UCLouvain

Faculté de philosophie, arts et lettres
Commission doctorale du domaine langues, lettres et traductologie
Institut Langage & Communication – Pôle de recherche en linguistique

Syntactic diversity and functional adequacy in L2 German writing

A multi-dimensional investigation of L2 learners' syntactic behavior at the interface with discourse organization

Membres du jury :

Prof. Fanny Meunier, présidente
Prof. Liesbeth Degand, promotrice
Prof. Ferran Suñer, promoteur
Prof. Carlee Arnett, lectrice extérieure
Prof. Tanja Mortelmans, lectrice extérieure

Thèse réalisée par
Mathieu Lecouvet

en vue de l'obtention du grade de
Docteur en langues, lettres et traductologie

Louvain-la-Neuve
Année académique 2021-2022

Pour mon père.

Aber ist nicht der Anfang und das Ende jeder Wissenschaft in Dunkel gehüllt?
(Heinrich von Kleist, Brief an Adolfine von Werdeck vom 28. Juli 1801)

TABLE OF CONTENT

Chapter 1 1
Introduction

Chapter 2 55
Syntax-discourse properties of prefield constituents in L2 German expository writing

Chapter 3 87
Non-canonical word order as a measure of syntactic complexity in advanced L2 German

Chapter 4 119
Unclogging the Bottleneck: The role of case morphology in L2 acquisition at the syntax-discourse interface

Chapter 5 157
The relationship between L2 learners' writing processes and performance in syntax and discourse organization: A keystroke-logging study

Chapter 6 189
General discussion and conclusion

References 215

Appendices 251

Acknowledgements 285

Chapter 1: Introduction

1. Preamble

When asked to comment on texts written by second language (L2) writers, both language teachers and native speakers of the target language often make the observation that syntactically irreproachable productions, i.e. texts characterized by no or only few violations of the target-language syntactic constraints, still sound foreign or unidiomatic (Bohnacker & Rosén, 2008; Callies, 2013; Carroll et al., 2000). In other words, even at advanced proficiency, syntactic accuracy is no guarantee that non-native writers manipulate the target language in the same way as natives. If accuracy is not the reason why L2 writing does not sound target-like, the question arises as to which dimension of L2 writers' syntax prevents them from converging with natives? In this dissertation, we will argue based on previous research findings that what distinguishes native and non-native syntactic performance in writing is primarily a question of syntactic diversity (see, e.g., De Clercq & Housen, 2017; Ortega, 2003, 2012; Ryshina-Pankova, 2010, 2015). Although it has no direct impact on the well-formedness of L2 learners' structures, syntactic diversity should not be reduced to a matter of stylistic preferences. One of the main purposes justifying the need to resort to a wider range of syntactic patterns in writing is the improvement of the functional quality of the written product. Concretely, syntactic diversity operates in support of the upper level of the discourse as a whole, and the specific mechanism through which syntactic forms contribute to the functional quality of the discourse is information structure (Bohnacker & Rosén, 2008; Hopp, 2009; Mauranen, 1996). In this dissertation, we will focus on one particular dimension of information structure, namely the principle according to which discourse-given pieces of information, i.e. pieces of information that have been introduced earlier in the discourse context, precede discourse-new ones (Birner & Ward, 1998; Clark & Haviland, 1977; Gundel, 1988; Sgall et al., 1986). This means that clause-initial constituents occupy a dedicated position to host information with a high degree

of discourse activeness. Prototypically, given information maps onto initial agentive subjects, but it frequently occurs that given information is non-agentive, in which case the canonical subject-first structure no longer qualifies for encoding the given-before-new principle. In German, the L2 under investigation in the present research, fronting discourse-given patient information can be realized by means of object-first structures. The interface relations between syntax and information structure that motivate the use of non-canonical forms such as object-first orders are a source of persisting difficulties in L2 acquisition, as demonstrated by previous experimental studies investigating the knowledge and comprehension of discourse-driven syntactic phenomena (see, e.g., Hopp, 2009; Lozano, 2006; Smeets, 2019; Texeira, 2020; Tsimpli & Sorace, 2006).

With a focus on L2 German writing, the present dissertation aims at examining the use of non-canonical syntactic structures involving the discourse-motivated reordering of subject and non-subject arguments. L2 learners are assumed to be acquainted with information-structure principles as a result of their L1 practice. The question arises however as to whether their encoding of information structure in L2 syntax converges with that of L1 German writers and, if yes, whether the structures that they employ at the interface with discourse match natives' syntactic preferences or not. As put forth in previous experimental research, the extra challenge related to the acquisition of target-language sentence formation rules may divert L2 learners' attention from discourse concerns such as the given-before-new principle. Furthermore, even when information structure is in place in learners' syntax, the underuse of specific target-language forms like object-subject reordering may prevent learners from overcoming the foreign-soundingness attached to their writing style. In this case, it would also be necessary to gain more insights into the nature of the obstacles on L2 learners' way to convergence on both forms and functions at the syntax-discourse interface.

In the next section, we propose to start this introduction with a discussion of the contribution made by syntactic diversity to the functional adequacy – conceptualized in terms of communicative efficiency – of L2 learners' output. As already emphasized, the dimension of functional adequacy at the center of our research is information structure, and in particular the preference for positioning discourse-given before discourse-new information. In the third section of this introductory chapter, we will describe in more detail the influence of givenness on the linear order of constituents in syntax. Section 3 will be completed by a presentation of the characteristics of the German sentence structure, which will serve as a basis for a description of how givenness maps onto non-canonical argument orders in German. In section 4, we will first offer an overview of the existing research on the syntax-discourse interface in L2 German. Overall, experimental research examining knowledge and comprehension of syntax-discourse interface phenomena in L2 acquisition has pursued three main lines of inquiry: the question whether learners can eventually converge with natives with respect to both competence and performance in discourse-driven syntax; the role of potential L1 effects; and the impact of what has been documented as a processing burden affecting L2 performance. Drawing on previous studies involving other target languages than German, section 4 will also go into these three issues in greater depth. Finally, more detail about our research goals as well as the organization of this dissertation will be provided in section 5 at the end of this introductory chapter.

2. The interplay between syntactic diversity and functional adequacy in L2 writing: preliminary remarks

2.1. Functional adequacy in L2 learning

It is often assumed that second/foreign language learning is confined to two major tasks: learning new vocabulary and mastering the grammar rules needed for building correct utterances. Following this commonsense perspective, a fluid coordination between a large vocabulary repertoire and a well-trained structure-building component is all it takes to reach

superior proficiency levels, so that whatever characterizes language activity beyond the sentence level is usually left on the periphery of learners' competence or taken as reflecting a general "quality of thinking" (Mauranen, 1996: 196). However, many raters of L2 written productions observe that although sentences produced by learners may be grammatically irreproachable, there is still some room left for improvement regarding the integration of new structures in the discourse context (Bohnacker & Rosén, 2008; Hawes, 2015). The discourse component of language production proves in other words essential for explaining why approximations in learners' use of word order lead to a lack of native-likeness in their written expression. The following example, taken from Mauranen's investigation of academic writing in L2 English, illustrates how non-native writers' syntactic choices might conflict with higher-level aspects of discourse organization and affect the thematic progression of their text (1996: 200):

(1) I assume the differences in childrens subcultures and perhaps differences in social maturation explains the results.

Even without referring to the preceding context, it does not take a careful reading to realize that the sentence in (1) constitutes a violation of the well-known principle of information packaging according to which newsworthy information units, also known as elements in focus, should be ideally positioned toward the end of the clause. This preference for a delayed introduction of focal information is motivated by the logical progression of the writer's statement. In the example, the writer has just completed his/her presentation of empirical results and, in line with a traditional organization of scientific articles, his/her next task is to elaborate on the possible factors motivating the results obtained. At this stage of discourse development, an adequate transition to the discussion of *the results* would require a passive structure. Such a syntactic

option would indeed allow for a more natural ordering of discourse-given before discourse-new information, as shown in (2).

(2) I assume the results[given information] can be explained by the differences in childrens subcultures and perhaps differences in social maturation[new information in focus].

The permeability of word order to aspects of discourse organization emphasizes that L2 writers should, in addition to grammar accuracy, also pay attention to functional adequacy when engaging in sentence production. The importance of functional adequacy in general, and of discourse competence in particular, has long remained marginalized in both models of L2 competence and measures of L2 performance (Kuiken & Vedder, 2017; Mauranen, 1996). Moreover, if we consider, in line with Callies (2013), textual organization and information management in discourse as core components of L2 learners' pragmatic competence, it must be noted that these aspects were long left outside the scope of the studies focusing on interlanguage pragmatics (see, e.g., Ellis, 2008; Kasper & Dahl, 1991). Interlanguage pragmatics was since its inception largely concerned with non-native speakers' production and comprehension of speech acts (e.g., the formulation of requests, apologies, refusals or compliments), embracing a narrow view on what it means for L2 learners to select among the various structural means offered by the target language to deal with the constraints of language use in social interaction. In fact, descriptions of pragmatic knowledge do not exclude information structure and discourse organization from the list of linguistic phenomena to be covered by the field of interlanguage pragmatics. For instance, in Barron's terms, pragmatic competence is conceived as "the knowledge of the linguistic resources available in a given language for realizing particular illocutions, knowledge of the sequential aspects of speech acts and finally, knowledge of the appropriate contextual use of the particular languages' linguistic resources" (2003: 10). Clearly, L2 learners' difficulties in mapping thematic progression onto the use of adequate syntactic

patterns, as illustrated in (1), fall within the scope of Barron's definition as concrete instantiations of the necessity to adjust linguistic choices to contextual demands.

The limited interest for the functional adequacy of syntax in L2 texts until the years 2000 (see LoCastro, 2011) is even more surprising that early accounts of foreign-language competence already included both discourse competence and grammatical/linguistic competence as central components of a global model of communicative competence. For instance, in Canale's model, discourse competence is understood as involving the "mastery of how to combine grammatical forms and meanings to achieve a unified spoken or written text in different genres" (1983: 9). The same parallel between the use of forms and their appropriate integration in a cohesive whole is found in Bachman's model of communicative language ability (1990). Interestingly, Bachman's model establishes an explicit connection between grammatical and textual competence, under an overarching subdivision that she designates as "organizational competence". Whereas grammatical competence is referred to as the knowledge of vocabulary, phonology, morphology, and syntax, the module of textual competence is understood as "the knowledge of the conventions for joining utterances together to form a text […] consisting of two or more utterances or sentences that are structured according to rules of cohesion and rhetorical organization" (Bachman, 1990: 88). Archibald (1994: 59f.) completes the description of the discourse module of L2 pragmatic knowledge by listing four subcomponents: cohesion, coherence, situationality, and information structure. All four dimensions underline the role of discourse competence in achieving communicative goals efficiently, both from the perspective of the interaction with context and interlocutors (situationality and coherence) and with respect to the ordering of discourse referents by means of adequate lexico-grammatical means (cohesion and information structure).

The understanding of communicative language competence in terms of both functions and linguistic resources is nowadays more widely acknowledged and it is worth noting that it

also provides a basis for discriminating between levels of language proficiency in the CEFR (Common European Framework of Reference for Languages; Council of Europe, 2020). The CEFR identifies a linguistic and a pragmatic competence as part of learners' communicative skills. Starting with linguistic competence, what emerges from the CEFR descriptive scheme is an emphasis on the notion of "range" next to those of accuracy and control. In this sense, evidence of more advanced mastery of the target language is found in the appropriate use of "a broad range of complex grammatical structures […] with considerable flexibility" (level C1) (Council of Europe, 2020: 130). Flexibility in the use of forms as a function of situation and audience, or in order to highlight specific points, is also at the core of pragmatic competence, alongside other functional dimensions like cohesion, coherence, and thematic progression, which also play a central role at the interface between syntax and discourse structure. In sum, the model of communicative competence established in the CEFR represents a logical culmination of the collaboration between language resources and the ability to design texts that was subsumed under discourse competence in early models. Whereas linguistic competence is concerned with the knowledge and use of forms, pragmatic competence stresses the importance of effective, structured, and, from the interlocutor's perspective, cooperative communication. However, pragmatic knowledge is expected to become incarnate in actual strings of words, just as language forms would inevitably miss their target if not informed by functional principles. As stated in the CEFR, the components of communicative competence "cannot be isolated from each other", for the reason that they "are always intertwined in any language use" (Council of Europe, 2020: 129).

2.2. Syntactic diversity as an indicator of functional adequacy in L2 writing

As exemplified by the CEFR descriptors, using one's language repertoire to perform communicative functions in an effective way has emerged as an ultimate goal of L2 acquisition. This development found further fulfillment in recent attempts in the field of language testing to

clarify the operationalization of functional adequacy in L2 writing by means of comprehensive rating scales capturing the functional dimension of learner productions. The rationale behind the elaboration of new rating instruments for gauging the communicative efficiency of writing tasks is, as argued by Kuiken and Vedder, that "the assessment of linguistic performance in L2 is not possible without taking into account the functional dimension of L2 production" (2017: 322). Despite this increased concern for functional adequacy in L2 writing research, studies that explicitly place functional aspects at the center of their investigation remain scarce. One notable exception is an exploratory study by Kuiken et al. (2010) who examined the relationship between ratings of functional adequacy on the one hand and indicators of linguistic complexity and accuracy on the other hand. The authors found statistically significant correlations between functional adequacy as assessed by individual raters and both lexical diversity and grammar accuracy. By contrast, no significant association was established between the functional component and the two measures of syntactic complexity employed in the study, i.e. subclause ratio and number of clauses per T-unit. These findings confirmed the difficulty to isolate relevant linguistic features that are indicative of writing development at the level of functional adequacy. In particular, regarding syntax, Kuiken et al.'s results suggest that traditional measures of syntactic elaboration based on learners' use of clause-linking devices do not provide a firm basis for monitoring functional performance in L2 writing.

To gain a better idea of how the development of functional adequacy materializes in syntactic forms, a number of studies looked into syntactic diversity as an alternative to indices of syntactic elaboration. In consonance with the emphasis on learners' range of language resources in the CEFR, Ortega (2003, 2015) also observes that progress in L2 proficiency involves more than syntactic complexification in the form of longer and more intricate structures. According to her, what syntactic development primarily indexes is "the expansion of the capacity to use the additional language in ever more mature and skillful ways, tapping

the full range of linguistic resources offered by the given grammar in order to fulfill various communicative goals successfully" (2015: 82). One of the first studies demonstrating the added value of syntactic diversity measures in relationship to written output was by Ellis and Yuan (2004). Focusing on the effect of planning conditions on L2 English learners' written narratives, the authors discovered that learners exhibited a higher degree of syntactic diversity – measured based on the variety of grammatical verb forms used in the task in terms of tense, modality and voice – when they were allocated more time, either before or during the task, to plan their response. By contrast, syntactic elaboration, measured as the ratio of clause to T-units, and lexical richness, calculated based on type-token ratios per segment of 40 words, did not change significantly when compared to the baseline condition without planning time. In view of these findings, Ellis and Yuan (2004) formulated the hypothesis that additional planning time made it possible for learners to pay greater attention to the propositional content of their narrative. In terms of linguistic features, this resulted presumably in a more careful search for the right verb forms to encode temporal and modal meanings or vary perspectives (i.e. narrate from the point of view of agents or patients) based on the discourse prominence of event participants.

Over the years, a growing body of research has accumulated suggesting that as L2 writers gain experience in using the target language to communicate, the range of syntactic forms they resort to tends to grow (e.g., Bi & Jiang, 2020; De Clercq & Housen, 2017; Mazgutova & Kormos, 2015; Vyatkina, 2012, 2013). Following Givón (1979: 49f.), one can argue that syntactic conservatism, i.e. the preference for canonical main, declarative, affirmative, active sentences, decreases to the extent that language users accentuate the degree of presuppositional complexity of their discourse. The phenomenon of presuppositionality, also known as backgrounding or topicality, relates to the assumptions made by speakers about the state of knowledge that their audience have about the discourse context. In its most concrete form, presuppositionality implies that when a speaker or writer progresses further in his/her message,

he/she needs to make sure that the discourse referents he/she uses can be identified without challenge by the hearer. On these grounds, Givón (1979) makes the case that deviations from neutral clause structures increase in proportion of the degree of presuppositional density of a message. In Givón's model, the neutral, i.e. the least presuppositional main declarative, affirmative, active structure, is the most frequent in discourse. This syntactic pattern, prototypically involving a definite subject and a discourse-new indefinite accusative object, is, in Givón's terms, "the major avenue for introducing new referential arguments into discourse" (1979: 52). To reinforce discourse cohesion, the challenge for language users is then to build logically on these initially presented, hearer-known referents, and this is where non-canonical syntactic variants come into play. Givón provides a detailed list of these syntactic variants, which include, among others, embedded clauses, relative clauses, clefts, passives, definite-accusative structures, and existential-presentatives (1979: 51). Without going into details (the reader may refer to Givón's demonstration of the discourse-presuppositional mechanisms associated with the different types of syntactic variants), what should be kept in mind is that syntactic diversification only makes sense from the angle of referential/presuppositional continuities in discourse.

Focusing on the development of syntax in L2 writing, several studies examined how non-native students writing in German expand their syntactic options to signal the persistence of information across clause boundaries. A first illustration involves Byrnes and Sinicrope's (2008) longitudinal investigation of learners' progress in the use of relativization across four curricular levels of L2 German instruction. Relativization performs similar discourse functions in German as in English and French, in that it mainly provides a meaning specification to a previously introduced referent. In addition, as shown in (3), relative clauses in German can be distinguished, like their translation equivalents in English, based on the different functions

performed by relativizers: subject (3a), direct object (3b), indirect object (3c), prepositional object (3d), and genitive (3e).

(3) (a) Der Ring, **der** fehlt, gehörte meiner Mutter.
'The ring that is missing was mother's.'

(b) Der Ring, **den** ich beschreibe, ist ein kleiner goldener.
'The ring that I'm describing is a small gold one.'

(c) Die Person, **der** ich den Ring geliehen habe, hat ihn vielleicht verloren.
'The person that I loaned the ring to may have lost it.'

(d) Das kleine Kästchen, **in dem** sie den Ring aufbewahrte, war schwarz.
'The small case in which she kept the ring was black.'

(e) Ein weiteres Kästchen, **dessen** Inhalt unbekannt ist, fehlt auch.
'Another case whose contents are unknown is also missing.'

(Byrnes & Sinicrope, 2008: 111)

Based on specific writing tasks designed for each of the four curricular levels covered in the study, the authors observed an overall increase in the frequency of relative clauses, which were rarely used at level 1, but then steadily increased from level 1 to 2, and 2 to 3. Interestingly, learners did not only resort more often to relatives clauses, but that ratio of relativization to overall subordination also showed an upward trend across levels. Finally, whereas level 1 data only included occurrences of subject, direct object, and prepositional object relatives, instances of the more marked dative and genitive types were found in more advanced productions. Taken together, these findings support the view that with increased L2 instruction, L2 writers display a more varied syntactic footprint, which can be seen as the logical outcome of their confrontation with conceptually more demanding tasks over time.

In another study examining syntactic diversification in relationship to the development of literacy skills in L2 writing, Ryshina-Pankova (2010, 2015) explored the use of topical nominalizations by American learners of German at various levels of acquisition. Compared to

relativization, nominalizations play an even more pronounced role at the interface with the discourse context. Nominalizations have been described by Halliday (1993) as a phenomenon whereby processes (typically expressed by verbs), attributes (formulated as adjectives), or full propositions (corresponding to clauses or sentences) are converted into nominals. Halliday (1993) further depicts them as grammatical metaphors that enable to shift from a dynamic, verb-centered representation of events to a more distanced depiction of experience by means of a noun-centered style. Nominalizations are taken as indicative of a written mode of communication. In particular, they typically serve a meaning-making strategy that is often encountered in academic registers (Halliday, 1989), which is related to their double discourse function of promoting abstractness and creating local cohesion. First, the synoptic style characteristic of nominalizations make it possible to adopt a general view on reality, transforming complex processes into objects of reflection. Second, nominalization is a means par excellence to introduce topic shifts in texts while maintaining the semantic link between utterances. As illustrated in (4), the whole proposition evoked in the first sentence is taken up as given information in the following sentence. In its new nominalized form, d*iese Aufgabe* ('this duty') operates both as a cohesion device and as the topic of the second utterance, to which new comments (the origin of Vietnamese children's commitment to school and family) are appended to make the communication move forward.

(4) Die Vietnamesischen Kinder fühlen sich vor ihren Eltern verpflichtet, in der Schule die besten Noten zu erhalten. **Diese Aufgabe**, perfekt zu ein, die sie sich selbst geben, ist mit der konfuzianischen Tradition verbunden.
'The Vietnamese children feel obliged to get the best grades in school. **This duty** to be perfect that they assign to themselves is connected to the Confucian tradition.'

(Ryshina-Pankova, 2015: 54)

Based on a quantitative analysis of learner texts across three successive curricular levels, Ryshina-Pankova (2010) found a constant progression in the use of nominalizations as

topicalized grammatical metaphors. Here again, these results demonstrate that a grammar alternative, the noun-centered style, percolates progressively into learners' interlanguage, allowing them to perform complex rhetorical functions (cohesion and abstractness).

