Underuse of Syntactic Categories in Falko
-
A Case Study on Modification[1]

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Abstract

This paper shows how the automatic syntactic analysis of a corpus of advanced learners of German as a foreign language helps in understanding the acquisition of modification. In former corpus research modification has been studied only by comparing the distributions of single words (or groups of words) in learner and native speaker data. We argue that in order to study modification as a syntactic category it is necessary to work with syntactically analyzed corpora. In this vein, we sketch out our approach to parsing learner language and conduct two contrastive interlanguage studies on modification in the syntactically annotated corpus, showing that not only lexical modifiers can be underused (as shown in many other studies), but that modification as a whole category (including multi-word modifiers such as prepositional phrases, and clausal modifiers such as relative clauses) is underused in our learner corpus data.

Keywords: modification, syntax, adverbs, parsing, learner German, underuse, contrastive interlanguage analysis

1. Lexical and Functional Modification

It has often been shown that learners of a foreign language use different aspects of modification differently from L1 speakers (see e. g. Hinkel 2003 on learner English, Aijmer

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[1] We want to dedicate this article to Brigitte Handwerker who has argued for many years and in numerous influential publications (e.g. Handwerker & Madlener 2009) that it is necessary to base studies of learner language on a solid theoretical foundation. She has shown in many papers that it is essential to look at words and at syntactic configurations – the findings in this paper are another case in point.

2002 on learner Swedish, Maden-Weinberger 2009 on learner German and a broad overview of studies on modification in L2 acquisition). In this paper we want to study the use of modification by learners of German as a foreign language in written texts. We argue that since modification is a functional category that can be expressed by different forms we cannot simply look at lexical items or even sequences of part-of-speech (POS) tags if we want to understand modification, but rather need to look at syntactic structures.

Modifiers occur in different forms and in different functions. As a first approximation we can say that modification is everything that is not strictly necessary to fill the argument structure of a verb.[2] Consider examples (1) and (2) from the German learner corpus Falko[3].

1. Generell gibt   es viele Leute, die   lange   gearbeitet   haben.
   Generally exists it many people who   long   worked   have.
   Generally, there are many people who have been working for a long time.

2. Aber ehrlich   gesagt, solche Behauptungen finde ich auch zweifelhaft.
   But honestly   said   such   claims   find I   also dubious
   However, honestly speaking, I also consider such claims dubious.

The verb *geben* in the sense ‚exist‘ in (1) needs a (non-referential) argument *es* ‚it‘ and an NP – in this case *viele Leute* ‚many people‘. The sentence contains different kinds of modifiers. *generell* 'generally' is a one word sentence modifier, *lange* 'long' is a one-word verbal modifier, *die lange gearbeitet haben* 'who have been working for a long time' is a relative clause that modifies a noun. In (2) we again see one word modifiers (*aber* 'but', *auch* 'also') and a multiple word modifier *ehrlich gesagt* 'honestly speaking'. Syntactically, of course, all modifiers are phrases and it does not matter whether a phrase consists of one word or multiple words. Much of the corpus-based research on modifiers in foreign language learning, however, has focused on single word modifiers (Chen 2010, Hancock & Sanell 2009, Dimroth & Watorek 2000, Vyatkina 2007, Möllering 2004). This is due to two reasons. The first reason is a technical one: word forms are easy to search for. The second reason is linguistic: It has been argued that certain modifying words have properties that make them especially difficult to learn. German modal particles constitute a case in point – it has been claimed in many studies that modal particles are highly polysemous, multi-functional, and rare in other languages which is said to lead to errors and

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[2] For the purpose of this paper we assume that it is always possible to make this distinction. We are, of course, aware of the many problems connected with the definition of argument structure (valency, subcategorization etc.) and the exact distinction between arguments and adjuncts (Przepiorkowski 1999, Hirschmann 2011). We also assume here that determiners are not modifiers.

[3] Falko contains written essays by advanced learners of German. A more detailed description follows in Section 2.

underuse by learners of German as a foreign language (two early contributions on the problem of modal particles are Zimmermann 1981, Jiang 1994). This view can be contrasted by the finding that learners of an L2 differ from L1 learners in that they have access to all syntactic stages of acquisition, while L1 learners pass a more or less fixed sequence of acquisition levels in which only certain structures (and words) are used (Schlyter 2005).

