I risked a bit too much”, he said, and the way
he said it showed that he was annoyed by it.
(ID NZZ_1994_08_29_a114_seg2_s6)
- (11) Den Blick erfreut das
the.ACC glance.ACC pleases the.NOM
viele Schöne.
much.NOM beautiful.NOM
‘All those beautiful things please the eye.’
(ID NZZ_1995_06_24_a215_seg3_s5)
- (12) Diese Neuerungen behagen naturgemäss nicht
these innovations please naturally not
überall.
everywhere
‘Naturally, not everyone is happy
with these innovations / some people
have doubts about these innovations.’
(ID NZZ_1994_11_29_a72_seg8_s3)

Additionally, comments refer to distinctive features of both stimulus and experiencer arguments, e.g. metonymic or metaphoric usage, non-canonical experiencers and similar phenomena.

Individual remarks on particularly interesting examples of a respective annotator in prose are presented in a separate column, *Misc*.

5. Conclusion and Further Perspectives

GerEO contributes to a wider quantitative perspective on German EO verbs and their syntactic behaviour by being the first larger manually annotated dataset that is publicly available. Due to the ongoing discussion about both theoretical and distributional aspects as well as their status in the verbal domain, we consider the resource fruitful for further research.

Due to its size, GerEO allows to detect heterogeneous behaviour among the whole group of annotated experiencer-object verbs as well as supposed subclasses proposed in the literature. Databases of this kind may aid both theorising as well as experimental efforts.

While the number of 64 verbs already covers a significant proportion of German EO-verbs (cf. e.g. the list provided by Rääts (2011)), the dataset could be further expanded both in terms of sample size as well as the number of verbs in the future.

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8. Appendix

Verb	Case	Sample Size	Verb	Case	Sample Size
<i>amüsieren</i> , 'to amuse'	acc	200	<i>frustrieren</i> , 'to frustrate'	acc	125
<i>anekeln</i> , 'to sicken'	acc	20	<i>gefallen</i> , 'to like'	dat	200
<i>ängstigen</i> , 'to frighten'	acc	109	<i>genügen</i> , 'to suffice'	dat	200
<i>anwidern</i> , 'to disgust'	acc	32	<i>guttun</i> , 'to benefit, comfort'	dat	200
<i>ärgern</i> , 'to anger'	acc	200	<i>imponieren</i> , 'to impress'	dat	200
<i>auffallen</i> , 'to strike'	dat	200	<i>interessieren</i> , 'to interest'	acc	200
<i>aufstoßen</i> , 'to strike (neg.)'	dat	200	<i>irritieren</i> , 'to irritate, confuse'	acc	200
<i>aufwühlen</i> , 'to stir up'	acc	117	<i>langweilen</i> , 'to bore'	acc	200
<i>ausreichen</i> , 'to suffice'	dat	200	<i>leidtun</i> , 'to feel sorry'	dat	200
<i>bedrücken</i> , 'to distress, depress'	acc	87	<i>missfallen</i> , 'to displease'	dat	200
<i>beeindrucken</i> , 'to impress'	acc	200	<i>nahegehen</i> , 'to afflict, upset'	dat	29
<i>befremden</i> , 'to alienate'	acc	177	<i>nerven</i> , 'to bother'	acc	141
<i>begeistern</i> , 'to thrill, enthuse'	acc	200	<i>peinigen</i> , 'to tantalise'	acc	85
<i>behagen</i> , 'to please'	dat	200	<i>plagen</i> , 'to plague'	acc	200
<i>bekümmern</i> , 'to concern, chagrin'	acc	60	<i>provizieren</i> , 'to provoke'	acc	200
<i>beruhigen</i> , 'to calm'	acc	200	<i>quälen</i> , 'to torment'	acc	200
<i>beschämen</i> , 'to shame'	acc	65	<i>schmeicheln</i> , 'to flatter'	dat	200
<i>beunruhigen</i> , 'to worry'	acc	200	<i>schockieren</i> , 'to shock'	acc	200
<i>bewegen</i> , 'to move'	acc	200	<i>schwerfallen</i> , 'to find difficult'	dat	200
<i>bezaubern</i> , 'to charm'	acc	138	<i>stören</i> , 'to disturb, bother'	acc	200
<i>deprimieren</i> , 'to depress'	acc	60	<i>überfordern</i> , 'to be too much, overwhelm'	acc	200
<i>einleuchten</i> , 'to be evident'	dat	200	<i>verängstigen</i> , 'to frighten'	acc	36
<i>einschüchtern</i> , 'to intimidate'	acc	200	<i>verärgern</i> , 'to annoy'	acc	200
<i>ekeln</i> , 'to disgust'	acc	23	<i>verblüffen</i> , 'to flabbergast'	acc	200
<i>empören</i> , 'to outrage'	acc	200	<i>verschrecken</i> , 'to scare'	acc	58
<i>entmutigen</i> , 'to discourage'	acc	200	<i>verstören</i> , 'to distract, distress'	acc	52
<i>entzücken</i> , 'to delight'	acc	190	<i>verwirren</i> , 'to confuse'	acc	200
<i>erfreuen</i> , 'to enjoy, delight'	acc	200	<i>verwundern</i> , 'to astonish'	acc	200
<i>erheitern</i> , 'to cheer, brighten'	acc	59	<i>widerstreben</i> , 'to oppose, have an aversion'	dat	76
<i>erschrecken</i> , 'to startle'	acc	200	<i>wundern</i> , 'to wonder'	acc	200
<i>faszinieren</i> , 'to fascinate'	acc	200	<i>zermürben</i> , 'to demoralize, grind'	acc	152
<i>freuen</i> , 'to please, be glad'	acc	200	<i>zusetzen</i> , 'to badger, harass'	dat	200

Table 3: Verbs and Sample Sizes