One last recent study that is worth mentioning was carried out by Vyatkina (2013) who tracked by using developmental profiling techniques the maturation of syntactic complexity in the writing of two beginning L2 German learners. Writing samples produced by the two participants were collected over 19 time points and coded for three main categories of syntactic structures: (a) coordinate structures, subdivided according to the type of coordinate (nominal phrases, modifier phrases, predicate phrases, clauses), (b) complex nominal phrases, distinguished depending on the type of modifier (attributive adjective phrases, prepositional phrases, relative clauses, nominal clauses), and (c) nonfinite verb structures, covering past participle phrases, "*zu* ('to') + infinitive" phrases, and infinitives governed by modal or auxiliary verbs. Whereas Vyatkina's (2013) study indicates a global developmental pathway in learners' syntax toward increasing frequency and variety of complex syntactic features, the results also point to a high degree of between-learner variation. In fact, in contrast to Cassie, the female participant, who managed to gradually diversify her use of forms, resorting to the three kinds of complex structures at almost all collection points in the second half of the observation period, Braden, the male participant, had trouble varying its syntactic strategies, as demonstrated for instance by his limited and irregular use of infinitives and complex nominal phrases. This had furthermore a direct impact on discourse quality: Whereas the frequent occurrence of phrasal elaboration devices in Cassie's texts attested a more economical, synoptic writing style, the overuse of patterns typical of less advanced practice in Braden's compositions, such as the repetition of coordinate structures, produced a redundant effect.

What the studies discussed in this section emphasize, is that for a substantial part, the development of literacy skills in non-native writing implies that learners move beyond their

comfort zone to perform new discourse functions in the target language. Whereas Vyatkina's (2013) study approaches syntactic diversity in a broad sense, by focusing on the gradual extension of syntactic resources in learners' interlanguage, the work conducted by Byrnes and Sinicrope (2008) and Ryshina-Pankova (2010, 2015) offers the advantage to zoom in on specific form-function mappings, demonstrating the tight connection between the use of certain syntactic variants and the creation of ideational links in discourse. To a large extent, it is in this line of thinking that the research presented in this dissertation is situated. Specifically, the main focus of the studies conducted as part of this doctoral research concerns the reordering of verb arguments (subjects vs. non-subject arguments) in texts written by L2 learners of German. Argument reordering in German is a particular form of syntactic flexibility occurring at the interface with information structure. As mentioned above, there is a language-independent preference, for the sake of communicative efficiency, to position discourse-given information earlier in the sentence. Therefore, in languages that exhibit a certain degree of word order flexibility like German, non-canonical object-before-subject orders can be favored in contexts in which the referents encoded by object arguments correspond to discourse-given information. The role of the given-before-new principle of information packaging in triggering non-canonical syntactic alternations will be described further in the following section, together with the characteristics of German sentence structure that are of interest for the present research.

3. Argument reordering at the interface with information structure in German

3.1. Concepts of information structure

3.1.1. The topic-comment structure

As stated by Chafe, information structure, also known as information packaging, refers to "the kind of phenomena […] that have to do primarily with how the message is sent and only secondarily with the message itself" (1976: 28). By way of illustration, both sentences in (5)

convey the same propositional content. Where the two sentences differ, is only with respect to the surface ordering of constituents: Whereas (5a) follows the canonical SVO order, in (5b), the direct object precedes the subject that surfaces at the right of the finite verb:

(5) (a) Der demokratische Präsidentschaftskandidat Joe Biden hat den wichtigen Swing State Michigan gewonnen.

(b) Den wichtigen Swing State Michigan hat der demokratische Präsidentschaftskandidat Joe Biden gewonnen.

'The democratic presidential candidate Joe Biden won the important swing state of Michigan.'

According to Chafe, what moves speakers to select the SVO or the OVS structure has mainly to do with principles of communicative efficiency, "just as the packaging of toothpaste can affect sales in partial independence of the quality of the toothpaste inside" (1976: 28). From the early days of linguistic theory, sentences have been considered as the linguistic counterpart to the way concepts are connected in the mind (Paul, 1920; von der Gabelentz, 1869). More concretely, the main idea is that sentences consist of two conceptual sequences, a psychological subject and a psychological predicate. Von der Gabelentz (1869) describes the psychological subject as the entity about which the hearer should think, and the psychological predicate as that what he/she should think about the psychological subject. Importantly, these two sequences do not necessarily overlap with the grammatical categories of subject and predicate, as shown in (5b), where the direct object *den wichtigen Swing State Michigan* acts as the psychological subject of the sentence.

In recent models of information packaging, the concepts of psychological subject and predicate are no longer in use, replaced by the notion of topic-comment (or theme-rheme) progression. In Lambrecht's terms, the topic corresponds to "a matter of standing interest or concern", and the comment refers to "a statement about a topic" (1994: 119), conveying information "which is relevant to and which increases the addressee's knowledge of this [topic]

referent" (1994: 127). In other words, the topic constitutes a reference point for the expression of newsworthy content, the comment (Givón 2001; Halliday, 1967). In this sense, the topic-comment progression fulfills both a cognitive and a communicative function. From a cognitive point a view, the topic provides a storage unit for the integration of relevant information in the hearer's memory. Coming back to the example in (5b), it means that when the hearer is asked to process the information that Joe Biden won, he/she does so with reference to a pre-established memory representation featuring the referent 'state of Michigan'. Then, from a communicative perspective, the dichotomy topic-comment is fundamental to understand how speakers make use of sentences to bring the communication forward. In fact, as argued in traditions associated with the Prague School, the distinction between topic and comment also mirrors the basic distribution of communicative dynamism in the sentence. Whereas the topic/theme acts as the point of departure of the message, the comment/rheme is the sentence element that, by adding new content, contributes to the progression of communication (Firbas, 1992). Within the comment, the sentence element that exhibits the highest degree of communicative dynamism is designated as focus. The primary function of the focus is to provide answers to questions under discussion, i.e. questions which are at the center of the interlocutors' attention (Roberts, 2012). For instance, in (5b), the scope of the focus spans over the subject constituent 'the democratic presidential candidate Joe Biden' which solves the question of who won in the important swing state of Michigan.

Regarding the topical pole of the sentence, a further distinction can be made between aboutness and givenness (or familiarity) topic (Givón, 2001). To describe the role of aboutness topics, Reinhart (1982) introduced the metaphor of the file card according to which topical referents correspond to the label of a file card. In this context, aboutness is a mechanism that specifies the card to which the information encoded by the comment of an utterance will be attached. Topics can refer to information mentioned earlier in the discourse, but it is not a

necessary condition for acting as a topical referent. When topics are in an anaphoric relation to discourse-old information, i.e. when they are contextually accessible to the addressee, they are characterized as givenness topics. The link between givenness and topicality was further examined by Lambrecht (1994) who postulated a so-called 'topic accessibility scale' establishing that the more accessible a referent is in the addressee's memory, the more chances it has to operate as the topic of a clause/sentence. In sum, the probability for a referent to be selected as an aboutness topic, i.e. to specify what the utterance is about, increases to the extent that it is relatable to the preceding discourse.

3.1.2. The effect of the given-before-new preference on word order preferences

In light of the crucial role of givenness[1] in providing sentence topics, several models proposed to shift the focus of attention from aboutness to givenness and to reformulate the topic-comment partition of the sentence in terms of a given-before-new principle of sentence organization (Birner & Ward, 1998; Clark & Haviland, 1977; Gundel, 1988; Sgall et al., 1986). Models of information structure that build upon the notion of givenness place particular emphasis on the hearer/addressee, whose cognitive states need to remain at the centre of the speaker's concerns. In this line of thinking, Sgall et al. (1986: 29) claim that

> … the sentence itself may be understood as a procedural structure involving a so-called 'given-new strategy', i.e., starting with 'given' information, which is readily available to the hearer in the activated subsection of his/her memory, and proceeding to 'new', or non-recoverable information. The sentence thus instructs the hearer, in an appropriate way, as to how some of the items s/he happens to have in his/her mind should be modified, or brought into connection with other items, in accordance with the speaker's intentions.

[1] Givenness should not be limited to its literal interpretation as the repetition, either in its original form as a full nominal phrase or in a pronominal form, of a discourse referent. In addition to the direct realization of given referents, givenness also includes an indirect realization, also referred to as bridging reference (Clark, 1977). In this case, the bridging referent and its antecedent do not exhibit an identity relation, as observed in anaphoric reference. Rather, they denote separate entities between which a relation of contiguity can nevertheless be established, as for instance between a country and its inhabitants or between a cause and its consequences.

As noted by Clark and Haviland (1977), the preference for fronting given referents in sentence production is based on the postulate that language is a cooperative enterprise[2]. This means that the given-before-new principle of information packaging takes the form of an implicit agreement between speaker and hearer about how information should, in their common interest, be distributed in clauses and sentences. To honour this contract, speakers have a range of tools, either syntactic or prosodic, at disposal. Focusing on word order, the given-before-new contract offers advantages to addressees, because it allows them to integrate new utterances, which start with discourse-old referents, i.e. referents that are easier to retrieve from memory, immediately into the discourse model (Benatar & Clifton, 2013). Furthermore, the given-new contract does not only have the effect of facilitating the addressee's comprehension task. Given information is also usually easier to activate in the production process, which means that its use at an early stage in sentence production also benefits speakers who may, by reusing given referents, save more resources for planning the rest of their utterance (Jaeger & Tily, 2011).

Psycholinguistic research has demonstrated the impact of givenness on two core stages of sentence production, namely grammatical function assignment and constituent assembly. Grammatical function assignment is the process by which the lexical concepts that form the message are mapped onto syntactic functions. This operation is followed by the process of constituent assembly that imposes a linear sequence on the various sentence constituents, arguments and adjuncts (Bock & Levelt, 1994). As emphasized previously, givenness is a form of conceptual accessibility that characterizes discourse-old referents and makes them more

[2] Despite the general tendency to conform to the given-before-new principle in sentence production, some contexts may call for the opposite new-before-given pattern, following a newsworthy-first principle according to which an element may be fronted because it expresses significant new information (Mithun, 1992). The newsworthy-first principle is notably at work in oral communication when speakers place extra emphasis on the constituent in focus (Frey, 2004a; Lötscher, 1985), as shown below:

(i) A: Was möchte er als Geschenk zu seinem Geburtstag?
'What would he like to receive for his birthday?'
B: [Die neue PlayStation 5]$_{Focus}$ möchte er gern bekommen.
'What he would like to receive is the new PlayStation 5.'

salient to both speakers and hearers. On the level of grammatical function assignment, conceptual accessibility was shown to favour the encoding of referents as subjects. For example, Tomlin (1995) found that when English speakers were asked to describe pictures featuring transitive events like the eating of one fish by another, they were more inclined to produce passive sentences when their attention was drawn to the patient participant on the picture (i.e. the eaten fish). In a follow-up study, Gleitman et al. (2007) demonstrated that participants' preference for encoding salient patients as subjects was rather due to a positional effect than the result of a mapping of the most accessible referent onto the most prominent grammatical function (the subject). In fact, the authors observed that accessibility also influenced the ordering of noun phrases in coordinated structures (the boy and the girl vs. the girl and the boy). In light of these findings, they concluded that the mapping of salient patients onto subjects was more likely the by-product of a more general tendency to start new structures with more accessible referents.

Gleitman et al.'s (2007) results echoed earlier findings by Bock and Irwin (1980), with the difference that, in contrast to the studies by Tomlin (1995) and Gleitman et al. (2007) who examined accessibility in terms of visual salience, Bock and Irwin proposed a more direct approach to discourse givenness. In their experiment, participants were read pairs of questions and answers that varied according to whether the discourse-given constituent in the answer appeared in a fronted position or not. This is illustrated by the following example involving the order of objects in the dative alternation in English:

(6) Context and question: A rancher received an inquiry from a cowboy about something he needed for his act. What did the rancher do?

Answer A: The rancher sold the cowboy the horse. (given-new)
Answer B: The rancher sold the horse to the cowboy. (new-given)

After a short break, the same set of questions was submitted to participants who were instructed to answer them by using a wording as close as possible to the original that was read in the initial phase of the experiment. Interestingly, the authors observed that when the initial presentation of answers involved the less appropriate new-given order, participants tended to reverse the original sequence to given-before-new in the second phase of the experiment. These results confirmed the assumption that when a language provides for syntactic structures that allow placing given referents earlier in the sentence, such structures are more likely to be produced than alternatives involving a later placement of given material.

3.2. Argument reordering in German: scrambling and topicalization

In English, as indicated above, the given-before-new principle implies a more frequent use of passive structures when the accessibility of patient referents increases. In German, the picture is somewhat different, for the reason that German allows for a higher degree of word order flexibility. Whereas syntactic functions are tied to the linear order of constituents in English, German makes use of explicit case marking to differentiate between subject, direct object, and indirect object. This means that, in word order flexible languages like German, the identification of syntactic functions is not affected by variations in constituent ordering, which can then be exploited in addition to passivization to mark contrasts in givenness. In other words, German permits permutations by means of grammatical voice, in the same way as English. However, where the two languages differ, is with respect to variations in constituent assembly, which are allowed in German, but not in English. Myachykov and Tomlin (2008) examined, using data from Russian speakers[3], the mapping of givenness onto syntax in word order flexible languages and observed a striking difference with English data. When confronted to the same experimental material as in Tomlin (1995), Russian speakers did not single out perceptually primed patient

[3] Russian also has a rich case-marking paradigm and displays argument-reordering options analogous to German to encode discourse effects.

referents by producing a passive structure. Instead of altering the mapping of syntactic functions, they showed a strong preference for assigning the sentence-initial slot to the direct object of an active clause.

Similar to Russian, German allows for placing non-subject arguments like direct objects at the left of the subject. Specifically, argument reordering can affect two areas of the German clause, the prefield and the middlefield (Grewendorf, 2002; Höhle, 1986). As Table 1 illustrates, the prefield corresponds to the position preceding the finite verb in main declarative clauses. German is a verb-second language, which entails that only one constituent can occupy the prefield. There is however no restriction on the syntactic function and syntactic category of the prefield-filling elements, which means that adverbial clauses or object NPs are as grammatically qualified as prefield constituents as subject NPs.

Table 1. Illustrations of the prefield and middlefield in the German clause

	Prefield	V2	Middlefield	V-final
(a)	Der berühmte Schriftsteller	hat	am Montag in Köln seinen neuen Roman	vorgestellt.
	the.NOM famous writer	has	on Monday in Cologne his new novel	presented
	'The famous writer presented his new novel on Monday in Cologne.'			
(b)	Ich habe gelesen, … (I read …)			
		dass	er am Montag in Köln seinen neuen Roman	vorgestellt hat.
		that	he on Monday in Cologne his new novel	presented has
	'I read that he presented his new novel on Monday in Cologne.'			

As for the middlefield, it needs to be defined in different terms depending on the type of clause (main or embedded). In main clauses, the middlefield covers the sequence located between the finite (V2) and the infinite (V-final) verb. In embedded clauses, both finite and infinite verbs surface in clause-final position. Within this configuration, the middlefield comprises the area between the complementizer, for instance *dass* ('that'), and the verb-final position.

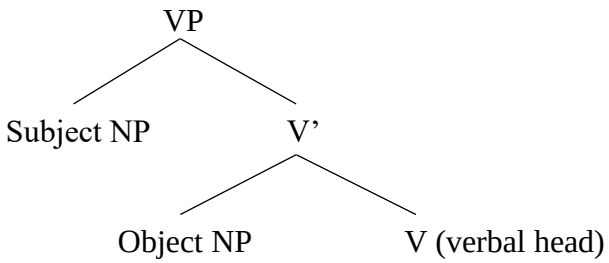
In generative approaches to grammar, word order variation in the German clause is referred to as 'scrambling' when it occurs within the middlefield, involving the movement of an argument from its base-generated position to the left of another constituent (argument or

adjunct) (Haider & Rosengren, 2003). When this movement targets the prefield position, it is labelled as ‘topicalization’ (Grewendorf, 1988; Lötscher, 1985). The movement of arguments is assumed to take place, either via scrambling or topicalization, when the surface order of arguments differs from an underlying structure that follows from the widely adopted hierarchy of grammatical functions in (7) (Büring, 1996; Choi, 1996; Lenerz, 1997, 2001):

(7) Subject > Indirect object > Direct object > Oblique

In German, the base-generated order, i.e. the structural organization of clause constituents that expresses the relationships between predicate and arguments, is traditionally assumed to correspond to the SOV, or verb-final, order. It is in other words the order that surfaces in embedded clauses. In hierarchical models of sentence structure, subject and object are base-generated within a Verb Phrase (VP), i.e. a syntactic unit composed of a verbal head and its dependents, as represented in (8):

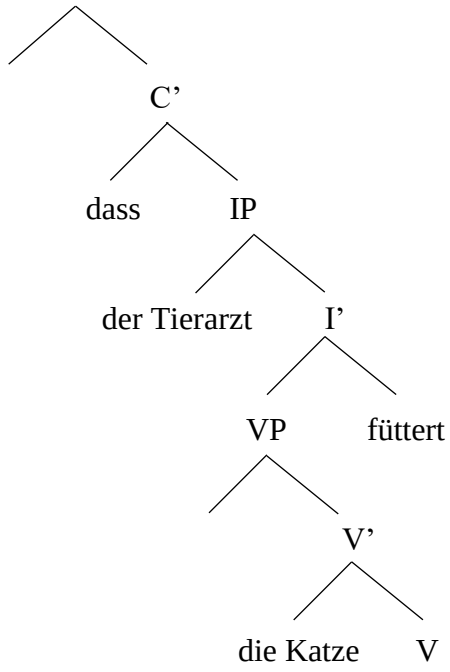
(8)



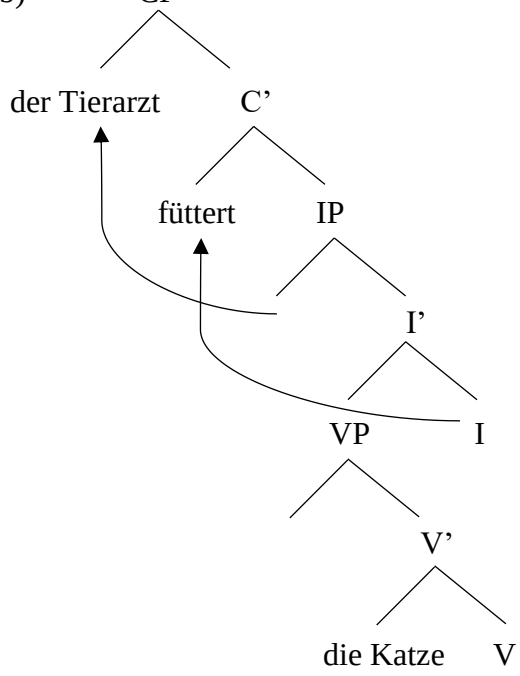
In finite clauses, the finite verb moves from the VP to the head of a so-called Inflection Phrase (IP) where finiteness marking takes place. In parallel, the subject moves from its VP-internal position to the specifier of the inflection phrase to receive its case features [+nominative] (Grewendorf, 1988: 219). The IP is in turn part of a higher phrase structure projection, the Complementizer Phrase (CP) that serves as a basis for distinguishing between main and embedded clauses (Grewendorf, 1988: 64-67). In embedded clauses, the complementizer occupies the head of CP (9a). By contrast, in main clauses, the CP head position is reserved for

the finite verb. This means that the fine verb needs to leave the IP domain to observe the verb-second constraint. A last operation is needed to achieve the canonical SVO order in V2 declaratives, namely the topicalization of the subject to the specifier of CP (9b).

(9a)



(9b)



Whereas the canonical structures in (9a) and (9b) provide the preferred order of subject and object in neutral contexts, in specific discourse contexts like (10a) in which the direct object is given and the subject carries focus, reordering by scrambling of the direct object across the subject can take place, as illustrated in (10b) (the trace *t* marks the position of the direct object before adjunction to IP). Following Frey (2004a), the derivation of the corresponding V2 declarative only requires an additional ‘formal movement’ of the scrambled object to the prefield, as indicated by the second trace *t’* in (10c).

(10) (a) Wer füttert die Katze? (Context)
‘Who feeds the cat?’

(b) Ich denke, dass [die Katze]$_i$ der Tierarzt t_i füttert. (Verb-final embedded clause)
I think that the cat the veterinary feeds
‘I think that it is the veterinary who feeds the cat.’

(c) [Die Katze]$_i$ füttert t_i' der Tierarzt t_i. (V2 main declarative clause)
'It is the veterinary who feeds the cat.'

The discourse-driven reordering of arguments affects the linearization of subject and direct object, as in (10), but it also extends to other combinations of arguments, as involved in the ordering of direct and indirect objects in ditransitive clauses (11) as well as in the placement of prepositional objects (12). In both examples (11) and (12), movement operations take place in accordance with the given-before-new principle, as signaled by the coreference relation between the displaced constituents and elements from the immediately preceding context.

(11) (a) Es handelt sich bei **den restaurierten Gemälden** um von dem Maler Hans Purrmann gefertigte Originale. (Context)
'The painting that were restored are originals by the painter Hans Purrmann.'

(b) Gerüchten zufolge habe [**die Gemälde**]$_{\text{direct object/given}}$ [ein gewisser Herr Lehmann]$_{\text{subject}}$ [seiner Tochter]$_{\text{indirect object}}$ geschenkt. (Scrambling direct object across indirect object)
'According to rumours, the paintings would have been donated by a certain Mr. Lehmann to his daughter.'

(12) (a) **Der Wiener Opernball** war damals eine Gelegenheit, die diplomatischen Beziehungen mit alten Verbündeten zu verstärken. (Context)
'Back then, the Vienna Opera Ball was an occasion to reinforce the diplomatic ties with traditional allies.'

(b) [**Zu diesem Ball**]$_{\text{prepositional object/given}}$ hatte [der Außenminister Sebastian Kurz]$_{\text{subject}}$ in 2018 [den ukrainischen Präsidenten]$_{\text{direct object}}$ eingeladen. (Topicalized prepositional object)
'In 2018, the Minister of Foreign Affairs Sebastian Kurz invited the Ukrainian President to this ball.'