The different forms of modification (words and multi-word phrases up to clauses) in examples (1) and (2), however, show that it is necessary to look beyond single words if we really want to understand the acquisition of modification. Are the differences in the acquisition of certain adverbs, particles, etc. which are attested in the above mentioned studies form based, or are they function based? Do learners have problems with specific classes of syntactic categories or do they have problems with specific functions of modification?

In the following section we want to briefly introduce our corpus and present overuse/underuse diagnostics that allow us to find underuse by learners independent of their L1. These diagnostics show us that adverbs are especially problematic. We will then (Section 3) refine our questions and demonstrate that we can only answer them using a syntactic analysis. In Section 4 we will briefly describe how we parse our corpus and what the syntactic annotation looks like. Section 5 presents some results.

2. Data and Analysis

Our study is based on the Falko corpus (Lüdeling et al. 2008, Reznicek et al. 2010), a freely available annotated learner corpus of German as a foreign language.[4] The corpus consists of written essays from advanced learners[5] (130,000 tokens); in addition there is a comparable native speaker corpus with texts produced under the same circumstances (70,000 tokens, Falko L1). The corpus is stored in a flexible multi-layer standoff architecture; it is possible to add annotation layers at any time (Lüdeling et al. 2005).

The learner data is first POS tagged and lemmatized, using the TreeTagger (Schmid 1994). A very important step of preprocessing for studies involved in Error Analysis as well as in Contrastive Interlanguage Analysis (see Granger 2008) is the construction of a hypothetical 'correct' version of a learner utterance which we call the target hypothesis. In previous

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[4] http://www.linguistik.hu-berlin.de/institut/professuren/-korpuslinguistik/forschung/falko/standardseite

[5] The learner level was assessed using a standardized c-test. The learners are mainly university students, most of them have acquired German in a tutored fashion, and some of them have spent time in a German speaking country. The corpus contains detailed metadata about the linguistic history of the learners. Text production was rigorously controlled.

publications we have shown that the construction of a target hypothesis has a crucial impact on the results of any kind of analysis of the learner data (Hirschmann et al. 2007, Lüdeling 2008, Reznicek et al. submitted; for a discussion of the interpretation of learner data see also Corder 1981, Tenjford et al. 2006, Diaz-Negrillo et al. 2010). In this article we want to focus on the importance of the target hypothesis for annotation. (Automatic) annotation of learner data is highly problematic because the data is unsystematic and differs in many ways from the data typically used for training annotation tools (Izumi et al. 2005). A target hypothesis (which is needed for independent reasons) is a version of the learner utterance that conforms to the grammar of the L2. Target hypotheses can be used as input by annotation tools (in our case taggers and parsers) which would fail if they were used directly on the learner data. Before we describe the tagging and parsing process we want to explain in more detail why we think it is necessary to have syntactic analysis of the learner data in order to understand modification.

3. Identification of Structural Features in L2-German

We are interested in those patterns of L2-German that are independent of transfer or interference phenomena, and are thus genuine features of learner German. As a diagnostic we look at underused structures. We compare L2 and L1 distributions and concentrate on those categories that show a statistically significant underuse by all learners. Overuse/underuse statistics can be computed for all categories or combinations of categories coded in the corpus (Lüdeling 2011, Reznicek et al. submitted). In Tables 1 and 2 we see comparisons of individual lemmas and consecutive POS tags. The normalized frequencies of each lemma or POS chain in Falko L1 (the native speaker control corpus) are compared with the normalized frequencies of the same type in different Falko learner subgroups. Using this diagnostic we find categories which are overused or underused by all Falko learner subgroups and we assume that consistent overuse or underuse is a property of German learner language rather than a transfer property. In Table 1 there is only one lemma which is clearly underused by all Falko learners: the reflexive pronoun *sich*. One could argue that reflexivity in German as a foreign language is a difficult property for every learner, independent of how reflexivity is expressed in the learner's L1 or previously acquired L2s (see Zeldes et al. 2008). The lower half of Table 1 shows a number of adverbs – none of these is clearly underused by all learners.[6]

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[6] The word *aber* 'but' has an adverbial reading but also functions as a conjunction and a focus particle (see Grünhagen 2011 for *aber* in learner language).