3.3. Subject-Object versus Object-Subject and the issue of optionality

Several corpus studies investigated word order alternations in German, with a focus on structures with both subject and (direct or indirect) object. A first investigation was carried out by Hoberg (1981) based on the *Mannheimer Corpus of contemporary written German*,

composed essentially of newspapers, magazines and novels. The first conclusion resulting from Hoberg's study is that the overall rate of OS structures in the middlefield is relatively low, as OS orders accounted for less than 4% of all structures including both subject and object. However, the results pointed to a strong interaction between order and case: In contrast to middlefields with an accusative object, which were found to appear in the subject-first order in 99% of all cases, the rate of OS orders was much higher in structures including a dative object, reaching almost 25%. Similar proportions were obtained in a later investigation of newspaper corpora by Kempen and Harbusch (2005), whose data borne out that word order variation within the middlefield was primarily due to the scrambling of dative objects.

Turning to the prefield, Hoberg (1981) provides corpus counts of the different types of constituents filling the prefield. These data indicate that 63,15% of all V2 declaratives start with a subject, 25,06% with an adverbial, and 10,15% with a non-subject argument. In a more recent study, Bader and Häussler (2010) examined a sub-corpus of sentences containing an object preceded by the definite article *den*, i.e. either an accusative singular or a dative plural object. As a first step, the authors reported that of all sentences including a *den*-object, 58,5% had the subject in the prefield, 12,4% the object introduced by *den*, and 29,1% other kinds of arguments or adjuncts. When narrowing down the comparison to subjects and objects, a rate of 17,5% of structures with objects in the prefield was obtained, similar to the rate of 18,4% that was found in an earlier corpus investigation by Weber and Müller (2004) that also focused on natives' preferences for either SVO or OVS in main clauses.

Taken together, these findings point to two main tendencies. First, as one would expect, OS orders are much less frequent than SO orders, attesting the distributional markedness of object-before-subject structures in German. Second, argument ordering, in particular the positioning of objects before subjects, occurs more often when it involves the fronting of objects to the prefield. The contrast between the prefield and the middlefield is even more striking when

we zoom in on accusative objects. Whereas accusative objects are placed on very rare occasions at the left of the subject in the middlefield, their topicalization to the prefield is more common. Specifically, Bader and Häussler (2010) observed that the accessibility conditions influencing OS orders differed depending on whether objects were preposed within the middlefield or fronted to the sentence-initial position. In fact, whereas reordering in the middlefield was found to be more frequent with dative objects, for the reason that datives often encode definite animate referents, other factors such as contextual accessibility were argued to stimulate variation in the prefield. Contrary to Bader and Häussler (2010) who did not analyze explicitly the weight of contextual accessibility factors, Weber and Müller (2004) looked at the effect of both givenness and definiteness on the topicalization of objects. Their results confirmed that the occurrence of OS orders increased in presence of given and/or definite objects, echoing Bader and Häussler's (2010) assumption that, when discourse motivations come into play, argument reordering targets more frequently the prefield than middlefield-internal positions.

The initial position of V2 clauses in German makes a particular contribution to the local cohesion between syntactic units by accommodating elements that are referentially linked to the preceding context. Nevertheless, this does not imply that given objects are automatically moved to the prefield, even when combined with discourse-new subjects. As shown by Weber and Müller (2004), despite the prevalence of given objects in OVS structures, given objects remain for a large part positioned post-verbally, i.e. at the right of new subject referents hosted in the prefield of SVO sentences. What these findings indicate, is that the given-new contract is not a strong constraint[4]. Other accessibility constraints, such as the animacy properties of

[4] Whereas no such constraint affects the grammaticality of SO and OS orders when both arguments involve lexical full NPs, the ordering of pronouns does not permit similar variability. In German, the ordering of pronominal elements in the middlefield follows specific restrictions that determine the ordering of pronominal arguments and lexical NPs as well as the ordering of multiple pronominal arguments. More concretely, lexical NPs cannot precede pronominal arguments within the middlefield, as shown in (iia) (the asterisk indicates ungrammaticality). By contrast, the combination of a lexical NP in the prefield and a pronominal argument in middlefield-initial position is fully acceptable. Corpus data have even revealed that structures like (iib) with an object lexical NP in the prefield followed by a pronominal subject in post-verbal position are one of the most frequent configurations associated with OVS structures (Bader & Koukoulioti, 2018). In presence of two given arguments, one full object NP and

subject and object (Bader & Häussler, 2010; Siewierska, 1993), or constraints related to the positioning of heavy constituents (e.g., long NPs with PP modifiers) (Hawkins, 1994), might interfere with it and explain why it might be preferable in some contexts to go against the instructions resulting from discourse accessibility. Furthermore, we should not overlook that computing OS structures, even in favourable discourse conditions, is more costly to language users, who may have to depart from a deeply entrenched subject-first preference when opting for argument reordering (Bader & Meng, 1999; Bader & Bayer, 2006). The bias towards subject-first structures to encode given patient referents was corroborated by experimental data. To test the effect of accessibility on sentence production, Skopeteas and Fanselow (2009) asked a group of German natives to describe series of two scenes presented on pictures. On the first picture, a participant (for instance, a boy) was introduced. Then, on the second picture, the participant was involved in an action-chain event that was likely to be encoded by a transitive sentence (e.g., "the boy is kicking a man on the shoulders"). On a first set of scenes, the contextually given participant was performing the role of agent. On a second set of pictures, the participant introduced in the first scene was represented as patient. The results showed that two main types of structures were elicited in the condition featuring a given patient: active SVO sentences and passives. Only few responses elicited OVS sentences, pointing to a strong preference for subject-first structures.

---

one pronominal subject, the preference for moving the object to the prefield has been argued to result from the need to keep the middlefield as short as possible, a strategy allowing both speaker and hearer to process the whole verbal bracket (from V2 to V-end) more easily (Chiarcos, 2009; Hawkins, 1994).

(ii) (a) *… dass [diese Entscheidung]$_{\text{direct object/full NP}}$ [er]$_{\text{subject/pronoun}}$ bisher keine Sekunde bereut hat.
'… that he has so far not regretted this decision for one second'

(b) [Diese Entscheidung]$_{\text{direct object/full NP}}$ hat [er]$_{\text{subject/pronoun}}$ bisher keine Sekunde bereut.
'He has so far not regretted for one second this decision.'

As for the ordering of multiple pronominal arguments in the middlefield, it strictly obeys the sequence subject-direct object-indirect object, as illustrated in (iiia):

(iii) (a) Wenn du es nicht tust, dann werde [ich]$_{\text{subject}}$ [es]$_{\text{direct object}}$ [ihr]$_{\text{indirect object}}$ selbst sagen.
'If you don't do it, I will tell it to her by myself.'

More generally, these conclusions, added to the corpus evidence detailed above, demonstrate that given objects are only optionally fronted in native German. And more importantly, even when given material is fronted, speakers are left with the choice between passives and object-first structures. Object fronting is well part of the German syntactic repertoire, but its use is not a matter of categorical constraints whose violation would lead to ill-formedness. Rather, OS orders appear to be subject to optionality. Even in favourable discourse conditions, OS orders remain in competition with subject-first active and passive structures. In this context, what eventually motivates the choice for one or the other option in natural production is clearly the result of a combination of principles which include, but are not limited to information structure (Bader & Koukoulioti, 2018; Weber & Müller, 2004; Weskott et al., 2011; Wierzba & Fanselow, 2020).

4. The syntactic expression of information structure in L2 German

4.1. Preliminary comments on the development of syntactic properties in L2 German

As outlined in the preceding paragraphs, the principles underlying the scrambling and topicalization of given objects in German have more to do with pragmatic preferences than with acceptability criteria. Nevertheless, even when speakers are left with the choice between putting the subject or the object first in German, the target-like realization of these two options remains tied to certain grammaticality conditions. With regard to the acquisition of topicalization in L2 German, a prerequisite for the movement of objects to the prefield is that learners adhere to the V2 constraint that characterizes West-Germanic languages (Bohnacker, 2005, 2006). Target-like placement of the finite verb in main clauses in V2 languages like German has been traditionally considered as "an exceptionally difficult phenomenon […] to acquire" (Bohnacker, 2005: 41). Explanations put forth in the literature to account for this difficulty are of three kinds. First, the assumption that the SVO sequence corresponds to a universal preference in the ordering of subject and verb would explain why learners maintain the subject

in pre-verbal position when fronting adjuncts (Clahsen & Muysken, 1986). In particular, what supports the postulate of a universal tendency to form ungrammatical XSVO structures as in (13) is the observation that violations of the V2 constraint occur even when learners' L1 is a Germanic V2 language (Håkansson et al., 2002).

(13) *Gerade ich habe das Licht ausgemacht.
Just I have the light turned.off
'I have just turned off the light.'

Closely related to the first explanation is the argument that SVO and XSVO structures are easier to compute than target-like XVSO sequences. From this perspective, the delayed acquisition of the V2 constraint would be due to the difficulty to exchange grammatical information across phrasal projections up to CP, i.e. the domain of the clause as a whole, when computing syntactic structures (Pienemann, 1998)[5]. Finally, a last factor hindering the acquisition of V2 is L1 transfer. In fact, although learners whose L1 is a V2 language also have a hard time implementing the V2 parameter in their interlanguage grammar, the task proves even harder for learners with either English or a Romance language as their mother tongue, since these languages permit XSVO structures (Tomaselli & Schwartz, 1990).

Despite these L1-specific and L1-independent learnability problems, previous research has established that the V2 constraint is eventually mastered in non-native Germanic. Evidence of the acquisition of V2 was provided based on both experimental and production data. First, based on grammaticality judgments and a sentence manipulation task, Conradie (2006) demonstrated that English-speaking learners of Afrikaans, a Germanic language with similar V2 properties as German, were able to reset the V2 parameter from their [-V2] mother tongue

[5] As illustrated in (13), the consequence of this difficulty to compute a full syntactic representation of the clause is that the adverbial phrase *gerade* is simply adjoined to the left of the finite SVO structure, i.e. the clause material that coincides with the IP domain, instead of being integrated into the derivation of the clause as a whole. To put it in another way: unable to access a fully integrated representation of the clause, the computational system opts for the sake of convenience for the juxtaposition of less complex structures.

to their [+V2] L2. In the acceptability judgment task, both native and non-native participants were shown pairs of sentences that varied according to the position of the verb in subject-first (14) and non-subject-first sentences (15).

(14)	(a)	Dirk	kyk	soms	sport	op	televisie.
		Dirk	watches	sometimes	sports	on	television
	(b)	*Dirk	soms	kyk	sport	op	televisie.

'Dirk sometimes watches sports on television.' (Conradie, 2006: 78)

(15)	(a)	Die	jakkals	het	Olaf	met	hierdie	geweer	geskiet.
		the	fox	has	Olaf	with	this	gun	shot
	(b)	*Die	jakkals	Olaf	het	met	hierdie	geweer	geskiet.

'The fox was shot by Olaf with this gun.' (Conradie, 2006: 73)

When asked to circle the correct option, L2 learners of Afrikaans performed like natives, with the exception that L2 participants judged V2 structures starting with an object slightly more severely than the L1 control group, probably because of a dislike for topicalized objects in their L1 English. Turning to the sentence manipulation task, Conradie (2006) observed that L2 learners produced almost no instance of non-target-like V3 sentences when asked to rearrange constituents to form correct V2 structures, which confirmed their ability to set the V2 parameter correctly in their interlanguage Afrikaans. Based on written and oral production data collected from a group of 16-year-old learners of L3 German (L1 Swedish, L2 English), Bohnacker (2005) came to the same conclusion: Despite the possible interference of their L2 English, learners formed less than 5% of non-target-like V3 main clauses at the end of their third year of L3 German instruction.

4.2. Discourse-driven word order alternations in L2 German: Previous findings

The conclusion that emerges from previous research focusing on the acquisition of the V2 constraint is that learners of German can reach native-like command of L2 syntactic rules, even when it requires overcoming the transfer of divergent syntactic properties. At this stage of the

discussion, it thus seems that L2 learners of German meet the two requirements for successful acquisition of discourse-driven syntax: first, they can achieve the level of grammatical control needed to form correct sentences in the target language; and second, as successful communicators in at least one other language, their mother tongue, they have already acquired sufficient knowledge about the appropriate linear encoding of information as a function of givenness and topicality. On this last point, it has in fact been demonstrated that L2 learners draw upon their pool of pragmatic knowledge from the very first stages of L2 acquisition. The first linguistic system that learners develop at the onset of L2 learning has been labelled as "Basic Variety" by Klein and Perdue (1992, 1997). This early manifestation of learners' attempt to convey meaning in the target language is characterized by minimal lexical resources (approximately 50 words) as well as a limited range of utterance structuring principles that are largely independent from the syntactic properties of both L1 and L2. Interestingly, these elementary structuring resources are mainly based on information structure categories like topic and comment. In (16) for example, *de brot* ('the bread') is the topic and *ich nehme* ('I take') the comment. Specifically, what motivates the learner to depart from the subject-first strategy is the informative prominence of the agent *ich*. The agent provides the answer to the question under discussion "Who takes the bread?" and is therefore introduced later in the utterance as required by its focus value (Klein & Perdue, 1992).

(16) de brot ich nehme
the bread I take (Klein & Perdue, 1992: 147)

With the exception of Klein and Perdue's work on beginning learners, L2 research on the development of word order has for a long time mainly focused on the learnability of purely syntactic properties, with the consequence that the impact of information structure categories on the acquisition of sentence structure has remained largely ignored. This changed in the last two decades, following the rationale that despite accumulated evidence pointing to the

convergence of interlanguage grammars on target-language morpho-syntactic parameters, the question whether this convergence would extend to phenomena at the interface between syntax and information structure deserved thorough consideration (Dimroth & Narasimhan, 2012). This increased attention to discourse-related syntax in L2 research has resulted in a rich body of published literature. A handful of these studies examined the syntax-discourse interface in L2 German, focusing either on learners' knowledge and comprehension of discourse-to-syntax mappings or on the adjustment of constituent ordering to the discourse context in L2 production data.

Starting with production data, learners' use of the German prefield for information-structural purposes received specific attention in a corpus study by Bohnacker and Rosén (2008). Bohnacker and Rosén's investigation drew on preliminary findings by Rosén (2006) who observed that the realization of well-formed V2 declaratives by L1 Swedish learners of L2 German did not guarantee a target-like distribution of constituents as a function of their informational value. In her pilot study, Rosén (2006) asked native speakers of German to assess the rhetorical quality of advanced L2 productions. Interestingly, the native respondents underlined on several occasions the lack of textual coherence of learner productions. More concretely, German speakers frequently targeted the beginning of utterances as responsible for learners' erratic style. As emphasized in our discussion of the German prefield, the pre-V2 position makes a major contribution to textual quality for the reason that it relates new clauses to their immediate referential context. Although both German and Swedish are V2 languages, the two languages exhibit distinct preferences for filling the prefield, starting with the frequent use of expletives in Swedish, which facilitate the introduction of rhematic information towards the end segment of the clause. By contrast, the prefield in German is more frequently occupied by non-subject arguments or adjuncts (Bohnacker & Rosén, 2008). Based on both oral and written corpus data, Bohnacker and Rosén (2008) examined whether these cross-linguistic

differences could account for L2 learners' difficulty to produce V2 structures that sound German to native ears. As a first step, the authors had a look at the frequencies of constituent types in the pre-V2 position in L1 Swedish, L1 German, and at three different levels of proficiency in L2 German. In contrast to L1 Swedish speakers who produced slightly more than 25% of non-subject-initial V2 declaratives, this proportion reached 50% in native German. Turning to L2 German data, non-subject-initial prefields were found to follow a gradual progression from approximately 15% at beginner levels to more than 35% in advanced productions. In other words, what these findings demonstrate is that, with increased proficiency, clauses that start with other constituents than the subject become more common, following a trend that brings learners closer to the native benchmark. Furthermore, when zooming in on the type of non-subject constituents in learner prefields, Bohnacker and Rosén (2008) found that although non-subject arguments remained rare in L2 data, their proportion showed a progression from beginner to intermediate levels. In a second step, the quantitative analysis of constituents in L2 prefields was discussed in relation to Rosén's (2006) rating experiment. To get a better sense of how learner utterances could be optimized to match native expectations, Rosén (2006) asked her L1 respondents to rewrite portions of L2 texts that did not sound German enough to them. Natives' interventions on L2 texts involved for a large part modifications related to the type of constituents accommodated in the prefield, with the aim of creating smoother transitions with the preceding context. By way of illustration, a native respondent suggested to front the pronominal prepositional object *dazu* ('to that') in (17). Here again, givenness seems to have played a decisive role since *dazu* links up with the reference to *schöne Ecken* ('nice spots') in the context sentence.

(17) (a) Man muss sich hier schöne Ecken suchen. (Context)
one must self here nice spots seek
(b) **Dazu** gehört ganz sicher das Hindenburgufer.
there-to belongs quite certain the Hindenburg-bank
'You have to find yourself some nice spots here. One of those would most certainly be the Hindenburgufer.'

(Bohnacker & Rosén, 2008: 531)

Overall, these corrections resulted in more variety in prefield preferences, in line with the corpus analysis that revealed a progressive diversification of prefield constituent types across proficiency groups. Native corrections led to a reduction of the share of prefield subjects from 68% to 55%, corresponding to an expanded proportion of other constituent types. In particular, the category which showed the highest increase was that of objects, doubling to 7% after native rewriting.

Focusing on the question whether native-likeness can be achieved at the syntax-discourse interface, Hopp (2009) examined advanced-to-near-native L2 German learners' representations and comprehension of scrambling phenomena in relation to the information-structural status of subject and object arguments. To disentangle possible L1 effects, Hopp (2009) recruited learners from three different L1 backgrounds: Dutch, English and Russian. For each of these three L1s, participants were divided in two groups indicative of advanced and near-native proficiency respectively. Hopp's (2009) experimental design involved two successive tasks, an acceptability judgement task and a self-paced reading task, which were submitted to both L2 participants and a native control group. In the first experiment consisting in acceptability judgments, participants were asked to rate on an open-ended scale embedded clauses that differed according to the factors 'Context' and 'Word order'. As shown in (18), the discourse context was manipulated according to three levels: All-focus, Subject-focus, and Object-focus. In the same way, word order involved three possible configurations, as reported in (19): SOV, scrambled OSV, and an ungrammatical SOV order including two nominative NPs.

(18) (a) Was ist passiert? All-focus
what is happened
'What happened?'

(b) Wen hat der Onkel geschlagen? Object-focus
who.ACC has the.NOM uncle beaten
'Who beat the father?'

(c) Wer hat den Onkel geschlagen? Subject-focus
who.NOM has the.ACC uncle beaten
'Who did the uncle beat?'

(19) (a) …dass der Onkel den Vater geschlagen hat. SO
that the.NOM uncle the.ACC father beaten has
'I think that the uncle hit the father.'

(b) …dass den Onkel der Vater geschlagen hat. OS
'I think that the uncle was hit by the father.'

(c) *…dass der Onkel der Vater geschlagen hat. $S_{NOM}O_{NOM}$

(Hopp, 2009: 467)

Learners' acceptability judgments revealed statistically significant effects of both proficiency and L1 background. At advanced proficiency levels, only the L1 Russian group was found to converge with native controls. Specifically, advanced L1 Russian learners attributed higher ratings to scrambled OS orders in subject-focus contexts, in accordance with both given-before-new and focus-last principles of information structure. Contrary to the L1 Dutch and L1 English groups, they also adequately identified structures containing two nominative NPs as violations of German morpho-syntactic rules. At near-native levels, all three L1 groups achieved convergence on the German morpho-syntactic system. As for syntax-discourse mappings, only the L1 Dutch participants deviated from the L1 benchmark, making no distinction in their judgments between the subject- and object-focus conditions on scrambling. In the self-paced reading task, experimental items were presented following one of the three focus contexts in (18) and displayed incrementally in seven segments, as exemplified in (20):

(20)	Ich glaube	dass	den Arbeiter	am Montag	der Lehrling
	I believe	that	the worker	on Monday	the apprentice
	matrix clause	*complementizer*	*object*	*adverbial*	*subject*
	segment 1	**segment 2**	**segment 3**	**segment 4**	**segment 5**
	abgelenkt	hat.			
	distracted	has			
	infinite verb	*finite verb*			
	segment 6	**segment 7**			(Hopp, 2009: 474)

The central finding that emerged is an overall delay in L2 learners' reading times compared to the native controls. Regarding the role of learners' L1 background, results revealed significant reading time differences for OS structures between object- and subject-focus contexts in the case of the L1 German, L1 English and L1 Russian groups, but no such differences were found in the L1 Dutch data. When measured in relation to the time needed to process OS orders in felicitous subject-focus contexts, reading slowdowns for the same OS orders in infelicitous object-focus contexts demonstrate learners' sensitivity to possible mismatches between syntactic structure and discourse context. Thus, the absence of such slowdown effects was interpreted as evidence that L1 Dutch participants did not react appropriately to the information-structural stimuli. Whereas the facilitatory effects observed for the L1 Russian group could be easily explained by the fact that Russian exhibits a rich case-marking paradigm as well as similar scrambling properties as German, the finding that L1 Dutch learners lagged behind their L1 English counterparts was rather unexpected. The reason is that contrary to English, Dutch allows subject-object reordering in embedded clauses. However, as emphasized by Hopp (2009: 467), object-subject orders in Dutch are more restricted than in German, in particular because Dutch has no overt case markers on full NPs. Options like (19b) are therefore ruled out in Dutch, since the absence of case morphology would cause the misinterpretation of the first NP as clause subject. As a result, Dutch OS orders are restricted to a limited set of fronted object NPs, supplemented with the condition that these NPs are used as contrastive topics as in (21).

(21) … dat [zulke boeken]$_{\text{contrastive topic}}$ zelfs Jan niet koopt.
… that such books even Jan not buys
'… that not even Jan buys such books.'
(Neeleman, 1994: 84, as cited in Hopp, 2009: 467)

Taking into account this complex mix of distributional similarity and functional differences between Dutch and German, Hopp (2009) suggested that L1 Dutch learners' disadvantage in both offline and online tasks was plausibly due to the interference of L1-familiar conditions on OS reordering, hindering the acquisition of the L2 IS-to-scrambling correspondences.

In this section, particular attention has been devoted to the acquisition of discourse-to-syntax mappings in L2 German. Specifically, the detailed presentation of the studies by Bohnacker and Rosén (2008) and Hopp (2009) has shed some light on three main research avenues that have steered recent investigations of L2 acquisition at the interface between syntax and discourse: (i) the learnability of discourse-related syntax, in particular the (im)possibility of achieving native-like ultimate attainment at the syntax-discourse interface in the L2; (ii) the (facilitating or impeding) role of the L1; and (iii) the impact of a processing disadvantage in the L2 related to the difficulty of coordinating grammatical and contextual information. In the following sections, we propose to address these three aspects in more detail by expanding the discussion to research on syntax-discourse phenomena in languages other than German.

4.3. The learnability of discourse-related syntax and the role of L1 effects

4.3.1. (Non-)converging representations at the syntax-discourse interface in L2 acquisition

A lively strand of inquiry in L2 research revolves around the question of L2 learners' capacity for attaining native-like proficiency. In contrast to L1 acquisition which almost invariably leads to full competence, evidence has been accumulated showing that L2 learners only achieve incomplete success in the process of acquiring a new language (see, e.g., Larson-Hall, 2008; Scherag et al., 2004). To account for this fundamental difference between native and non-native learning, the hypothesis was formulated that language learners can no longer, past a certain age,

process linguistic stimuli in a way that enables them to obtain learning outcomes comparable to natives. In light of this theoretical proposal, also known as the critical period hypothesis (Birdsong, 1999; Lenneberg, 1967), new investigations have been conducted from the years 2000 with the aim of locating specific grammar domains that prove persistently impervious to native-like acquisition. A series of studies that fit into this research agenda devoted particular attention to syntax-discourse phenomena involving the encoding of referring expressions in null-subject languages such as Spanish and Italian. In accordance with their typological specificities, null-subject languages rely on other strategies than scrambling and topicalization to realize information-structure features like givenness and topicality. One of these strategies consists in the alternation between null and overt subject pronouns to differentiate between referents that are both contextually given and topical and referents whose antecedent were newly introduced as rhematic information in the immediately preceding context. In other words, whereas null subjects signal both givenness and topic continuity, the overt realization of subject pronouns points to a shift of topic, meaning that a non-topical given referent is promoted to the role of sentence topic in the new utterance (see, e.g., Calabrese, 1986). As a result, when pronouns have two possible antecedents as in (22), the null subject felicitously signals topic continuity by referring to the subject of the matrix clause. By contrast, an overt pronoun indicates a shift of topic, as it is typically interpreted with reference to the object of the preceding clause.

(22) **Juan**$_{i}$ saludó a **Pedro**$_{j}$ mientras Ø$_{i/\#j}$/él$_{\#i/j}$ abría la puerta.
'Juan greeted Pedro while Ø/he opened the door.' (Lozano & Callies, 2018: 422)

Although the alternation between null and overt subject pronouns derives from a universal tendency to map more accessible referents onto discrete forms (Ariel, 2001), the question was asked whether L2 learners could master the production and comprehension of potentially ambiguous pronouns, in particular when their L1 does not exhibit the same distinction between

overt and null anaphora. Most studies examining the acquisition of pronominal subject forms in Romance languages drew on experimental data collected from L1 English (very) advanced learners of L2 Spanish or Italian. The central finding that emerged from these investigations is that even near-native learners still show residual interpretation difficulties at the syntax-discourse interface as they continue to tolerate overt pronouns in topic continuity contexts. Nevertheless, although near-native L2 learners erroneously accept overt pronouns despite their co-reference with maintained topics, their behavior does not significantly differ from natives when it comes to rejecting null subject anaphora in topic shift contexts (Belletti et al., 2007; Sorace & Filiaci, 2006). The original explanation that was put forward to account for the non-convergence of near-native learners singled out the interfering effect of the native grammar in which the interpretable features [±Topic Shift] do not match up with distinct forms. L1-familiar representations cause learners to relate overt pronouns to both topic contexts, and this is precisely this underspecification of the constraints that govern the interpretation of overt anaphora that would be responsible for the residual mismatches observed in comprehension (Sorace, 2011; Tsimpli et al., 2004).

Tempting as it may be, the hypothesis that L1 representations obstruct convergence was contradicted by further evidence indicating that residual interpretation problems also affect bilingual speakers of two null subject languages (Bini, 1993; Lozano, 2006; Sorace & Serratrice, 2009). In addition, production data showed that non-convergence is not limited to infelicitous overt pronouns in topic-continuity contexts. In fact, Montrul and Rodríguez Louro (2006) found based on an oral retelling task with L1 English-L2 Spanish participants that whereas very advanced learners came close to natives on the use of null anaphora in topic-continuity contexts (only 0.3% of non target-like overt pronouns), their divergence from the native benchmark was more pronounced in topic-shift contexts (5.5% of ambiguous null subject pronouns).

Beyond the absence of consensus on the nature of learners' difficulties in mapping topicality contexts onto pronoun forms, the conclusion that the syntax-interface conditions inevitably lead to fossilization states was also challenged. It could for instance be established by Rothman (2009) that the acquisition difficulties experienced by intermediate L1 English learners of L2 Spanish could be eventually overcome at highly advanced proficiency levels. Based on context-matching acceptability judgments and an elicited production task, Rothman (2009) observed that the highly advanced group attained native-like patterns, in contrast to intermediate L2 learners who had trouble linking forms to contexts and systematically over- or underused overt pronouns in the production experiment. In addition to Rothman's results, the possibility of achieving native-like mastery at the syntax-discourse interface gained further support from more recent research on clitic doubling in L2 Spanish and Bulgarian. Clitic doubling is a discourse-related syntactic phenomenon that occurs in conjunction with topicalized NPs. As illustrated in (23), the topic surfaces in a dislocated position in the left periphery of the clause and co-refers with a clitic that occupies the clause position in which the topic is interpreted. Clitic doubling is limited to topical referents, i.e. prohibited in association with focused NPs, and is also coupled with a semantic condition, as clitics require that the co-referent topic has a specific interpretation (23a vs. 23b).

(23) (a) El libro, lo leí.
The book it-CL I.read
'The book, I read it'.

(b) *Un libro, lo leí.
A book it-CL I.read

Ivanov (2009), Slabakova and Ivanov (2012), and Slabakova et al. (2012) investigated intermediate and (very) advanced learners' knowledge of discourse-driven clitic doubling in L2 Spanish and Bulgarian and observed in the same way as Rothman (2009) that native-likeness is accessible to high-proficient learners. Concretely, these studies examined learners' ability to

assess the appropriateness of two main types of sentences in context: left dislocations with clitic doubling and focus frontings. Both target structures were also manipulated with respect to the presence versus lack of clitic. Advanced and very advanced learners were found to behave like native controls by adequately accepting the occurrence of clitics in association with fronted topics while favoring structures without clitics in focus contexts. By contrast, at intermediate proficiency levels, learners still exhibited a lack of sensitivity to the discourse-related distribution of clitic marking.

Like Hopp's (2009) findings on scrambling in L2 German, what previous research on the distribution of subject pronoun forms and clitics tells us is that syntax-discourse phenomena do not pose insurmountable learning challenges. In addition to L1-L2 configurations, certain forms (e.g., overt subject pronouns) as well as specific task requirements might either facilitate or complicate learners' acquisition path, but there is no reason based on the existing body of research to believe that interlanguage grammars cannot integrate accurate representations of distribution patterns at the syntax-discourse interface. Nevertheless, what previous work unanimously underlines is that the syntax-discourse interface is a locus par excellence of vulnerability in L2 acquisition. In fact, even if native-like competence is not an inaccessible horizon, the same cannot be said for performance. As suggested by Hopp's (2009) data, convergence on acceptability judgments does not guarantee native-like processing efficiency under time pressure. In other words, the non-native syntax-discourse interface has a precarious nature that is in first instance due to its inherent function of coordinating two main sources of information, i.e. grammatical information related to the syntactic parameters activated in the target language and grammar-external information associated with information structure. This complexity which puts high computational demands on L2 speakers will be addressed in more detail in the following paragraphs.

4.3.2. Computational difficulties at the syntax-discourse interface in advanced L2 acquisition: The Interface Hypothesis

The findings reported in the previous sections have clearly established that full convergence on discourse-driven syntactic representations is only accessible to (very) advanced L2 learners, and that native-like mastery is seriously threatened in real-time performance. On that point, Hopp's (2009) observation of a processing disadvantage in L2 online tasks echoed other findings by Roberts et al. (2008). Using like Hopp (2009) both offline and online experiments, Roberts et al. (2008) tested intermediate-to-advanced learners' pronoun interpretation preferences in their L2 Dutch, a non-null-subject language. Along with native controls, two L2 groups were recruited, a group with a null-subject mother tongue, namely Turkish, and a L1 German group, since German has pronoun distribution patterns similar to Dutch. As outlined above, overt pronouns in null-subject languages prototypically co-refer with clause-external non-topical antecedents. By contrast, in non-null-subject languages, the interpretation of overt pronouns is biased towards immediately preceding subjects/topics. Roberts et al.'s (2008) experimental design focused on three different pronoun resolution conditions. The condition illustrated in (24a), labelled as local resolution, provides an unambiguous sentence-internal antecedent for the pronoun. Local resolution is also possible in the optional condition (24c), with the difference that a second, sentence-external, referent is also made available as an optional competing antecedent. Finally, in the disjoint condition (24b), number agreement forces the interpretation of the pronoun with reference to the subject of the previous sentence.

(24) (a) *Local resolution*
De werknemers zitten in het kantoor. Terwijl **Peter** aan het werk is, eet **hij** een boterham.
'The workers are in the office. While Peter is working, he is eating a sandwich.'

(b) *Disjoint resolution*
De werknemers zitten in het kantoor. Terwijl Peter aan het werk is, eten **zij** een boterham.
'The workers are in the office. While Peter is working, they are eating a sandwich.'

(c) *Optional resolution*
Peter en Hans zitten in het kantoor. Terwijl **Peter** aan het werk is, eet **hij** een boterham.
'Peter and Hans are in the office. While Peter is working, he is eating a sandwich.'

(Roberts et al., 2008: 341)

Offline data stemming from an acceptability judgment task revealed that both native and non-native groups rated the local and optional conditions higher than the disjoint one, with no L1-related differences between Turkish and German learners. This finding was not surprising as (24b) was expected to cause more difficulties due to the absence of a sentence-internal antecedent for the plural pronoun. However, complementary online data gathered from an eye-tracking experiment painted a different picture, as both L2 groups demonstrated longer fixation times on the pronoun in the optional condition compared to Dutch natives. The explanation proposed by the authors was that the ambiguity of the third-person singular pronoun in (24c) likely caused extra processing difficulties to L2 learners who may have trouble coordinating syntactic and discourse cues as rapidly as native speakers.

Interestingly, this processing disadvantage in the L2 has been shown to affect discourse-related syntax more than grammar-internal interface phenomena regulating the encoding of lexical or semantic information. In English, for instance, locative inversions like "On the horizon appeared a large ship" depend on both lexical and discourse conditions. First, the lexical condition prescribes that only unaccusative verbs can undergo locative inversion. Second, the discourse function of locative inversions is to introduce non-presupposed referents in a spatio-temporal framework. For this reason, locative inversions require both a pre-verbal phrase denoting a stage topic and a post-verbal discourse-new subject in focus (e.g., "a large ship").

Based on a series of timed and untimed tasks, Texeira (2020) investigated advanced and near-native L1 French and L1 Portuguese learners' acquisition of locative inversions in L2 English. With respect to the types of verbs compatible with locative inversions, the author found that L2 learners favored informationally-light verbs like unaccusatives of existence and appearance (e.g., appear, arrive, enter), although their performance still significantly differed from native controls under time pressure, i.e. in the tasks that taxed the most on processing resources. Moving to the role of discourse conditions, the data showed residual L2 optionality in discourse contexts that natives did not consider as equally appropriate in conjunction with locative inversions, namely all-focus and narrow-subject-focus contexts. Importantly, Texeira (2020) found a higher level of optionality in relation to discourse contexts compared to verb types. Moreover, Portuguese near-native and French advanced learners, i.e. two groups who behaved on par with native controls in untimed tasks on verb types, departed from the native benchmark in the untimed experiments which focused on discourse contexts.

Adding to previous findings (see, e.g., Lozano, 2006; Smeets, 2019; Tsimpli & Sorace, 2006), Texeira's (2020) results demonstrate that the interface linking syntax to grammar-external discourse categories is more problematic than grammar-internal relations between syntax and lexicon/semantics. This persistent vulnerability of the syntax-discourse interface motivated the formulation of the so-called Interface Hypothesis according to which the integration of purely syntactic knowledge with discourse information corresponds to a more complex level of language use that may cause repeated processing breakdowns in L2 performance (Sorace 2011, 2012; Sorace & Serratrice, 2009). In other words, the Interface Hypothesis does not deny learners' capacity to draw on target-like grammatical knowledge in L2 practice. Rather, the assumption is that this ability to compute syntax-discourse mappings, i.e. the ability to direct attentional resources to multiple incoming constraints, is likely to operate in a less automatic fashion. As observed in timed tasks, L2 learners' difficulty in

mobilizing sufficient processing flexibility leads to a state of cognitive discoordination which resembles the extra stress that native users might experience when exposed to linguistic stimuli on a noise background (Kilborn, 1992). As attested in several studies, L2 learners' processing disadvantage is even more pronounced in association with non-canonical structures, object/patient-first orders being the prime example (Hopp, 2009; Lopez-Beltran et al., 2021; Wilson, 2009). According to Hopp (2009), the reason is that in addition to the complexity related to the coordination of syntax and discourse information, non-canonical structures resist least-effort routines consisting in the application of a general subject/agent-first template. If these economy strategies yield the desired outcomes in all-focus or object-focus contexts (18a/b), they however fail to evince appropriate discourse-to-syntax mappings in contexts featuring given objects and subjects in focus, leading to persistent garden-path effects (measurable by reading slowdowns) in comprehension and to the overuse of high-frequency canonical patterns in production.

4.3.3. A closer look at L1 effects in production

A central matter of interest in L2 research concerns the role of learners' L1 background in the acquisition of a second or foreign language. Although the question what exactly that role may be remains a source of debate, the rich body of research accumulated since the mid-twentieth century suggests that the existence of L1 transfer mechanisms in L2 learning is beyond doubt (Whong-Barr, 2006). The concept of L1 transfer has its roots in the behaviorist tradition of research according to which language acquisition proceeds by imitation of behavior (Sharwood Smith & Truscott, 2006). Language use draws in other words on an existing pool of previously established habits that support successful communication with the members of a language community. Against this backdrop, the difficulty inherent in learning a second language is that it requires overcoming a series of deeply entrenched routines that no longer count as valid language habits in the L2. From this perspective, it is assumed that similarities between L1 and

L2 will facilitate the acquisition process, whereas L2 typological specificities that differ from learners' L1 will be more difficult to master (Foley & Flynn, 2013).

With respect to the syntactic realization of information structure, a case of L1-L2 typological divergence that received particular attention in previous research concerns the transfer of L1-familiar subject prominence in topic-prominent East-Asian L2s like Japanese and Korean. Contrary to syntactically rigid languages like English in which the subject-centered linearization of clauses is impermeable to information-structure changes, topic-prominent languages share several syntactic features that support the organization of sentences around topics. In other words, whereas English favors passivization to turn topical patients into subjects, topic-prominent languages tend to downplay the role of the subject to express topicality. Instead, a common way to arrange a sentence in these languages is to introduce the topic right before the subject and to differentiate between the two by means of explicit morphological markers, as shown in (25).

(25) ano hon-wa John-ga katta. (Japanese)
that book-TOPIC John-NOM bought
'Speaking of that book, John bought it.'

Studies examining the acquisition of topic prominence by native speakers of English confirmed an overuse of L1-familiar subject-centered syntax at beginner-to-intermediate stages, with a late target-like realization of topicality in learners' production (see, for instance, Jung, 2004; Lee, 2020). Evidence was also provided for a repeated overextension of the topic-marking particle "-wa" to subjects in less-proficient L2 Japanese learners' productions, pointing to a L1-conditioned conflation of syntactic and information-structure categories (Nakahama, 2009).

In L2 German, the transfer of L1-familiar syntactic patterns has been argued to have detrimental effects on the encoding of information structure. Such conclusions were for instance drawn by Bohnacker and Rosén (2008) in view of L2 German learners' difficulties in adopting

similar prefield-filling strategies as natives. A first example reported by the authors involved learners' overuse of given subjects and expletives in written production. Although this strategy of opening V2 declaratives on elements of low information value like expletives is quite common in learners' L1 Swedish, its transfer to learners' L2 German was perceived by native speakers as "very un-German", prompting corrections that favored the fronting of non-subject material, as exemplified in (26) (Bohnacker & Rosén, 2008: 529).

(26) (a) **Es** ist in dem königlichen Zimmern, wo den Besuchern
it is in the royal rooms where the visitorn
die Motive aus Mittelalterem Märchen begegnen.
the scenes from medieval sagas meet
(advanced L2 learner)

(b) **In den königlichen Zimmern** begegnen den Besuchern
in the royal rooms meet the visitors
Motive aus mittelalterlichen Märchen.
scenes from medieval sagas
(native rewriting)
'In the royal rooms, visitors will see scenes from medieval sagas'.
(Bohnacker & Rosén, 2008: 529)

Overall, when asked to adjust learner sentences, German natives often proposed to postpone given subject referents to the middlefield-initial position at the right of the finite verb, as illustrated in (27) where native speakers' preference goes for the fronting of the discourse-linking adverbial *deswegen* ('therefore').

(27) (a) Ich finde deswegen, dass zum Beispiel die Traditionen
I find therefore that to-the example the traditions
sehr wichtig sind.
very important are
(advanced L2 learner)

(b) Deswegen finde ich, dass…
therefore find I that
(native rewriting)

'Therefore, I think that it's very important to keep tradition.'
(Bohnacker & Rosén, 2008: 532)

As competent L1 users, L2 learners no longer have to acquire universal information structure principles such as given-before-new or topic-comment. Instead, the challenge they face has more to do with the target-like expression of information-structure constraints. In fact, mastering target-language discourse-to-syntax mapping patterns and adjusting their distribution to the native benchmark are the two major hurdles that learners need to overcome on their way to native-likeness. Interestingly, what previous findings on the acquisition of topic prominence and prefield-filling preferences suggest is that the transfer of L1-familiar syntactic means is not without effect on the information-structural adequacy of L2 productions. Indeed, whereas the late acquisition of topic-centered syntax in East-Asian languages may affect the target-like formulation of topic-comment, the overuse of subject-first structures in L2 German has been shown to weaken the quality of between-sentence transitions (see (27)). Learners' trouble in accessing target-language preferred forms, even at advanced stages, is not unexpected, in particular in interface conditions that call for the use of non-canonical structures. However, what raises more questions is the conclusion that non-convergence on forms systematically leads to functional alterations. As Byrnes rightly notes, grammatically and communicatively flawless L2 productions can still "prompt native speakers to comment that they "wouldn't put it that way"" (2012: 508). To put it differently, examining learners' interlanguage should certainly include, but also go beyond the question of formal convergence. In order to investigate how learners adapt their syntactic behavior to the informational needs of their audience, L2 varieties must also be approached "as communicative systems in their own right", that is not only as "imperfect imitations of the target language" (Dimroth and Narasimhan, 2012: 329). Providing detailed insights on how L2 learners create textuality irrespective of their (non-)adherence to German-specific structural regularities is in this sense one of the central goals of the present doctoral research.

To further clarify the various research objectives addressed in this research project as well as their connection to the state-of-the-art overview provided above, the following section proposes a brief introduction to the different studies that form the body of this dissertation. Through this reading guide, we want to shed light on the various logical steps that paved this doctoral research, with particular emphasis on how our research questions and methodological choices should be appreciated from the perspective of a larger effort that seeks to relate the development of L2 grammar and rhetorical resources to general communicative concerns.

5. Research goals and organization of the dissertation

As mentioned earlier in this introduction chapter, the central topic of this dissertation is L2 German learners' use of non-canonical argument orders to encode discourse functions related to information structure. In this introduction, we emphasized based on previous research findings the close connection between the diversification of L2 syntactic repertoires and learners' increasing sensitivity to discourse meanings. In German, the preposing of object arguments to positions at the left of the subject is a well-documented syntactic strategy to which speakers and writers resort with the aim of signaling what they think is a suitable anchor point for their utterances. Specifically, fronting objects – when the corresponding patient referents encode discourse-given information, i.e. information that is prominent in the preceding context – may facilitate the updating of addressees' discourse model. However, in contrast to syntactic principles like the V2 rule, the mapping of information-structure categories onto syntax is not a matter of well-formedness. In native use, given objects do not systematically precede new subjects and when they do, the syntactic outcome does not necessarily take the form of subject-object reordering, since passive structures can also be employed to topicalize patient referents. In this context, the challenge for L2 learners becomes clearer. In fact, why would they favor grammar options that are more costly to compute and whose distribution in the native input does not evince clear-cut pairings of forms and functions?