This diagnostics can be applied to any category that is annotated in the corpus.[7] In Table 2 we compare the frequencies of part-of-speech bigrams, finding that bigrams containing adverbs are consistently underused by all learner groups and that adverb-adverb chains show the most significant underuse among all chains looked at. This is interesting since adverbs are almost always modifiers.

word	de	da	en	fr	ru	usb
die (the)	0.0297	▲0.0391	▲0.0391	▲0.0410	▲0.0351	▲0.0353
der (the)	0.0241	▼0.0187	▼0.0207	▼0.0192	▲0.0286	▼0.0233
und (and)	0.0230	▼0.0228	▼0.0230	▼0.0210	▼0.0212	▼0.0207
es (it)	0.0119	▼0.0108	▼0.0113	▲0.0133	▲0.0123	▼0.0049
sich (oneself)	0.0116	▼0.0062	▼0.0056	▼0.0069	▼0.0054	▼0.0047
aber (but)	0.0033	▲0.0073	▲0.0066	▲0.0073	▲0.0038	▲0.0073
auch (also)	0.0083	▲0.0085	▼0.0054	▼0.0057	▼0.0044	▼0.0070
so (so)	0.0047	▼0.0035	▼0.0045	▼0.0035	▼0.0031	▼0.0044
nur (only)	0.0038	▲0.0045	▲0.0047	▼0.0038	▼0.0024	▲0.0047
sehr (very)	0.00134103	▲0.0033	▲0.0021	▲0.0023	▼0.0007	▲0.0016
immer (always)	0.00262571	▼0.0019	▼0.0021	▼0.0025	▼0.0021	▲0.0033

Table 1. Comparison of frequent lemmata in the Falko corpus. The column 'de' shows normalized frequencies in the Falko L1 subcorpus. The other columns show the frequencies for different L1s. 'da': Danish; 'en': English; 'fr': French; 'pl': Polish; 'ru': Russian; 'usb': Uzbek. Shading corresponds to the strength of the deviation and arrows give the direction (under- or overuse). White cells show negligeable deviations.

c_pos_bi	de	da	en	fr	ru	usb
ART-NN	0.0639	▲0.0672	▲0.0672	▼0.0634	▲0.0791	▼0.0582
ADJA-NN	0.03937	▼0.0330	▼0.0374	▲0.0409	▲0.0552	▼0.0293
APPR-ART	0.02504	▲0.0278	▲0.0262	▲0.0250	▲0.0261	▼0.0178
ART-ADJA	0.02035	▼0.0167	▲0.0214	▲0.0238	▲0.0274	▼0.0129
ADV-ADJD	0.00815	▲0.0087	▲0.0087	▼0.0079	▼0.0047	▼0.0068
ADV-ADV	0.01285	▼0.0105	▼0.0061	▼0.0061	▼0.0028	▼0.0035
VVFIN-$.	0.00578	▼0.0046	▼0.0049	▼0.0051	▲0.0074	▼0.0058
VAFIN-$,	0.00485	▲0.0076	▲0.0061	▲0.0080	▼0.0035	▲0.0115

Table 2. Comparison of part of speech chains (bigrams) in the Falko corpus, POS tags conform to the STTS tagset (Schiller et al. 1999). The column 'de' shows normalized frequency in the Falko L1 subcorpus. The other columns show the frequencies for different L1s. 'da': Danish; 'en': English; 'fr': French; 'pl': Polish; 'ru': Russian; 'usb': Uzbek.

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[7] The Excel Add-In that produces these figures and visualizations was programmed by Amir Zeldes and is freely available at http://korpling.german.hu-berlin.de/~amir/uoaddin.htm.

A category can be underused in L2 because the learners have not acquired it – in this case it is uninteresting for our purpose. Or it is underused because the learners (unconsciously) avoid it, although they actually have access to the category. As stated above, previous form-based studies looking at modification in learner German report that learners have problems using certain (individual) modifiers. The general adverb underuse in Falko points in the same direction, but it is more abstract than these findings, because it refers to a whole word class and not to individual items. This leads us to the question what the precise reason for the observed underuse (specific words in the case of the reported studies and the overall adverb underuse in our findings) is. Is it due to problematic lexemes only or due to the avoidance of single word adverbs in favor of multi-word adverbials, or due to the avoidance of a whole syntactic class? Is modification generally underused or do learners make up for the underuse of adverbs by other means of modification?