In view of the optionality affecting object fronting in native German and taking into account the difficulty to coordinate syntax and information structure in the L2, a first objective of this research was to approach the syntax-discourse interface in L2 German beyond the traditional focus on form, i.e. beyond the (im-)possibility of developing a converging knowledge about the distribution of syntax-discourse forms. Preceding studies on L2 learners' acquisition of discourse-to-syntax mappings were for a vast majority based on experimental designs targeting learners' knowledge and comprehension of specific target-language structures. However, more effort is needed to examine the actual encoding of information structure in L2 production, which covers in turn two main sub-questions: (i) do learners mobilize target-language reordering patterns in their production as a diversification strategy aiming at communicative efficiency?; (ii) how do L2 German varieties encode, beyond the issue of formal convergence (i.e. the appropriate use of argument reordering), universal principles of information structure? These two lines of inquiry served as a starting point for the design of a first exploratory study that focused on learners' use of the German prefield to achieve textual coherence. This first study (see Chapter 2) targeted intermediate-to-upper-intermediate learners of German (L1 French) who were asked to write a short informative article with the help of both content support and a list of words. In contrast to Bohnacker and Rosén's (2008) corpus investigation of prefieds in L2 German writing, our dataset was not only examined based on syntactic features, as our analysis of learner prefields also included semantic and information-structural criteria. Concretely, prefields were coded for syntactic functions, semantic role characteristics, and for referential givenness. By doing so, our goal was to provide an informed answer to the question whether functional adequacy at the level of information structure could be achieved in L2 productions, irrespective of learners' (non-)convergence with natives on the use of target-language patterns like object fronting.

The results of this exploratory study demonstrated that the intermediate-to-upper-intermediate learners significantly favored canonical subject-first patterns, and that this behavior at the level of grammar functions was associated with a preference for accommodating discourse-new referents in the sentence prefield. To put it differently, these findings ran counter the assumption that learners could ensure an appropriate realization of the given-before-new principle while lacking native-likeness in their syntactic choices. In this light, the two following objectives were formulated as a basis for the next research steps: (i) find out whether convergence at the intersection between formal diversity and functional adequacy could eventually be attained at more advanced stages of L2 writing; (ii) gain more insights into the obstacles that prevent literate language users from deploying target-like syntax-discourse strategies in non-native written communication. In other words, two main directions were explored on the grounds provided by the multi-level analysis of learner prefields. The first direction treated non-canonical discourse-driven word order as a marker of L2 syntactic development and sought to examine the manifestation of discourse-related syntactic diversity in (very) advanced writing. As for the second direction, the focus lied on the nature of the bilingual deficits in non-native discourse-driven syntax. In line with previous experimental and corpus studies, acquisition difficulties were approached as both language-specific, i.e. in relation to the potential interfering role of L1-L2 typological differences, and language-independent, i.e. resulting from a general processing disadvantage affecting L2 learning.

To explore discourse-driven word order in advanced L2 German, as well as the impact of L1 transfer and L2 processing difficulties, three different studies were conducted with specific theoretical frameworks and tailor-made methodological approaches. In Chapter 3, we report on a corpus study examining to what extent learners' syntactic repertoire broadens across upper-intermediate-to-very-advanced proficiency levels in relation to the maturation of L2 communicative skills. Based on corpus data, we focused on the frequency of two types of non-

canonical discourse-related structures, passives and subject-object inversions. The development of non-canonical word order across proficiency levels was approached with reference to research on L2 syntactic complexity which opens a window onto how learners exploit the paradigmatic and syntagmatic flexibility offered by the target language. Against this backdrop, the use of non-canonical word order patterns was conceptualized as an indicator of syntactic diversity, i.e. diversity on the paradigmatic axis, and quantified in parallel to metrics of syntactic elaboration (length-based measures at different levels: sentence, T-unit, clause) targeting complexification on the syntagmatic axis.

In Chapter 4, we zoom in on the interplay between object fronting and case morphology and address the question to what extent learners' command of case is a prerequisite for accessing argument reordering. In theoretical accounts of residual non-convergence in advanced learners, functional morphology, including case marking, has been described as the so-called "bottleneck" of acquisition (Slabakova, 2006). In this context, we formulated the hypothesis that mastering the mapping of syntactic functions onto case forms – a locus of typological distance between learners' L1 French and the target language – could play a decisive role in either impeding or facilitating performance in discourse-driven syntax. The design of this study was experimental and based on three different tasks: a fill-in-the-blanks exercise under time pressure targeting the use of case endings; a sentence manipulation task in context involving the reordering of sentence constituents based on the discourse status of referents (given or new); a general proficiency test. In addition to addressing the issue of L1 transfer at the syntax-discourse interface, a corollary objective of this third study was to highlight that complex linguistic phenomena often involve multiple interface conditions (see White, 2011). Specifically, a crucial question investigated in study 3 was to what extent the interface between syntax and discourse depends on transversal interface conditions linking syntax with morphology.

As emphasized in this introduction, the ultimate threat to target-like performance in discourse-driven syntax has to do with the high processing demands that the interface between grammar and discourse context places on L2 learners. Whereas this processing burden has been extensively documented in comprehension, little is known about how it manifests in production. To remedy this, we examined in the final part of this doctoral research how learners' processing ease during writing, as measured by indicators of writing fluency, finds reflection in the linguistic make-up of the written product at the levels of syntax and discourse. This fourth study (see Chapter 5) found its theoretical and methodological foundations in earlier work pointing to a competition for attentional resources during writing, with difficulties in solving higher-level issues of rhetorical adequacy (syntactic strategies, discourse cohesion) when the bulk of attention is directed towards lower-level concerns (spelling, grammar accuracy, lexical retrieval) (e.g., Chenoweth & Hayes, 2001, Manchón & Roca de Larios, 2007; Stevenson et al., 2006). On these grounds, we aimed at mapping the process-product relations characterizing learner compositions. Process measures capturing learners' pausing and revision behaviors during writing were collected using keystroke logging, a research technique that allows for tracking the motor activities of text production in real time. Regarding product features, we adopted for this fourth study a broader perspective on syntactic diversity and discourse cohesion, examining in addition to constituent reordering and referential givenness the variety of clause (sub)types and the use of discourse connectors.

Note to the reader

The different chapters of this dissertation were written as individual papers and submitted for publication in international peer-reviewed journals: The study reported in Chapter 2 has been published in a recent issue of the journal *Linguistische Berichte* (Lecouvet, Degand, & Suñer, 2021); Chapter 3 has been accepted for publication in the *International Review of Applied Linguistics in Language Teaching* (*IRAL*) (Lecouvet, 2021); the study presented in Chapter 4

has recently appeared in *Language Acquisition* (Lecouvet, Degand, & Suñer, 2021); and Chapter 5 has been submitted for publication in the *Journal of Writing Research* (Lecouvet, Degand, & Suñer, 2021). The advantage of this dissertation format consisting in a compilation of research articles is that each chapter can be read on its own. However, an inconvenient is that there may be some overlap between the literature reviews provided in the different chapters, as well as with the state of the art offered in this general introduction. We apologize to the reader for these redundancies.

Chapter 2: Syntax-discourse properties of prefield constituents in L2 German expository writing

1. Introduction

In the last decades, the cognitive turn in linguistic theory has led to considerable investigation into the ways in which grammar phenomena contribute to the construction of meaning (see, e.g., Langacker, 1987; Goldberg, 1995). In other words, there has been increasing emphasis on the elements of grammar as structures that are "shaped and constrained by the functions" they serve (Langacker, 2008: 7). As a result, the field of syntax, which used to be treated by formalist approaches as an autonomous device for structure computation, has been progressively modelled as a pervasive system representing semantic and pragmatic (including discourse) information in linear order (Hyman, 1983; Givón, 1985). In recent research on second language acquisition, there has been a parallel emphasis on learners' command of the target-language grammar in terms of syntax-semantic and syntax-discourse interface phenomena. Focusing on the syntax-discourse interface, several contributions have shown that learners encounter major difficulties in adjusting the form of their utterances to discourse constraints such as information structure (see White, 2011; Dimroth & Narasimhan, 2012 for a review of relevant studies). This reinforced the assumption that target-like use of word order matching discourse functions is a hallmark of ultimate native-like attainment in the L2 (Lozano, 2006; Hopp, 2009).

The present paper aims at shedding some light on the command of word order phenomena at the syntax-discourse interface in the writings of intermediate-to-upper-intermediate French-speaking learners of German (level B1-B2). The acquisition of word order in L2 German has received much attention in the literature (see, e.g., Clahsen et al., 1983; Clahsen & Muysken, 1986; Håkansson et al., 2002). However, few studies addressed the issue of L2 syntax from the perspective of its interaction with discourse embedding and information structure. Moreover, despite their merits, most contributions on L2 syntax-discourse phenomena remain focused on

learners' use, processing and representations of specific target-language structures to encode discourse constraints (see, e.g., Bohnacker & Rosén, 2008; Hopp, 2009). In this article, we propose to extend the analysis of learners' productions to a larger scope including not only a focus on specific discourse-to-syntax mapping patterns, but also a more general account of how learners deal with information-structure constraints such as the givenness status of discourse referents. For this purpose, we examine the way in which learners fill the clause-initial position in V2 declaratives to adjust to preceding discourse. In German, the finite verb is placed in second position in declarative clauses, with a single constituent preceding it and filling a position known as prefield[6]. The prefield is a dedicated position for hosting topical constituents (see Erteschik-Shir, 2007), but there are no restrictions as to the syntactic role of constituents that can qualify as prefields. It follows that not only subjects can occupy the clause-initial position, as it can indeed also contain adjuncts serving as stage topics and non-subject arguments with a high degree of discourse activeness. On this latter point, a specific research question addressed in this paper involves the assessment of learners' use of non-canonical discourse-to-syntax mappings in the form of the fronting of non-subject arguments. Based on the link between prefield and discourse activeness and the comparison with L1 data, this question is discussed in connection with the main issue at the centre of our investigation, namely to what extent L2 preferences in grammar, i.e. learners' preferences for certain types of prefields, reflect proficiency at the level of information structure.

The article is organized as follows. Section 2 presents a description of syntax as constrained by iconicity principles of discourse (i.e. given information before new information), as well as a presentation of object fronting structures in German and a discussion of word order acquisition in L2 German (with and without reference to discourse). On this basis, the research

[6] The prefield is originally defined within the framework of the so-called topological field model capturing distribution regularities in the surface word order of German sentences. The topological field model identifies a verbal bracket hosting finite (left bracket) and non-finite (right bracket) verbal elements, as well as three fields (prefield, middelfield and postfield) that are filled with adjuncts and arguments (see Höhle, 1986).

questions are presented. Section 3 is devoted to the methodological matters. We describe the two groups of participants, the conditions of the writing assignment and the annotation scheme adopted for data analysis. In section 4, we present and analyze the results of the cross-group comparison. Section 5 discusses the main findings in light of language-specific and language-independent issues of L2 syntax-discourse acquisition. Finally, section 6 offers a brief conclusion.

2. Theoretical framework

2.1. Word order markedness and the encoding of information structure in syntax

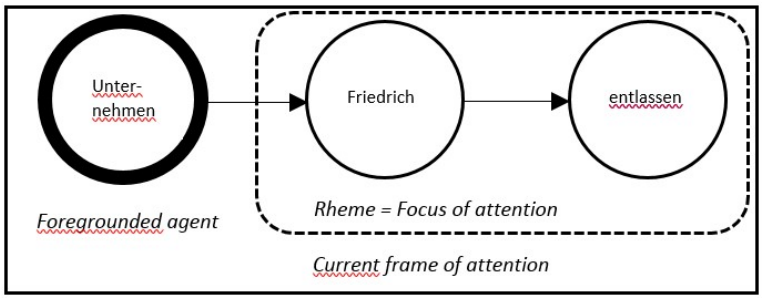
An essential prerequisite for all investigation in the field of L2 acquisition pertains to the nature of grammar knowledge. Focusing on word order, cognitive-functional approaches to grammar (Givón, 1985; Langacker, 1987; Goldberg, 1995) stress the inextricable connection between knowledge of structure and knowledge of meaning. From a cognitive-functional point of view, the linear organization of syntactic constituents is in essence permeable to factors relating to information flow. At each stage of the discourse chain, syntactic units are designed as attentional frames, whose conceptual integration involves the repetition of discourse given referents in preposed positions (Langacker, 2008: 512-513). Building upon the speaker's assumptions about the degree of activation of referents in the addressee's mind at the time of utterance (Chafe, 1976, 1994; Prince, 1981), givenness thus operates as a reference point opening space for rhematic information to be selected from a limited set of possible propositions. To summarize, the conceptual motivation of word order in unfolding discourse, arranged from left to right according to information flow, legitimates the assumption of an iconicity principle at work in syntax. An appropriate formulation of this principle can be found in Greenberg's Iconicity of Sequence Principle (1966: 103):

Iconicity of Sequence Principle:

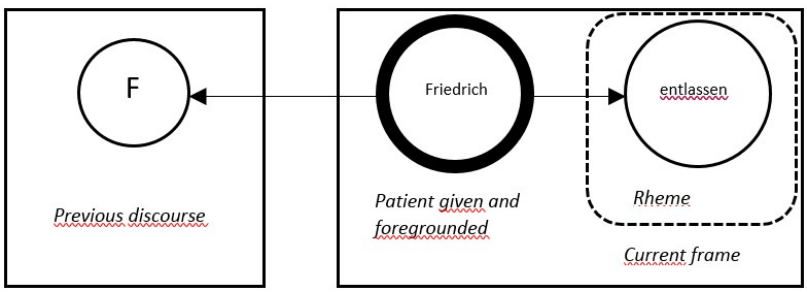
The order of elements in language parallels that in physical experience or the order of knowledge.

Assuming the non-arbitrary, i.e. cognitively rooted, mapping of information structure (henceforth, IS) onto word order, it is necessary to introduce a distinction between unmarked and marked structures. Here, markedness is to be understood in terms of conceptual difficulty. This means that the unmarked arrangement in a language is easier to process, i.e. requires less mental effort, in the sense that concepts (e.g., event participants) are encoded according to their accessibility in human experience (Givón, 1991: 337; Langacker, 1991: 74). By way of illustration, an action-chain event involving the dismissal of an employee may give rise to different argument orderings in its linguistic realization.

(1) Das Unternehmen hat Friedrich entlassen. **(Agent first)**
the.N.NOM company has Friedrich-OBJ dismissed-PTCP
'The company has dismissed Friedrich.'



(2) Erinnerst du dich an meinen Freund **(Patient first)**
remember-2SG you.NOM you.ACC at mein-M.ACC friend
Friedrich? Er wurde entlassen.
Friedrich he has.been-PASS dismissed-PTCP
'Do you remember my friend Friedrich? He has been dismissed.'



The active SVO sentence in (1) corresponds to the unmarked structure in that it aligns to the sequence of its conceptual basis, the action-chain event. The agent *Das Unternehmen* is assigned the grammatical function of subject and occurs in sentence-initial position. Now, let us examine (2), the passive counterpart to (1) embedded in context. Having no semantic effect on the description of the action-chain event, the passive alternation can be characterized as a discourse-related marked structure. In (2), a feature [+given] is added to the feature [-agent] of the aboutness topic (the patient referent *Friedrich*) and therefore provides justification for the choice of a discourse-related passive structure. As Dryer (1995: 113) claims, a component of the speaker's language knowledge must include a set of discourse rules that determines the contexts which call for the selection of a marked structure such as the passive. This of course does not imply, from the perspective of morphosyntax, that the realization of an active sentence like (3) would prove not well-formed in the same context as in (2).

(3) Erinnerst du dich an meinen Freund Friedrich?
remember-2SG you.NOM you.ACC at mein-M.ACC friend Friedrich
Das Unternehmen hat ihn entlassen.
the.N.NOM company has him dismissed-PTCP
'Do you remember my friend Friedrich? The company has dismissed him.'

Nevertheless, although morphosyntax could potentially stand on its own feet and ignore pragmatic factors, options like (2) prompt us to admit that when "pragmatic factors become part of grammar, the result is syntax and morphology" (Hyman, 1983: 71-72). Structures emerging in discourse can then be best defined in terms of felicitousness in the sense that they are, in matching embedding context, favored over other grammatically possible alternatives.

2.2. Marked structures at the left periphery in German

Focusing on languages allowing for word order flexibility, we can see that the reversal of canonical order not only applies to thematic roles, as it may also affect the syntactic functions of arguments (see Givón, 1994: 8-12; Chiarcos, 2009: 56-58). In this case, the active voice is

maintained and only changes in linear structure derive from the discourse status of the involved constituents. Let us examine the following example in German, provided with context:

(4) Der zuständige Unfallversicherungsträger lehnte die Anerkennung des Unfalls als versicherten Wegeunfall ab.
'The competent accident insurance company rejects to recognize this accident as a road traffic accident.'

Diese	**Entscheidung**	hat	**ein**	**Sozialgericht**	auf>	Klage
this.F.ACC	decision-OBJ	has	a.N.NOM	social-court-SUBJ	on	complaint

des	Verletzten	<hin	aufgehoben.
the.M.GEN	injured-GEN		annulled-PTCP

'A social court annulled this decision on complaint of the victim.'

Here, the fronted object NP *Diese Entscheidung* refers to information already evoked by the previous sentence, as indicated by the demonstrative, while the subject NP *ein Sozialgericht* introduces a new discourse entity, as signaled by the indefinite article.

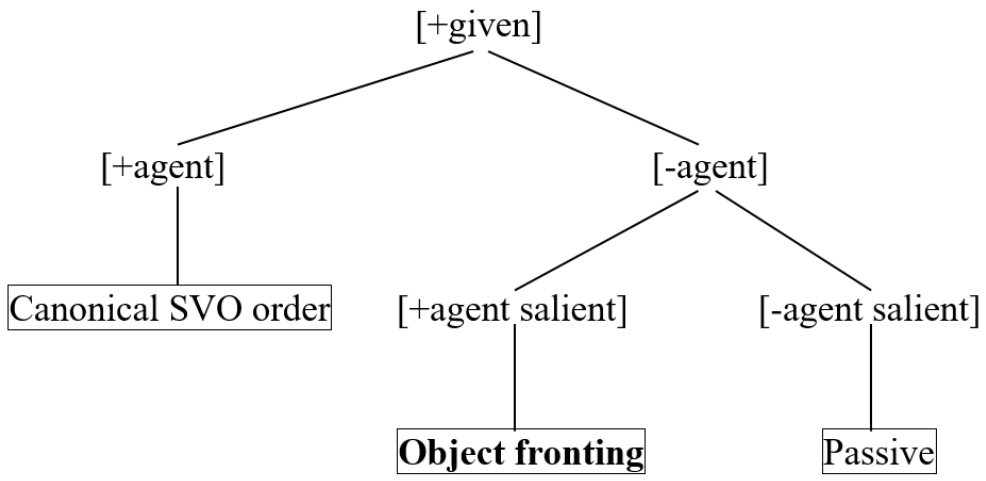


Figure 1. Utterance structure in function of prefield givenness, prefield semantic role and agent saliency[7]

To summarize, there are three devices available in German in order to promote given arguments to the sentence-initial position: (i) the unmarked SVO order, i.e. the active structure in which the agent exhibits the highest degree of discourse activeness; (ii) the passive structure that

[7] Saliency is to be understood here in terms of newsworthiness.

retains the canonical subject-first pattern, but in which the given patient is promoted to the prefield, and the agent is either demoted to adjunct status or omitted; (iii) object fronting that maintains the preposed patient in its syntactic function of object, and in which the agentive subject, relegated to the post-verbal domain, is not demoted. Figure 1 sketches the various options for fronting given arguments in combination with semantic role and agent saliency.

Structures involving objects in the clause prefield (object fronting) are a property of morphologically rich languages like German. Indeed, in languages using inflectional marking to encode syntactic relations, linear order is available as an additional device to fulfill discourse functions (Frajzyngier & Shay, 2016: 103). This form-function correlation between information structure and syntax, i.e. the arrangement from left to right of given and new information, may however constitute a major challenge for L1 French/L2 German speakers. As for object fronting, French has no equivalent, as syntactic relations are not indicated by morphology, but by the relative position of constituents. A translation of (4) in French would then take the form of either a passive, as in (5a), or a left-dislocation with clitic resumption, as illustrated in (5b).

(5) L'organisme assureur avait rejeté la reconnaissance de l'accident comme accident de la route couvert par l'assurance.
'The competent accident insurance company rejects to recognize this accident as a road traffic accident.'

(a) **Cette** **décision** a été annulée par un tribunal
this.F decision has been annulled-PTCP by a.M court
social sur plainte de la victime.
social on complaint of the.F victim

(b) **Cette** **décision,** un tribunal social **l'** a annulée.
this.F decision a.M court social it-CL has annulled-PTCP
sur plainte de la victime.
on complaint of the.F victim
'A social court annulled this decision on complaint of the victim.'

2.3. Discourse competence and the acquisition of word order in L2 German

Despite increased emphasis on interfaces in language theory, current perspectives on language learning remain largely grounded in a modular view of grammar, which approaches syntax and information structure as separate objects of inquiry. Focusing on syntax in L2 German, several contributions since the early eighties, all related to Processability Theory, have strengthened the hypothesis of a rather fixed sequence of developmental stages in the acquisition of German structures (Clahsen et al., 1983; Clahsen & Muysken, 1986; Håkansson et al., 2002). From SVO canonical order as a starting point, learners are taken along a typical pathway leading to SOV subordinate clauses. Regarding V2 declaratives, intermediate stages deal with XVS structures involving the fronting of adverbials, but no specific place is allocated in the acquisition hierarchy to OVS structures resulting from object fronting. In other words, most studies addressing syntactic development in L2 German are primarily concerned with patterns of verb placement, leaving aside the question of subject-object ordering. To date, the only investigation of prefield-filling strategies in L2 German productions, oral as well as written, can be found in a study by Bohnacker and Rosén (2008), who looked at the frequencies of prefield constituent types in native German, native Swedish and non-native German (L1 Swedish) corpora. The authors conclude that prefield filling in the L2 is sensitive to L1 transfer and they link the overuse of L1 patterns to the implementation of information-structural principles at work in Swedish. However, this finding must be considered with prudence, since the analysis is based on generalizations regarding the informational value of grammatical categories (e.g., phonologically light adverbials like *so* as discourse-linking elements), the authors' annotation scheme leaving out IS variables as such.

Compared to research on L2 German syntax, research investigating IS contours of learners' utterances is relatively recent and driven by the need to study L2 productions "as communicative systems in their own right and not as imperfect imitations of the target

language" (Dimroth & Narasimhan, 2012: 329). Interesting in this respect is the seminal contribution of Klein and Perdue (1992), who provided a detailed analysis of learners' utterances at early stages of acquisition. Their work shows that beginning learners organize basic patterns in the form of juxtaposed NPs (or an NP and a PP/AdvP) following a theme-rheme progression.

(6) De brot ich nehme (Klein & Perdue, 1992: 147)
'The bread I take'

(7) Sie in ein Zimmer (Klein & Perdue, 1992: 160)
'She in one room'

While early expressions in the L2 mainly elaborate on IS principles, the overall picture shifts when learners proceed to the acquisition of L2 morphosyntax. On the one hand, L2 learners seem capable of handling IS functions attached to specific forms when the form-function pairings in question also play a role in the L1 (see Hendriks, 2000 regarding the use of left-dislocations in L2 French). On the other hand, when confronted to unknown word order patterns for encoding IS functions, learners' attempts to access the syntax-discourse (SD) interface remain "persistently problematic" (Lozano, 2006: 158). The prediction that target-like command at interfaces is unachievable has been challenged by Hopp (2009), who demonstrated that advanced learners with L1 English mastered IS constraints on German scrambling, but this conclusion is based on on-line comprehension reading and acceptability judgement tasks, and therefore leaves open the question of whether learners can maintain the same level of accuracy in production contexts.

In sum, numerous contributions looked at word order phenomena in L2 German, either from the perspective of narrow syntax or with a closer focus on IS, but very few (e.g. Bohnacker & Rosén 2008; Hopp 2009) considered the interaction between syntactic form and discourse functions based on the assumption of a complex interface. Furthermore, empirical studies

interested in SD mapping functions make use of syntactic criteria to make sense of learners' interlanguage. However, even if learners fail to use target-like structures to encode IS, there is nothing indicating that learners' productions underperform at the SD level. By way of illustration, the underuse of object fronting in L2 German may for instance be offset by an overuse of adverbial clauses creating thematic coherence:

(8) (a) **Dieses** **Versprechen** hat der Vorstand gebrochen.
this.N.ACC promise-OBJ has the.M.NOM Board-SBJ broken-PTCP
'The Management Board broke this promise.'

(b) **Was** **dieses** **Versprechen** **betrifft**, der Vorstand
what this.N.ACC promise-OBJ concerns-3SG the.M.NOM Board
hat **ihn** gebrochen.
has it.N.ACC broken-PTCP
'With regard to this promise, the Management Board broke it.'

In light of the need to assess L2 productions from the angle of language functions, the data presented in this article will be analyzed based on the two following research questions:

- To what extent do L2 learners resort to target-language forms like object fronting to mark IS features such as givenness?
- Do the syntactic patterns occurring in L2 discourse observe IS constraints like the given-before-new principle, irrespective of the use of specific target-language structures?

Within a broader framework, answers to these questions should, in a next step, provide material for addressing the following theoretical issues:

- Is there an effect of the L1 on word order patterns encountered in L2 SD?
- Does L2 acquisition in SD point to more universal, language-independent issues of processing complexity?

With reference to these points, a central question to be discussed is whether the SD interface is a hallmark of near-native attainment in the L2 or, on the contrary, an intrinsic feature of L2 varieties we can expect to find, though in different forms, at less advanced acquisition stages.

3. Method

3.1. Participants

Two groups of participants took part in the study: a group of 23 learners of German as a foreign language and a group of 24 native speakers of German as controls. At the time of data collection, all L2 participants were enrolled in the second or third year of the bachelor degree program in modern languages. In accordance with the requirements specification detailing the acquisition stages to be reached after completion of each language module, the group of learners was taken as a homogenous group representative of an intermediate (B1) to upper-intermediate (B2) proficiency level. All 23 learners reported French as L1. Regarding the L1 German group, 21 participants were, at the time of the study, undergraduate students of education, the remaining three being students in modern languages.

3.2. Data collection

Learners and native controls were asked to write a newspaper article (length of ca. 300 words) about the following topical issue: "One year after the presidential election in the US". The motivations behind this writing task were the following. First, in contrast to argumentative texts, informative and expository texts offer the advantage of requiring the clear and objective exposition of a complex situation. Second, unlike story retellings, news items tend to break with the chronological sequencing of events to depict the ins and outs of a complex issue at a given point in time (Van Dijk, 1988). Finally, in order to increase text coherence and communicative dynamism, it is not uncommon to observe transitions in news stories where the rheme of a syntactic unit becomes theme in the following one (Moya Guijarro, 2001: 109-110). For these reasons, we considered this text genre would be best suited to encourage participants to pay greater attention to discourse constraints.

To reduce cognitive load on L2 participants, two strategies were adopted: (a) provision of linguistic and content support in the form of a vocabulary list and a list of bare facts relevant to the topic, in bullet form and organized by sub-themes, and (b) unpressured time conditions. Increased planning time has long been linked with improved proficiency in writing tasks. Several studies do indeed indicate that when learners are afforded more time to articulate their thoughts, their productions gain in fluency and complexity (Foster & Skehan, 1996; Ellis & Yuan, 2004). Regarding content support, recent findings revealed that it was likely to reduce processing and planning difficulties (Révész et al., 2017).

3.3. Data coding

First, all handwritten data were typed, saved as text documents and manually entered into a spreadsheet. The segments considered for coding were verb-second declarative clauses, including coordinated structures. All verb-second declaratives were listed in the same order as their order of appearance in the texts and labelled according to source text and group provenance (L1 or L2). It should be noted that interrogative clauses were not coded, since V1 interrogatives have no prefield and V2 interrogatives follow predictable patterns with focused *wh*-constituents in clause-initial position. As a result, 490 clauses for the L2 group and 566 clauses for the L1 control group were considered for coding.

In line with the complex nature of the SD interface, four categories were established as a framework for coding: verb valency, prefield grammatical function, prefield semantic role and prefield IS status. We did not include any morphological features in the quantitative analysis given the fact that the German inflectional paradigm displays several instances of neutralization (e.g., the use of identical endings for feminine singular, neuter singular and plural articles in nominative and accusative forms) and syncretism (e.g., the same inflection for masculine nominative and feminine dative). For this reason, we limited our investigation of morphological accuracy to a qualitative analysis based on the few occurrences of the masculine singular

nominative/accusative alternation in the dataset (see 5.2. for a discussion of the role of functional morphology in L2 acquisition at the SD interface). The detailed coding guidelines for grammar functions, semantic roles, and IS status are provided in Appendix 1.

3.3.1. Verb valency

It goes without saying that object fronting can only be expected in the presence of at least one object argument. Therefore, in order to restrict the analysis of prefield grammatical functions to relevant clause contexts, we specified the realized valency, i.e. all uttered verb arguments, of each main clause. Table 1 provides a list of all structures in our dataset with at least one overt object argument.

Table 1. Valency patterns involving at least one overt object argument

Structure	**Examples from the dataset**
Obj$_{acc}$	*Es gibt nämlich eine hohe Senkung der Arbeitslosigkeit* (Obj$_{acc}$). ‘There is indeed a large reduction of unemployment.’
Subj + Obj$_{acc}$	*Die Wall-Street* (Subj) *hat also die Macht* (Obj$_{acc}$) *übernommen*. ‘So, Wall Street took over power.’
Subj + Obj$_{dat}$	*Experten* (Subj) *stehen der Sache* (Obj$_{dat}$) *skeptisch gegenüber.* ‘Experts consider the situation with scepticism.’
Subj + Obj$_{prp}$	*Gleichzeitig setzt er* (Subj) *sich auch für die Verteidigung der Religionsfreiheit* (Obj$_{prp}$) *ein.* ‘He is at the same time also committed to the defense of religious freedom.’
Subj + Obj$_{acc}$ + Obj$_{dat}$	*Dem Volk* (Obj$_{dat}$) *hatte er* (Subj) *Steuersenkungen* (Obj$_{acc}$) *versprochen.* ‘He had promised tax reductions to the population.’
Subj + Obj$_{acc}$ + Obj$_{prp}$	*Zusätzlich belastet die Steuerreform* (Subj) *das Budget* (Obj$_{akk}$) *mit jährlich weiteren 150 Milliarden US-Dollar* (Obj$_{prp}$). ‘In addition, the tax reform charges the budget with a further 150 billion US-Dollar per year.’
Subj + Obj$_{acc}$ + Adv	*Nach einem Jahr Regierungszeit jedoch, hat er* (Subj) *den Staat* (Obj$_{acc}$) *um weitere 700 Milliarden US-Dollar* (Adv) *verschuldet*. ‘However, after one year in office, he has increased the public debt by a further 700 billion US-Dollar.’
Subj + Obj$_{acc}$ + Prd	*Das Weiße Haus* (Subj) *stellt diese* (Obj$_{acc}$) *als ‚Fake News‘ (Prd) dar*. ‘The White House labels these as fake news.’

3.3.2. Prefield grammatical function

Regarding grammatical function, each prefield was classified into one of the seven following categories: subject, expletive, object (accusative, dative or prepositional), predicative, adverbial, ellipsis (for omitted subjects in coordinated clauses) and dependent (e.g. the case of fronted prepositional phrases that function as NP modifiers).

Two comments need to be made regarding the occurrence of multiple constituents at the left of V2. First, left-detached positions, i.e. positions occupied by elements outside the clause but within the sentence, will be allocated a specific category termed pre-prefield filling. An example of such structures is given in (9):

(9) **Und ob seine Erfolge positiv oder negativ sind,**
and whether his-PL.NOM achievements positive or negative are.3PL
darüber muss sich jeder seine eigene
about.it must.3SG themselves-REFL everyone.NOM their-F.SG.ACC own
Meinung bilden.
opinion form-INF
'And whether his achievements are positive or negative, everyone has to form their own opinion on this matter.'

Second, the question arises as to how to deal with multiple clause constituents in learners' prefields, as illustrated in (10). These patterns were labelled as multiple prefield occupations and used as an assessment criterion for learners' command of V2 placement.

(10) **Aber [sein Versuch] [durch den Widerstand der**
but his.M.NOM attempt by the.M.ACC resistance the.PL.GEN
Senatoren] scheiterte.
senators failed.3SG
'But his attempt failed due to resistance from Senators.'

3.3.3. Prefield semantic role

Each occurrence of verb arguments in clause-initial position was classified as being either more agent-like or more patient-like. This classification is based on Dowty's (1991) inventory of core semantic properties, which allows for a more transparent approach to argument relations without having to rely on a list of thematic roles whose exhaustiveness is always a matter of

debate. Table 2 outlines proto-agent and proto-patient properties, as defined by Dowty (1991: 576).

Table 2. Thematic proto-roles properties

Proto-role	Properties
Proto-Agent	a. Volitional involvement in the event or state
	b. Sentience/perception
	c. Causing an event or change of state in another participant
	d. Movement (relative to the position of another participant)
	e. Existence independently of the event named by the verb
Proto-Patient	a. Undergoes a change of state
	b. Causally affected by another participant
	c. Stationary relative to movement of another participant

3.3.4. Prefield IS status

As mentioned in the introduction, IS was addressed in terms of discourse givenness. This entails that discourse referents, which may be known from the extralinguistic context (e.g., the republican senators), but are introduced for the first time in the discourse, received the label "discourse new". The main obstacle to be overcome in coding for discourse givenness is related to the text segment within which it is reasonable to consider a referent as active, i.e. accessible to the addressee's consciousness. Since the delimitation of this segment may be, in many cases, a matter of interpretation, we built on the notion of immediately relevant preceding context (see Firbas, 1992: 22-25) and, for the sake of consistency, limited its extent to the preceding sentence (S-1).

In light of existing guidelines for the annotation of IS categories (Götze et al., 2007; Mamprin & Stede, 2016), the three following givenness values were adopted for coding prefield complements: given, new, and bridging. A referent was reported as given whenever it was mentioned earlier in S or in S-1 – although potentially in another linguistic form (e.g., as a pronoun). In contrast, referents mentioned in a clause but not in a previous clause from the same sentence or in S-1 were assigned the status "new". Cases of bridging involve a range of new discourse entities whose introduction is however determined by their relationship to a referent

previously mentioned (Clark, 1977). By opening a window for newness on the basis of given discourse material, bridging is in this way the medium par excellence to enhance the communicative dynamism of a text without prejudice to the overall coherence. In the simplest case, this link between new information and a referent in S-1 is explicit, as illustrated by the relationship of possession:

(11) Nur 40% der Amerikaner stehen hinter dem Präsidenten.
'Only 40% of Americans stand behind the president.'

Seinen	**Vorgänger**	unterstützten	50%	des	amerikanischen	Volkes.
his-M.NOM	predecessor-OBJ	supported.3PL	50%	the.N.GEN	american-GEN	people-GEN

'His predecessor was supported by 50% of American people.'

There are less obvious varieties of bridging which appeal to the addressee's ability to draw inferences from their world knowledge. However, in a majority of instances, a relation of set inclusion or contiguity can be captured between both referents, as manifested by the following examples from our dataset:

(12)

Von	**einer**	**bis**	**zu**	**neun**	**Meter**	**hohen**	**Mauer**	ist	weit	und
of	a-F.DAT	up	to	nine	metres	high.DAT	wall	is	far	and
breit	nichts	zu	sehen.	Lediglich	**ein**	**kleiner**	**Zaun**	hat		
wide	nothing	to	see-INF	Only	a.M.NOM	small-M.NOM	fence	has		
dort	seinen	Platz	gefunden.							
there	his-M.ACC	place	found-PTCP							

'No such thing as a 9 meter high wall can be seen far and wide. Only a small fence has been installed there.'

(13) Seit einigen Tagen kann man in vielen Zeitungen Zwischenzeugnisse über den Republikaner lesen.
'Since a few days interim reports about the republican can be read in the newspapers.'

Grund	ist,	dass	er	seit	dem	20.	Januar	als	45.
reason	is	that-COMP	he	since	the.M.DAT	20th	January	as	45th
US-Präsident	vereidigt	wurde.							
US president	sworn.in-PTCP	has.been-PASS							

The reason is that he was sworn in on 20th January 2017 as the 45th President of the US.'

4. Results and analysis

4.1. Command of V2

Before turning to the in-depth analysis of how French-speaking learners of German use the clause prefield, we first need to determine how they respond to the V2 rule in declaratives. As reported in Table 3, our group of intermediate-to-upper-intermediate learners adhere at a high level to the V2 constraint:

Table 3. Frequency of target-like V2 declaratives (L2 participants)

Verb pattern		
Target-like V2	*N*	472/490
	Percent	96%
Non-target-like V3	*N*	18/490
	Percent	4%

With the confirmation that learners master the V2 constraint, we can now address the question of the types of constituents they select to fill the free position at the left of the finitum. In other words: are learners dealing with the prefield in a target-like fashion, i.e. as a position that "can be occupied by virtually any constituent, phrasal or clausal, argumental or non-argumental, phonologically light or heavy, and with any semantic function" (Bohnacker, 2005: 44)?

4.2. Constituents in the prefield

4.2.1. Prefield grammatical function

A first indication of how learners use the prefield as a reference point to anchor a new V2 clause in discourse is the degree of flexibility they display in selecting constituent types. Table 4 shows that the frequencies of constituent types in L2 productions differ primarily from L1 data in the use of subjects and objects as prefield-filling elements (see also Figure 2 for a graphic representation). Regarding the use of subjects and objects in the prefield, the contrast between L2 and L1 data is even more striking when we limit the analysis to relevant syntactic contexts,

i.e. to structures in which the main clause verb subcategorizes for one subject plus at least one object NP or PP (accusative, dative or prepositional objects). Typical contexts involving the presence of this type of syntactic arguments include transitive (Subj + Obj_{acc}), ditransitive (Subj + Obj_{acc} + Obj_{dat}) and relative intransitive clauses, i.e. intransitive clauses selecting a dative or prepositional object (Subj + Obj_{dat}/Obj_{prp}).

Table 4. Constituents in the prefield according to grammatical function (L2 compared to L1)

Type of constituent	**L2 German writing** (*n*=490)	**L1 German writing** (*n*=566)
Subjects	254 (51,8%)	241 (42,6%)
Expletives	16 (3,3%)	13 (2,3%)
Objects	2 (0,4%)	43 (7,6%)
Adverbials	171 (34,9%)	208 (36,7%)
Predicatives	21 (4,3%)	32 (5,7%)
Dependents	0 (0%)	7 (1,2%)
Ellipses	8 (1,6%)	22 (3,9%)
Multiple prefields	18 (3,7%)	0 (0%)

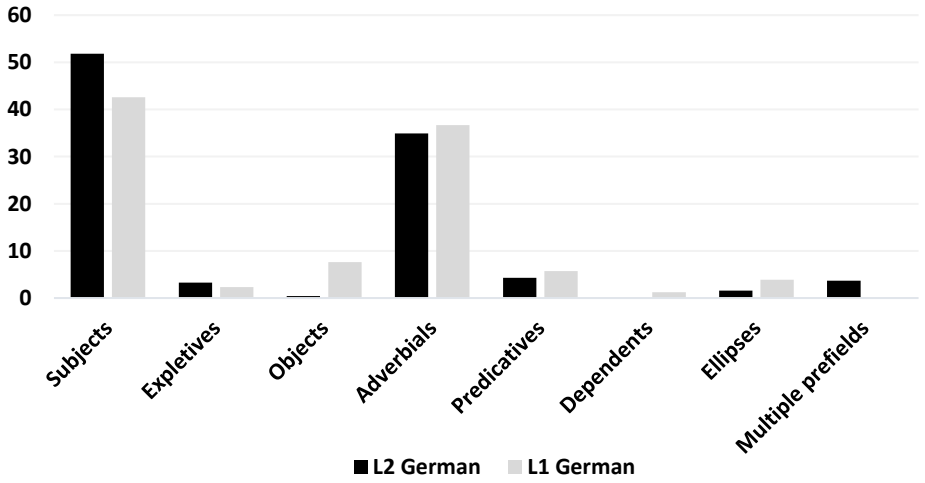


Figure 2. Percentage of prefield constituent types according to grammatical function (L2 compared to L1)

As reported in Table 5 (see also Figure 3), the gap between learners and natives is in all logic widening when structures which do not accommodate objects (e.g., copular structures) are left out of the picture. A Chi-squared test was carried out on the constituent types *Subjects* (vs. the sum of all non-subject constituents) and *Objects* (vs. the sum of all non-object constituents),

with L1 and L2 groups encoded as categories of the explanatory variable. The analysis pointed to a significant association between group and subject use in the prefield (χ^2 = 15.33, df = 1, p < .001). The same conclusion holds for the positioning of objects in the prefield (χ^2 = 31.24, df = 1, p < .001). A calculation of probability ratio (0.058, 95% CI [0.014, 0.240]) also indicated that objects are much less likely to appear in L2 than in L1 prefields.

Table 5. Constituents in the prefield according to grammatical function (results limited to valency patterns including objects)

Type of constituent	**L2 German writing** (*n*=261)	**L1 German writing** (*n*=312)
Subjects	147 (56,3%)	124 (39,8%)
Expletives	1 (0,3%)	1 (0,3%)
Objects	2 (0,8%)	41 (13,1%)
Adverbials	95 (36,4%)	123 (39,4%)
Dependents	0 (0%)	2 (0,7%)
Ellipses	7 (2,7%)	21 (6,7%)
Multiple prefields	9 (3,5%)	0 (0%)

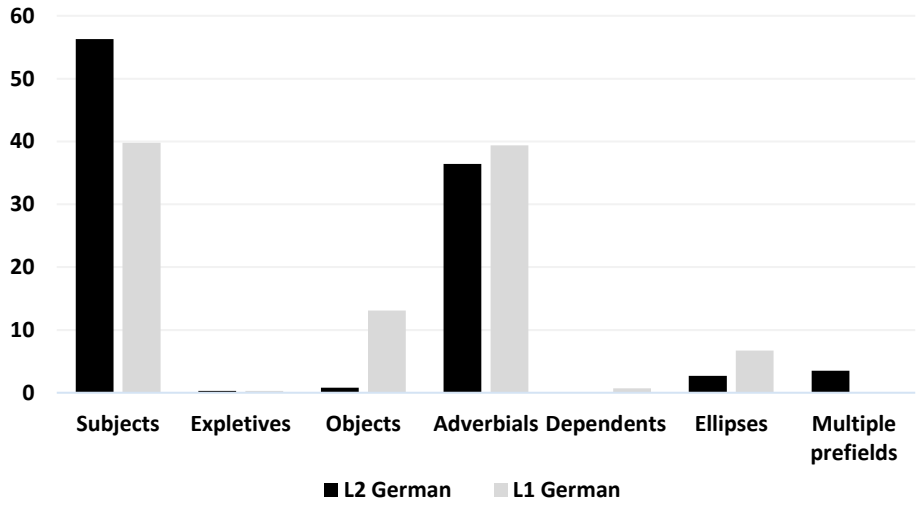


Figure 3. Percentage of prefield constituent types (results limited to valency patterns including objects)

Furthermore, the comparison between L1 and L2 results in Table 5 calls for some comments regarding (a) fronted dependents and (b) ellipses. First, as illustrated in (9), repeated in (14), L1 data show patterns of discontinuous constituency which, although used sporadically by natives, do not appear in L2 productions. To account for discontinuous constituency, both generative

and cognitive-functional models highlight the prominent role of the theme-rheme structure of the clause. More specifically, linear discontinuity is allowed if head and dependent do not share similar IS properties. A dependent PP can accordingly be split from its embedding NP and occupy the clause-initial position if it functions as a background element, while the nominal head is assigned to a conceptual grouping with a higher degree of informativeness (Langacker, 1997: 15; De Kuthy, 2002: 159-160).

(14) Und ob seine Erfolge positiv oder negativ sind, **[darüber]**$_{\textbf{PP-dependent}}$ muss sich jeder seine eigene **[Meinung]**$_{\textbf{NP-head}}$ bilden.
'And whether his achievements are positive or negative, everyone has to form their own opinion on this matter.'