In Falko we find a general adverb underuse for the whole learner population which results from the finding that the POS category ADV (adverb, particle) is underused among all learner groups in Falko, and that ADV-ADV chains (Table 2) are even more underused than the single ADV underuse would predict. It is important to note that the part-of-speech category ADV (adverb) in the STTS tagset that we use in Falko is rather broad - Hirschmann (2011) shows that certain adverbial functions (such as modal particles) are actually more underused than other adverbial functions. A more fine-grained tagset for adverbs might be helpful but would be difficult to assign automatically since many of the adverbs are polysemous. In addition, such a fine-grained categorization would say nothing about multiple-word modifiers at all. In order to answer the more general questions formulated above we need a syntactic analysis. Since there is not yet much work on the syntactic annotation of learner data we will describe how we have parsed the Falko data and analyzed the relevant categories.

4. Syntactic Annotation of Falko

The target hypotheses which we created for the Falko L1 and L2 corpora (Section 2) allow us to use state-of-the-art NLP tools for automatically predicting the syntax of learner utterances.[8] We manually corrected automatically assigned part-of-speech tags (Rehbein et al. 2012) and used the word tokens and the corrected POS tags as input for the syntactic

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[8] There is an ongoing debate on the question of whether target hypotheses are necessary for the analysis of learner language. Dickinson & Ragheb (2009) try to get around the expensive costs of creating target hypotheses while automatically parsing advanced learner English, which is seen as problematic by other authors (Rosén & de Smedt 2010). As we have argued above, we consider the formulation of target hypotheses (or conceptually similar annotations) to be necessary for many aspects of understanding learner language. We think that it is essential for the automatic analysis of any corpus containing a substantial amount of data which cannot be interpreted directly with a given annotation scheme.

dependency parser (Bohnet 2010).[9] The parser was trained on around 40,000 trees from the TiGer treebank (Brants et al. 2002), a German newspaper corpus annotated with phrase structure and dependency (functional) information. The hybrid annotation scheme of TiGer, which comprises a set of 27 syntactic categories and 49 grammatical functions, allows for transforming the phrase-structure trees into bilexical dependencies by applying head-finding rules to the constituency structures. The resulting dependency version of the treebank which utilises the same set of grammatical functions as the original TiGer treebank was then used to train the parser.

While creating the target hypotheses we kept track of all changes applied to the data (insertions, deletions, correction of spelling errors, movement of lexical material). This allowed us to map back the automatic parses of the target hypotheses to the original learner (or native speaker) utterances after parsing.
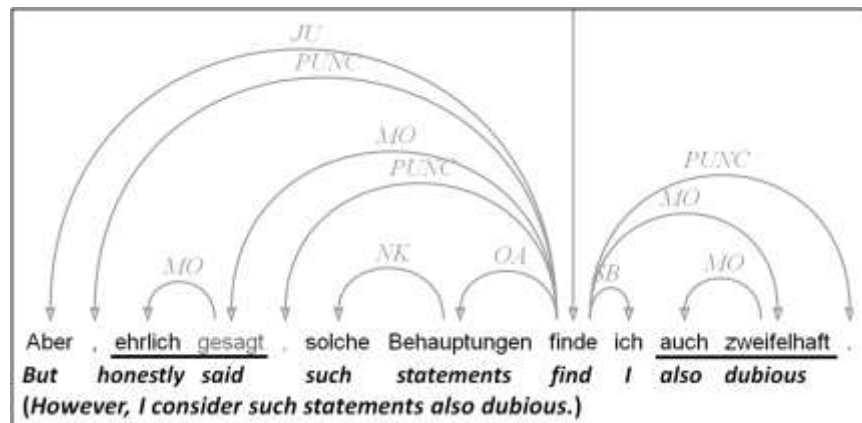