Another example of structures constrained by discourse factors is provided by subject ellipses. The omission of the subject in the second conjunct of coordinate clauses is a cost-effective way to handle givenness. However, even though they seem more familiar with subject omission than with constituency split – possibly because of L1 resources –, learners resort less often to ellipsis than natives.

4.2.2. Prefield Semantic role

Based on the classification of arguments according to their semantic roles in the event structure, we can observe, as reported in Table 6, that few L2 prefields show proto-patient properties compared to L1 counterparts, whether in the form of object fronting, by the use of a passive (or a related structure like the passive infinitive (15)) or in combination with unaccusative (16) and experiencer verbs (17).

(15) **Diese Entscheidung** ist nicht einfach klar>zu<stellen. **(L2)**
this.F.NOM decision is not easy to.clarify-INF
'This decision is not easy to clarify.'

(16) **Das Wachstum** ist jüngst um 3% gestiegen. **(L2)**
the.N.NOM growth is recently by 3% increased-PTCP
'This growth has recently increased by 3%.'

(17) **Kindern** **illegaler** **Einwanderer** droht eine plötzliche **(L1)**
children-DAT illegal-PL.GEN immigrants threatens a-F.NOM immediate-F.NOM
Abschiebung.
expulsion
'Children of illegal immigrants live under the threat of an immediate expulsion.'

A Chi-squared test was performed and showed a significant relationship between the variables *Group* and *Semantic proto-role* (χ^2 = 16.79, df = 1, p < .001). A complementary measurement of probability ratio (0.505, 95% CI [0.359, 0.712]) confirmed a lower likelihood for proto-patient arguments to occur in L2 learners' prefields.

Table 6. Semantic proto-roles in prefield position

Type of proto-role	L2 German (*n*=170)	L1 German (*n*=183)
Proto-Agent	135 (79%)	108 (59%)
Proto-Patient	35 (21%)	75 (41%)

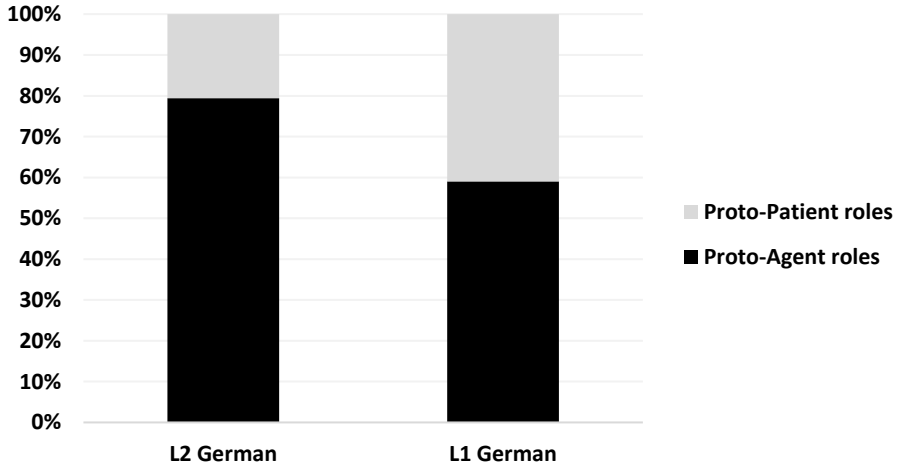


Figure 4. Classification of prefields according to semantic proto-roles

These results coupled to those of the analysis by grammatical functions suggest that learners not only rely on a subject-first strategy to fill prefield positions, but that this preference for subjects is accompanied by a strong tendency to conform with an agent-first principle. In other words, the findings point to difficulties to depart from the unmarked syntactic order in the L2. Compared to natives, learners show a greater preference for the depiction of events in a source-

goal fashion, i.e. following – regarding temporality and causation – the unmarked iconic order of presentation of the involved participants. Furthermore, when they select the patient as the primary event participant, learners almost invariably opt for a passive. In other words, the challenge for learners is to access the use of object fronting (see figure 1, section 2.2.), a challenge that may be explained by the impossibility to transfer this specific pattern from their L1 background. As stated above, the underuse of object fronting in L2 productions does not imply that learners do not resort to alternative strategies to create structures combining patient givenness and agent newsworthiness. The prediction that these strategies materialize in an overuse – compared to L1 data – of thematic adverbial clauses/PPs in the prefield or pre-prefield is indeed supported by the data. Learners' prefields/pre-prefields display 20 occurrences (4,1%) of thematic clauses/PPs, against 5 (0,9%) in the L1 data. The following examples illustrate how learners make use of these patterns in order to express action-chain events from the perspective of a thematic patient.

(18) (a) **Im Hinblick auf die Beseitigung von Obamacare (L2)**
in.the.N.DAT regard to the.F.ACC removal of Obamacare
hat das Weiße Haus bestanden dieses Gesetz
has the.N.NOM White House insisted-PTCP this.N.ACC law
auf>zu<heben.
to.repeal-INF
'Regarding the removal of Obamacare, the White House has insisted on repealing this law.'

(b) **Was das Obamacare anbetrifft,** hat die neue **(L2)**
what the.N.ACC Obamacare concern-3SG has the.F.NOM new
Regierung die Wahl gemacht, es auf>zu<heben.
government the.F.ACC choice made-PTCP it to.repeal-INF
'What Obamacare concerns, the new administration made the choice to repeal it.'

(c) **Weitere Vorhaben wie die Teil-Absetzung der (L1)**
further.PL.ACC projects-OBJ like the.F.ACC partial-repeal the.F.GEN
Obamacare konnte er ebenfalls nicht verwirklichen.
Obamacare could.3SG he also not implement-INF
'Nor could he implement further projects such as the partial repeal of the health insurance Obamacare.'

4.2.3. Prefield IS Status

The underuse of object fronting suggests that learners rely on V2 clause patterns that do not lead to target-like language use. However, the fact that learners' utterances could sound more target-like does not entail that learners organize and structure information in a purposeless fashion resulting in a lack of textual coherence. The use of alternative strategies to anchor V2 clauses in discourse and make discourse processing less choppy constitutes a first argument against the assumption that learners fail to calibrate syntax to discourse requirements. This assumption seems also weakened by the frequency of given constituents in learners' prefields, comparable to that of German natives (χ^2 = 0.052, df = 1, p = .86). Learners appear to identify the prefield as a position dedicated to the repetition of constituents from S/S-1. However, difficulties arise when it comes to using the prefield as a bridging between given and new, i.e. as a suitable position to initiate smooth thematic shifts in discourse (see Table 7 and Figure 5).

Table 7. Givenness status of prefield constituents

	L2 German (*n*=276)	**L1 German** (*n*=323)
Given	90 (32,6%)	103 (31,9%)
New	149 (54%)	131 (40,5%)
Bridging	37 (13,4%)	89 (27,6%)

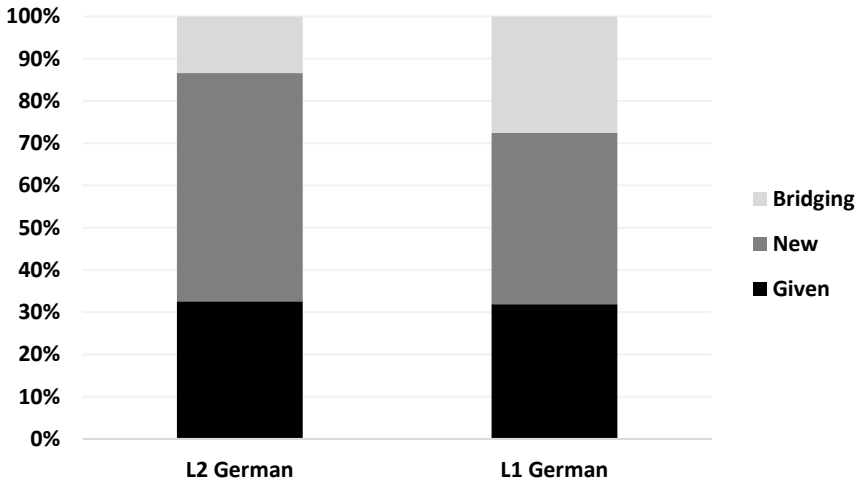


Figure 5. Classification of prefields according to givenness status

A Chi-squared test for comparing the distribution of new (vs. the sum of all non-new) and bridging (vs. the sum of all non-bridging) referents in both groups of participants was run and a significant association between group and IS category was found in each case ($\chi^2 = 10.42$, df = 1, $p < .001$ for the category 'new'; $\chi^2 = 17.69$, df = 1, $p < .001$ for 'bridging'), with probability ratios close to 1 though – except for bridging referents, whose probability to occur in the L2 equals 0.49 (95% CI [0.345, 0.691]) times their probability to be used by natives.

Furthermore, by focusing on the patterns of thematic progression employed by the participants, we can observe that learners are, compared to natives, more prone to reproduce thematic constituents from one prefield to the next (see Table 8). These observations should however be approached with caution since the Chi-squared test revealed no statistically significant correlation between groups and S-1 IS segments for the three categories *Theme S-1* ($\chi^2 = 3.16$, df = 1, $p = .09$), *Rheme S-1* ($\chi^2 = 3.95$, df = 1, $p = .051$) and *Entire S-1* ($\chi^2 = 0.11$, df = 1, $p = .84$).

Table 8. IS status of given and bridging prefields in S-1

	L2 German (*n*=127)	**L1 German** (*n*=192)
Theme S-1	70 (55,1%)	85 (44.3%)
Rheme S-1	46 (36,2%)	91 (47,4%)
Entire S-1	11 (8,7%)	16 (8,3%)

Following the taxonomy of thematic progression proposed by Daneš (1974), we can postulate an acquisition path leading learners from low-level patterns of constant continuous theme (Theme S = Theme S-1), as illustrated in Figure 6 (from the L2 dataset) to advanced, more natural-like sounding patterns of simple linear (or zig-zag) progression (Theme S = Rheme S-1), as represented in Figure 7 (from the L1 dataset). It should be stressed that figures 6 and 7 do not intend to provide representative examples of all patterns of thematic progression found in both L1 and L2 datasets. Rather, both illustrations count as the two extremes on a continuum from rigidity to flexibility in terms of thematic progression and, as such, define a developmental

sequence leading to the ability to insert smooth shifts of attention (see Firbas, 1992) in the discourse under construction.

Theme 1	*Rheme 1*
Donald Trump	*hat mehrere Kritik von der ganze Welt erhalten.*
'Donald Trump	has received much criticism from the world.'
Theme 2 ↓	*Rheme 2*
Er	*kommt von der republikanischen Partei.*
'He	comes from the republican party.'
Theme 3 ↓	*Rheme 3*
Er	*hat während der Wahlkampagne „verrückt" Dinge gesagt.*
'He	said crazy things during the election campaign.'
Theme 4 ↓	*Rheme 4*
Er	*möchte ein Mauer zwischen Mexiko und den USA gebaut.*
'He	would like to build a wall between Mexico and the USA.'
Theme 5 ↓	*Rheme 5*
Er	*möchte auch eine andere wirtschaftliche Entwicklung bilden.*
'He	also wants to generate a new economic development.'
Theme 6 ↓	*Rheme 6*
Er	*möchte auch eine Verschärfung der Migrationspolitik bilden.*
'He	also wants to harden American immigration policy.'
Theme 7 ↓	*Rheme 7*
Er	*hat sofort als ein rassistisch und gefährlich Politiker gewesen dargestellt.*
'He	was immediately considered as a racist and dangerous politician.'

Figure 6. Pattern of constant continuous theme (L2)

In this sense, learners' underuse of bridging strategies, added to their preference for theme repetition prompts us to approach the SD challenge not only at the level of discourse coherence, but also in terms of communicative dynamism. Cook provided a succinct and appropriate description of these two issues, which helps us circumvent the difficulties encountered by L2 participants: "Communication might be defined as the conversion of new information into given information, and a successful communicator as a person who correctly assesses the state of knowledge of his or her interlocutor. If we misjudge, and treat what is given as new, we will be boring; in the reverse case, when we assume the new to be given, we will be incomprehensible" (1989: 64).

Nevertheless, it is also important to emphasize that our group of intermediate-to-upper-intermediate learners already shows a good feel for pushing the communication forward and taking up new information as a thematic unit in following utterances. The results reported above indicate in fact that the gap between L1 and L2 participants is limited, at least compared to differences in terms of grammatical functions or semantic roles. The use of alternative strategies that learners can transfer from their L1 also points to a capacity to tackle IS constraints in the foreign language, even if this sensitivity to IS does not translate into the use of German-specific linguistic forms.

Theme 1	*Rheme 1*
Wenn man heute über Trumps Präsidentschaft Bilanz ziehen müsste, könnte man sagen,	*dass Trump auf jeden Fall versucht hat,* ***seine Wahlversprechen einzuhalten****.*
'If we had to make a report of Trump's presidency, we could say	that Trump at least tried to fulfill his promises.'
Theme 2	*Rheme 2*
Das Einhalten seiner Wahlversprechen	*ist ihm ganz sicher* ***im wirtschaftlichen Sektor*** *gelungen.*
'The fulfillment of his promises	is quite certainly a fact in the economic sector.'
Theme 3	*Rheme 3*
Amerikas Wirtschaft	***wächst stetig****.*
'America's economy	is growing steadily.'
Theme 4	*Rheme 4*
Dies *geschieht*	*obwohl Amerika im Laufe dieses Jahres zwei Wirbelstürme über sich ergehen lassen musste.*
'This is happening	although America endured two hurricanes this year.'
Theme 5	*Rheme 5*
Diese wirtschaftlichen Erfolge	*könnten auch mit* ***der allgemeinen besseren wirtschaftlichen Lage in Europa und Amerika*** *einhergehen.*
'These economic successes	could also be due to the overall better economic situation in Europe and America.'
Theme 6	*Rheme 6*
Die Wirtschaft	*erholt sich nämlich langsam aber sicher von dem Börsencrash im Jahre 2008.*
'The economy	is recovering slowly but surely from the market crash of 2008.'

Figure 7. Pattern of simple linear/zig-zag thematic progression (L1)

4.2.4. Morphological accuracy

As stated above, the declension paradigm for German substantives does not allow us to make generalizations based on the extent of our dataset. However, the repetition of specific errors in the use of accusative case endings for masculine nouns suggests that learners still have a deficient awareness of the connection between case forms and grammatical functions. Due presumably to a persistence of L1 influence, learners have made a habit of associating grammatical functions to specific clause positions. As by reflex, they attribute the accusative ending *–en* to constituents immediately following V2, even if these constituents operate as clause subjects. This is illustrated by the following examples:

(19) Eine Erklärung dafür ist sehr wahrscheinlich **den** **Anstieg**
a-F.ACC explanation for.it is very likely the.M.ACC increase-SBJ
der Einstellungen in einigen Sektoren.
the.PL.GEN appointments in some sectors
'An explanation for it is most likely the recruitment increase in some sectors.'

(20) Dieses Versprechen hat **den** **Präsident** auch gehalten.
this.N.ACC promise has the.M.ACC president-SBJ also honoured-PTCP
'The president has also honoured this promise.'

(21) Deshalb wird **den** **Präsident** von Finanzierung profitieren,
therefore will.3SG-FUT the.M.ACC president-SBJ of funding benefit-INF
damit er die Mauer bauen kann.
so.that he the.F.ACC wall build-INF can.3SG
'Therefore, the president will benefit from funding in order to build the wall.'

Learners' use of case endings as default forms matching specific clause positions (nominative case for prefield elements and accusative case for constituents after V2) tells us much about the crucial impact of the inflection system of a foreign language on the learnability of SD correspondence rules. In line with Hopp (2009) who demonstrated that at non-advanced levels Russian learners showed a better command of German scrambling than Dutch and English

learners[8], L1 morpho-syntactic features appear to be an area worth looking into in order to explain the absence of some IS sensitive patterns (e.g., object fronting) in L2 productions.

5. Discussion

The aim of the present study was to investigate the proficiency of intermediate-to-upper-intermediate L2 learners of German (L1 French) at the syntax-discourse interface. More specifically, it sought to determine whether learners adapt the form of their utterances to the givenness status of discourse referents and, if so, whether the patterns they choose match those used by native speakers. The analysis of L2 productions in relation to L1 data pointed to a significant underuse of object fronting, a type of structure favored by natives to mark syntactic objects as appropriate transitions with preceding discourse. However, the underuse of object fronting in L2 data does not translate in an equivalent degree of underperformance regarding the positioning of given referents in the prefield. First, this is due for a great deal to a preference in learners' productions for patterns of thematic progression based on the repetition of themes from unit to unit. Second, it also reflects the use of compensation strategies which learners model on L1-familiar expressions of thematic organization. In line with these findings, the investigation of learners' performance in SD allowed us to identify two thresholds whose crossing may lead to increased naturalness, dynamism and coherence in L2 writing.

5.1. Crossing from one level of representation to the other: the issue of computational difficulties at interfaces

As suggested by learners' preference for patterns of theme repetition as well as their limited resort to bridging strategies in prefields, the coordination of syntactic and discourse constraints may be subject to computational difficulty in L2 productions. Discourse-related syntax often involves, as outlined in the introduction, the production of non-canonical word orders which,

[8] Unlike Dutch and English, German and Russian have a rich system of morphological case marking.

as such, request learners to integrate a more complex set of information, including but not limited to syntactic constraints. However, learners' tendency to replicate structures over portions of discourse goes hand in hand with a pronounced preference for unmarked syntactic options. The unmarked syntactic option obeys a series of default rules (subject first, agent first) that learners tend to overuse at the cost of discourse organization. In other words, certain discourse contexts call for a modification of the linear structure and the underuse of linear modification in L2 texts suggests that learners "fail to see the textual wood for the trees of sentence grammar" (Hawes, 2015: 94).

Why is it then that L2 writers who are undoubtedly accustomed to syntax-IS mappings in their L1 encounter such difficulties in adjusting word order to discourse context? Building on classical cognitive models of written language production (Hayes, 1996; Kellogg, 1996), an answer lies most likely in the impact of L2 encoding and monitoring constraints. When learners engage in writing tasks, they face the challenge of translating the planned content into well-formed strings of words. Unlike natives, L2 writers have to direct increased resources to (a) translation operations such as lexical retrieval and morpho-syntactic encoding and (b) monitoring and revising operations to ensure the accuracy of morphosyntax, spelling and punctuation (see Shaw & Weir, 2007: 39-42). As a result, learners may be so monopolized by lower-level issues of grammar and word finding (see Van Waes & Leijten, 2015) that they are left with few working memory resources to deal with higher-level aspects such as discourse organization (Chenoweth & Hayes, 2001; Schoonen et al., 2003). In sum, in L2 writing, encoding and revision progress on a word-to-word, clause-to-clause and sentence-to-sentence basis, with the consequence that it slows down production and causes learners to overlook the discourse level. Knowledge of SD mapping rules that might be called upon in L1 writing may then remain underexploited when it comes to writing in a foreign language.

5.2. Crossing from one language to the other: the issue of typological distance

As previously stated, the underuse of object fronting in L2 data, i.e. learners' preference for unmarked subject-first structures, points to a limited awareness of the functioning of the target-language grammatical system. Concretely, the hypothesis emerging here is that learners' low flexibility in constituent ordering is the logical consequence of a lack of insight into the role of case morphology in disambiguating syntactic functions. This triggers learning difficulties and a more pronounced incidence of L1 effects in proportion to the typological distance between the L1 and the L2 (Giacolone Ramat, 2003). It has been noted on several occasions that inflectional morphology constitutes the "bottleneck" of L2 acquisition (Slabakova, 2006), since it confronts learners with mechanisms for encoding functional categories which not only apply to linear structure, but also at the word level. In other words, learners exhibit a representational deficit in morphosyntax, leading in turn to the overuse of default structures and the necessity to employ L1-familiar compensation strategies to improve discourse coherence.

The possibility to go against this representational deficit may presumably depend on the accessibility, i.e. transparency, of L2 grammatical features in the input (Ellis, 2002; Rast, 2008). More specifically, since morphological richness is the trigger for word order flexibility, learners' task is to gain awareness of the connection between inflection forms and grammatical functions as encountered in the input. However, the challenge is here even more demanding given the high amount of syncretism and case neutralization observed in the German inflectional paradigm.

6. Conclusion

In this article, we have investigated how (upper-)intermediate L2 learners of German (L1 French) make use of the prefield for information-structural purposes. Regarding the use of syntactic patterns in writing, the comparison with natives' preferences has revealed that learners have difficulty accessing the target-language system to adjust the form of V2 declaratives to

discourse context. Learners' command of narrow-syntax constraints like V2 is largely target-like. Yet, when we look at prefield constituents, L2 data exhibit a strong preference for unmarked patterns (subject first, agent first), which corresponds to an underuse of discourse-related structures involving object fronting. At the level of information structure, the analysis of prefields has suggested that learners face challenges in linking syntactic production with higher-level discourse constraints to enhance textual coherence and communicative dynamism. The underuse of bridging categories before V2 and a preference for patterns of theme repetition were identified as complementary indicators of the difficulty to articulate syntax and discourse functions in L2 writing. The computational complexity inherent to the syntax-discourse interface as well as the typological distance between source- and target-language systems were discussed as potential explanatory factors accounting for the gap between proficiency in narrow syntax and command of syntax-discourse mappings.