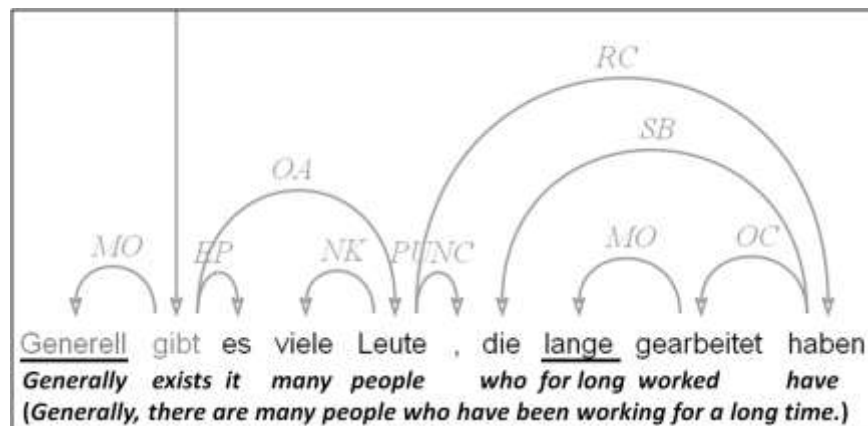*Figure 1. Dependency tree for Example 2.*

Figure 2. Dependency tree for Example 1.

5. Modification: Some Results

Using the syntactic annotation and the underuse diagnostics we can now try to answer more general questions. Consider the dependency trees from Examples (1) and (2) in Figures 1 and 2. Here we find the information we need to address the remaining questions. In Figure 1 we see, for instance, a modifying edge (with the edge label MO) from a modified category (*gibt* 'exists') to the modifier (*generell* 'generally'). Figure 2 depicts two pairs of consecutive modifiers which would be analysed as phrases with a head and an internal modifier. In the Falko dependency version such complex modifiers are expressed (and can be found) through edges pointing from a modifying element to further elements that belong to the modification process itself.[10]

modifier	raw L1	norm L1	raw L2	norm L2	L2 under-/ overuse
ADV (adverb)[11]	6388	69.8	8140	50.1	▼
AVP (AdvP)	517	5.7	674	4.1	▼
AP (AP)	248	2.7	370	2.3	▼
SR (rel. clause)	862	9.4	1347	8.3	▼
PP (PP)	3462	37.8	5771	35.5	▼
PWAV (interrogative)	227	2.5	393	2.4	▽
NP (NP)	69	0.8	125	0.8	-
ADJA (Adjective, prenominal)	2739	29.9	5056	31.1	△
SA (adverbial clause)	632	6.9	1193	7.3	△
PROAV (pronominal adverb)	277	3.0	609	3.7	▲

Table 3. Modifier distributions in Falko L1 and Falko L2, ranked from strongest underuse to strongest overuse. Normalized frequencies are occurrences per 10000 edges.

6. Modification in advanced learner German – conclusion and future work:

In this paper we have looked at modification in advanced learner German. There are many previous studies that suggest that learners do not use modification in the same way that native speakers do. Most of these studies focus on single lexemes (often modal particles) and study their misuse or underuse[12]. Since modification is a functional (syntactic) category we have argued that it is not sufficient to look at lexical items or even part-of-speech classes in order to understand the phenomenon. While word underuse or POS underuse may help us formulate hypotheses about learner patterns, in the end we need a syntactic analysis.

Using underuse/overuse statistics on a parsed learner corpus we have shown that the acquisition of modification in advanced learner German has form-based aspects as well as function-based aspects. Modification is generally underused by the learners. While learners

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[10] According to our definition of modification the relative clause in Figure 1 (edge label RC) is also a modifier. Depending on the research question RCs could easily be excluded or included in the analysis.

[11] The category adverb includes adverbially used adjectives which show a similar underuse to clear adverbs.

[12] Most of the previous studies look at a single language pair – it is thus not clear whether the findings are due to transfer effects or are structural properties of learner language.

use many modifying categories similarly to native speakers there seems to be a general problem with adverbs and adverbial phrases. We will concentrate on these classes in further studies. We will also have to explore the other end of the edge in the syntactic tree – the modified element as well as the relationship between modifier and modified element.

We argued that for this and many other questions concerning learner data it is necessary to separate form and function and this means that parsing the data is well worth the effort. We have shown that the formulation of a target hypothesis is a crucial step in parsing 'non-canonical' data.

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