Chapter 3: Non-canonical word order as a measure of syntactic complexity in advanced L2 German

1. Introduction

Over the years, linguistic complexity has become an established construct in second language research, mainly due to the central role of complexity measures in the description and assessment of learners' written performance (e.g., Bulté & Housen, 2012; Lambert & Kormos, 2014; Ortega, 2003, 2012). In this sense, the development of complexity in learners' compositions has been argued to translate into specific patterns of lexical, morphological, and syntactic complexity. Focusing on syntactic complexity, a large body of studies has accumulated indicating how the syntactic make-up of learners' compositions evolves across L2 proficiency levels (e.g., De Clercq & Housen, 2017; Kuiken & Vedder, 2019; Vyatkina, 2012). It has for instance been shown that the development of syntactic complexity conforms to a three-stage model, which starts with an increase in coordination, followed by a growing use of subordinated clauses, and by phrasal complexification at more advance levels (Norris & Ortega, 2009; Wolfe-Quintero et al., 1998). However, over the last decade, research on syntactic complexity came under criticism for promoting a reductionist approach to the construct, with the consequence that an entire dimension of complexity was left unexplored (Lambert & Kormos, 2014; Ortega, 2012, 2015). In fact, while several definitions of syntactic complexity emphasize notions such as variety and diversity, most research on L2 writing has confined its calculation to a handful of complexity indices, mainly measures of syntactic elaboration such as length and clause-linking devices (Bi & Jiang, 2020; Polio, 2001; Vyatkina, 2012).

There are legitimate reasons for extending the operationalization of syntactic complexity to measures that capture the diversity of structures in learner texts. First, more proficient language use does not necessarily imply a surge of weighty structures, for instance in the form of longer sentences that contain more subordinate clauses (Hawkins, 2009; Pallotti, 2015). On

the contrary, experienced learners tend to avoid long formulations in favor of a more compact language that facilitates the expression of complex meaning in an efficient manner (Biber & Gray, 2010; Byrnes, 2009; Mazgutova & Kormos, 2015; Ryshina-Pankova, 2010; Staples et al., 2016). Syntactic complexity develops in parallel to the maturation of learners' communicative skills, which urges researchers to find appropriate measures that can be used to describe subtle changes in L2 syntactic development. Furthermore, complexity measures are also closely linked to the target-language system (Bernardini & Granfeldt, 2019; De Clercq & Housen, 2017; Gyllstad et al., 2014; Kuiken & Vedder, 2019; Martin et al., 2010). Therefore, it makes sense to refrain from overextending standard complexity measures to languages that rely on other grammar features to encode the same propositional content. In the present study, we make ours this objective to broaden the spectrum of complexity measures and propose to this end to examine the added value of measures of syntactic diversity to distinguish between proficiency groups in advanced L2 German. Concretely, we argue for the use of two types of non-canonical word order phenomena, argument inversions and passives, as diversity indices and apply them alongside traditional measures of elaboration on 75 argumentative texts written by upper-intermediate to near-native L2 learners of German. The focus of our investigation is twofold: (i) address the issue of the relationship between both diversity and elaboration measures and learners' general proficiency; and (ii) provide further insights into how the two subsets of syntactic complexity, that is elaboration and diversity, interact in learners' productions.

In the following section, we will first focus on the relationship between the concept of linguistic complexity and L2 general proficiency. Then, previous findings on the ways in which measures of syntactic elaboration vary across proficiency levels will be presented, before a discussion of recent studies focusing on the operationalization of syntactic complexity in terms of the diversification of structures. Thereafter, we will propose the use of non-canonical word

order phenomena, argument inversions and passives, as measures of syntactic diversity in advanced L2 German. Research questions and hypotheses will be introduced in section 3, followed by a presentation of the design and methodology of our study, including the description of all complexity measures employed in our analysis. Results will be reported in section 5 and discussed in section 6. Finally, we will suggest perspectives for future research and offer a brief conclusion.

2. Background

2.1. Interlanguage complexity and L2 proficiency

Ortega (2012) identifies three lines of research that drive the investigation of L2 linguistic complexity. The first one focuses on the relationship between complexity and L2 overall proficiency. The underlying rationale is that the assessment of learners as more or less proficient in the language can be best achieved through predictable patterns of complexity indices. The challenge for researchers that are active within this framework is then to isolate specific markers of complexity that help discriminate between heterogeneous levels of L2 proficiency. The second strand of research has its roots in task-based language learning. Here, interlanguage complexity is approached as an indicator of learners' performance when dealing with specific task requirements. Crucially, the main question at stake is whether modifications at the level of the cognitive demands that task conditions place on learners lead to predictable effects on the characteristics of learners' produced language. The third motivation behind the investigation of complexity has to do with the identification of interlanguage developmental sequences. In this line of work, complexity features are regarded as reliable benchmarks to capture learners' maturation process towards more advanced stages of grammatical development. The central focus of the present study is situated in the first area of research. Our purpose is in other words to contribute to a more detailed, theoretically well-grounded and empirically validated picture of the forms that syntactic complexity takes across proficiency levels.

The postulate of a relationship between complexity and proficiency, i.e. the idea that the production of linguistically more complex structures mirrors a more developed and efficient use of the L2, is not without challenges. As emphasized by Pallotti (2015), the problems associated with complexity are mainly due to the polysemy of the concept. Complexity can indeed be defined in terms of: (i) structural complexity, a characterization of linguistic structures as a function of the quantity of their elements and their relational patterns of organization; (ii) cognitive complexity, referring to the cognitive load associated with the processing of specific structures; and (iii) developmental complexity, involving the order in which structures emerge in learners' interlanguage. Structural complexity is often labelled as 'absolute' complexity, as opposed to 'relative' complexity, which approaches linguistic features as more or less difficult from a learner-dependent point of view (Bulté & Housen, 2012; Dahl, 2004; Miestamo, 2008). Although complexity is inherent in learners' "capacity to use more advanced language" (Ellis, 2009: 475), the pitfall is to unduly reduce complexity to proficiency and thereby fall into a circular reasoning: proficiency levels define complexity features and, in turn, complexity determines proficiency. The fact is that complexity, difficulty and proficiency do not coincide. As a clear case of conflict, it has for instance been shown that structurally more complex forms (e.g. extraposition) may cause less processing effort than others (see Hawkins, 2009). Conversely, proficient language does not necessarily imply more complexity, since communicative efficiency often requires simpler language. The bottom line here is not that the interaction between complexity, difficulty and proficiency should be ignored. On the contrary, the premise that complexity varies across proficiency levels should be taken seriously and researchers should keep examining specific forms of complexity as indicative of distinct levels of proficiency. Nonetheless, any operationalization of complexity needs to start from an objective, i.e. independent from the learner, description of what it means for an utterance to be linguistically complex.

2.2. The development of syntactic complexity across proficiency levels

Syntactic complexity as an inherent property of utterances has traditionally been conceptualized in terms of syntactic elaboration. Beaman, for instance, argues that syntactic complexity involves "longer sentences and more subordinate clauses that reveal more complex structural relationships" (1984: 45). The two main types of measures that are prototypically associated with syntactic elaboration are syntactic length and clause linking (coordination and subordination). Beginning in the 1970s, a large number of studies on syntactic complexity have investigated how measures of syntactic elaboration relate to L2 proficiency levels. The majority of these studies provided evidence for a strong relationship between syntactic complexity and proficiency (see Ortega, 2003). Overall, syntactic complexity is regarded as following a three-stage path across proficiency levels (Bardovi-Harlig, 1992; Norris & Ortega, 2009; Wolfe-Quintero et al., 1998). The starting point (stage 0) corresponds to the production of independent structures. Then, sentences and clauses are linked by coordination (stage 1). Stage 2 is characterized by an increase in subordinate clauses and, finally, at the final stage, complexification operates within the clause at the phrasal level. In sum, defining the development of syntactic complexity as the use of "progressively more elaborate language" (Foster & Skehan, 1996: 303) requires targeting the right areas of growth at each stage of development. At beginner and low-intermediate proficiency levels, learners produce longer sentences that result from an increased use of coordination (Bardovi-Harlig, 1992; Vyatkina, 2012). At subsequent levels, the increase in sentence length masks a change in learners' use of clause-linking devices that corresponds to a higher rate of subordinate clauses. Finally, from intermediate to (very) advanced levels, T-unit[9] length is not only affected by subordination, but also by more elaboration at the phrasal level (see, e.g., Neary-Sundquist, 2017), which signals

[9] The concept of T-unit is defined by Hunt as "one main clause plus any subordinate clause or non-clausal structure that is attached to or embedded in it" (1970: 4).

a stylistic evolution towards characteristics of academic discourse and written prose (Biber & Gray, 2010; Staples et al., 2016). Two remarks need to be made at this point. First, measures cannot be limited to large-grained indices such as sentence length or T-unit length that hide substantive shifts in the anatomy of syntactic complexity. Second, the nature of these changes demonstrates that syntactic complexity is a multi-dimensional construct that accommodates a variety of structural changes across proficiency levels (Norris & Ortega, 2009). Numerous studies have indeed pointed to considerable differences between learners, with most often a dynamic make-up of learners' interlanguage that adjusts to a wider syntactic repertoire to fulfill particular communicative goals (Ortega, 2015; Spoelman & Verspoor, 2010; Verspoor et al., 2017). This also holds true across proficiency groups, as specific measures might exhibit non-linear trajectories including "omega-shaped" patterns, with a rising tendency that reverses at advances levels, and plateaus, when measures no longer differentiate between adjacent levels.

2.3. Broadening the construct and measurement of L2 syntactic complexity

The impasse to which large-grained measures of length have led has brought about new definitions of syntactic complexity that highlight terms like "variety" and "diversity". Early conceptualizations of complexity already put great emphasis on these notions. By way of illustration, Foster and Skehan consider the development of complexity as involving "a greater variety of syntactic patterning" (1996: 303). Similarly, Wolfe-Quintero et al. mention "a wide variety of both basic and sophisticated structures" as a dimension of interlanguage complexification (1998: 107). Thus, the idea rapidly gained acceptance that both elaboration and variation deserve to be taken into account as indicators of complexity. In a more recent work, Lu characterizes syntactic complexity in this sense as "syntactic variation and sophistication, or, more specifically, the range of syntactic structures that are produced and the degree of sophistication of such structures" (2011: 36). However, as Polio points out, "variety

does not enter in the equations" when we look at how syntactic complexity is actually measured (2001: 96).

2.3.1. Exploring the functional foundations of syntactic complexity

The necessity to expand the scope of syntactic complexity and include more fine-grained measures of diversity[10] goes hand in hand with a perspective shift from a structure- to a function-centered line of thought. Following Ortega, more proficient L2 learners are dealing with "the creation of meanings that are, conceptually and socially, increasingly more complex" (2015: 85). Accordingly, the calculation of complexity needs to cover the full range of strategies that learners adopt to adjust their utterances to the communicative requirements of tasks. For instance, certain forms of writing genres such as academic discourse are characterized by specific ideational and interpersonal meanings that ask for a higher degree of abstraction. This can be achieved by the use of a noun- rather than verb-centered style that creates more distance from the depicted states of affairs and presents entities and processes in a timeless fashion reflecting the communicative intention to produce knowledge (Schleppegrell, 2006). Evidence for a gradual increase in the use of nominalizations was provided by Ryshina-Pankova (2010) in her study conducted on the writing of 55 advanced learners of German recruited from three different curricular levels. What a strategy like nominalization demonstrates is that at advanced levels complexification does not necessarily lead to more intricate sentences that contain more coordinated or subordinate clauses (see also Byrnes, 2009). On the contrary, the expression of complex ideas by expert L2 writers and speakers is often associated with a simplification of forms in comparison to novice learners (Pallotti, 2009). In other words, simplification is not the counterpart of a lack of linguistic resources. Instead, simplification suggests the ability to

[10] Granularity is to be understood in terms of specificity (Kyle & Crossley, 2018: 333), in the sense that further distinctions are introduced between subtypes of structures (e.g., active vs. passive forms, finite vs. infinite embedded clauses, pre- vs. post-modifiers in complex nominals, etc.) that are treated uniformly in traditional elaboration-based approaches to complexity.

exploit existing linguistic subsystems with an increased degree of flexibility, with the aim of serving complex functions (Derewianka, 2003). Such an approach to complexity is closely aligned with the notion of optimal compression as defined in information theory. The fundamental intuition here is that efficient encoding keeps the message as short as possible (see, e.g., Juola, 2008; Sadeniemi et al., 2008). That is, what matters is to minimize the surface structure associated with a given amount of information, meaning that the use of longer strings of language is only justifiable if combined with an increase in informational content. In this light, the role of a large syntactic repertoire becomes clearer, since it equips language users with the possibility to achieve communicative goals in multiple ways. When applied to L2 use, this implies that more experienced learners will have more syntactic options at disposal, allowing them to favor compressed form-function pairings over longer paraphrases that often sound non-target-like.

2.3.2. The need for developmentally more sensitive measures

Over the last five years, the growing use of syntactic variety/diversity measures has provided a more detailed picture of how complexity progresses across proficiency levels. Several studies have pointed to the benefits of using measures of clausal diversity in addition to clausal length. In a recent study, Bi and Jiang (2020) developed a measure of diversity based on the type-token-ratio of dependency relations calculated on text segments of 50 words and applied it to their investigation of essays written by beginner to intermediate EFL learners (L1 Chinese). The results revealed that syntactic diversity was a better predictor of writing proficiency than most measures of syntactic elaboration used in the study, including measures of phrasal elaboration. In the same vein, in an investigation of oral narratives produced by learners of English and French (L1 Dutch) at four different proficiency levels from beginner to advanced, De Clercq and Housen (2017) included a measure of diversity based on a distinction between general types of clauses (matrix/subordinate/coordinated) and a further classification of subordinate clauses

into formal (finite/infinite) and functional (complement/adverbial/relative) subtypes. In contrast to clause length that remained approximately constant, the results for clause diversity indicated a statistically significant increase between level 1 and levels 3 and 4 for both L2 English and L2 French. Clause diversity also provides additional information about the evolution of subordination preferences at less advanced levels, where the use of dependent clauses has not reached a plateau yet. For instance, Jiang et al. (2019) observed that across four levels from beginner to intermediate the proportion of relative and adverbial clauses in the total of subordinate clauses tends to grow at the cost of complement subordination (see also Lambert & Nakamura, 2019).

Syntactic diversity is a valuable instrument to complement measures of elaboration, but its use proves even more essential to capture the progression of complexity at more advanced levels, where global measures no longer offer a window on possible changes. Mazgutova and Kormos (2015) examined the development of intermediate and upper-intermediate EFL writers' productions within the time frame of a 4 weeks intensive training and found no statistically significant change between pre- and post-training measures of elaboration (T-unit length and Dependent clauses/T-unit). In contrast, significant differences were found with respect to fine-grained measures of clausal and phrasal complexity (conditional clauses, complex nominals and modifiers/noun phrase, among others). However, contrary to expectations, the authors also observed a considerable increase for their measure of syntactic structure similarity, which is based on the proportion of intersection tree nodes that adjacent sentences have in common (see Graesser et al., 2004). They associated this finding with the hypothesis that at a certain point learners may favor the repetition of similar constructions to support the cohesion of their texts. In sum, similar to elaboration, variety is not always consistent with the pragmatic requirements of tasks, which goes against the intuition that more diverse necessarily means better. Therefore, assuming that diversity is a hallmark of advanced

production, the challenge is to pinpoint specific grammar phenomena whose use expresses structural diversity and communicative efficiency as two sides of the same coin.

2.3.3. A cross-linguistic approach to syntactic complexity

Measures of variety/diversity are not only needed to capture more subtle forms of complexification, but also to adopt a cross-linguistic perspective on L2 syntactic development. The bulk of research on syntactic complexity has been devoted to syntactic growth in L2 English, coupled with the implicit assumption that "the relationship between complexity and development or proficiency [is] similar across languages" (De Clercq & Housen, 2017: 319). However, typological differences between languages may have a considerable impact on the structural properties of one and the same construction and, as such, influence the mapping of complexity measures onto developmental stages. For instance, Martin et al. (2010) did not consider subordination in their investigation of syntactic development in L2 Finnish because subordinate clauses do not differ syntactically or morphologically from matrix clauses in Finnish and, as a result, subordination does not denote any complexification on the paradigmatic axis. As argued by Kuiken and Vedder, "syntactic complexity should thus be assessed by particular measures, which focus on language-specific features" (2019: 193). Even though studies focusing on syntactic diversity in L2s other than English remain scarce, first steps were taken in this direction in the last few years. Focusing on both elaboration and diversity in L2 French and English, De Clercq and Housen (2017) tracked the evolution of several complexity indices across four proficiency levels (beginner-advanced) as well as in comparison with L1 comparison groups for each language. Interestingly, their results revealed that at advanced levels L2 English learners matched the L1 data, while L2 French still exhibited a considerable divergence from natives for a wide range of length and diversity measures (NP-length, AS-Unit-length, ratio of subordinate clause subtypes, among others). Cross-linguistic differences were also identified by Gyllstad et al. (2014) in their investigation of texts written

in English, French and Italian (L1 Swedish). The authors found statistically significant increases in T-unit and clause length between A and B CEFR levels in L2 French and English, but not in the Italian data, a finding that they linked to a possible influence of the null-subject parameter in Italian. Concretely, learners at beginner levels would tend to overproduce overt subjects and then progressively adapt to the null-subject constraint. In a follow-up study, Bernardini and Granfeldt found no evidence supporting the role of the null-subject parameter and concluded that SLA research is "still a long way from understanding how different factors interact in the study of linguistic complexity in learner performance" (2019: 226). It is precisely to this understanding of how language-specific word order properties, communicative functions and learners' proficiency interact in the deployment of syntactic complexity that the present study aims to contribute. To this end, we propose to investigate, in addition to global measures of syntactic elaboration, two subsets of syntactic diversity measures in L2 German: argument reordering as involved in passives, and constituent reordering phenomena (topicalization, scrambling and left-dislocations). The formal and functional properties of these syntactic phenomena are described in the following paragraphs.

2.4. The complexity of non-canonical word order in German

Languages differ according to the degree to which they allow the order of arguments to vary within the clause. In languages like English that exhibit a limited degree of morphological richness, word order is relatively rigid. Syntactic functions are tied to the position of arguments and, as a result, the only way to achieve a non-linear mapping of semantic roles onto syntactic functions is voice alternation. The variation between active and passive voice is possible in German but, in addition to passivization, German also allows for the reordering of syntactic functions. This is due to the fact that German has a richer agreement structure and a case-marking system, which makes it possible to modify the order of constituents in the clause

without losing track of their syntactic function. Thus, a transitive event like 'X reads Y' can be encoded in three different ways in German:

(i) The canonical SVO order: The active-direct structure in which the order of clause constituents corresponds to the unfolding of the action chain, from agent to patient.

(1) Der Student hat den Roman gelesen.
the.NOM student has the.ACC novel read
'The student read the novel.'

(ii) The passive: The voice alternation that preserves the subject-first constituent structure, but in which the patient is promoted to a more prominent position and the agent is demoted to adjunct status or omitted. The passive is expressed using the auxiliaries *werden* (processual passive), as in (2a), and *sein* (stative passive), or by means of alternative forms such as *sich lassen* + infinitive (2b) or *sein* + *zu*-infinitive (2c) that add the notion of possibility.

(2) (a) Der Roman wurde (vom Studenten) gelesen.
the.NOM novel has.been by.the.DAT student.DAT read
'The novel has been read (by the student).'

(b) Der Roman lässt sich einfach lesen.
the.NOM novel lets Itself easily read

(c) Der Roman ist einfach zu lesen.
the.NOM novel is easy to read
'The novel is easy to read.'

(iii) The inversion: The active structure that maintains the patient in its syntactic function of object and moves it to the left to a position preceding that of the agentive subject, which is not demoted to a less salient status. Inversion in German is achieved through sentence-initial topicalization (3a), scrambling (3b) or left-dislocation (3c).

(3) (a) Den Roman hat der Student gelesen.
the.ACC novel has the.NOM student read
'The student read the novel.'

(b) …dass den Roman der Student gelesen hat.
that the.ACC novel the.NOM student read has
'… that the student read the novel.'

(c) Den Roman, der Student hat ihn gelesen.
the.ACC novel the.NOM student has it.ACC read
'The novel, the student read it.'

Table 1 provides a summary of the mapping between semantic roles, syntactic functions and constituent positions associated with each structure type.

Table 1. Mapping between semantic roles, syntactic functions and constituent ordering in canonical and non-canonical structures in German

	lesen < agent [Student], patient [Roman] >					
	SVO		**Passive**		**Inversion**	
Argument structure	AGENT	PATIENT	AGENT	PATIENT	AGENT	PATIENT
Functional structure	SUBJ	OBJ	SUBJ	OBLIQUE	SUBJ	OBJ
Constituent structure	NP_{subj}	NP_{obj}	NP_{subj}	PP	NP_{obj}	NP_{subj}

Similar to Ryshina-Pankova's investigation of nominalization, our focus on non-canonical word order – passives and inversions – is grounded in a view on complexity that considers the variation of structures on the paradigmatic axis in relationship to the development of learners' communicative skills. In other words, using non-canonical word order phenomena, we propose, in line with Menn and Duffield, a "whole-language" complexity metric that targets both learners' interlanguage complexity as anchored in their mental grammar (I-language) and the actual production of forms in various contexts of use (E-language) (2014: 281). In context-neutral situations, a canonical SO order is produced, as it corresponds – in transformational approaches to syntax – to the basic word order that is assumed to be directly generated from the

grammar. This order is not linked to additional functional motivations like information structure constraints and is also easier to process. In contrast, when discourse factors come into play, further pressure is put on the grammar to derive a non-canonical structure[11], as exemplified in (4).

(4) a. Der Lehrer hat **einen Roman** empfohlen. (context sentence)
the.NOM teacher has a.ACC novel recommended
'The teacher recommended a novel.'

b. **Den Roman** hat der Student gelesen. (topicalization)
TOPIC **COMMENT**
'The student read the novel.'

The surface structure that results from the syntactic derivation does not lead to any increase in length, but this does not mean that the addition of information structure constraints does not translate into more structural complexity. As illustrated in (5), the derivation of non-canonical orders, which follows from the representation of the patient referent as a topic or background in the discourse context, triggers an inflation of the syntactic structure in terms of tree nodes and movement operations[12].

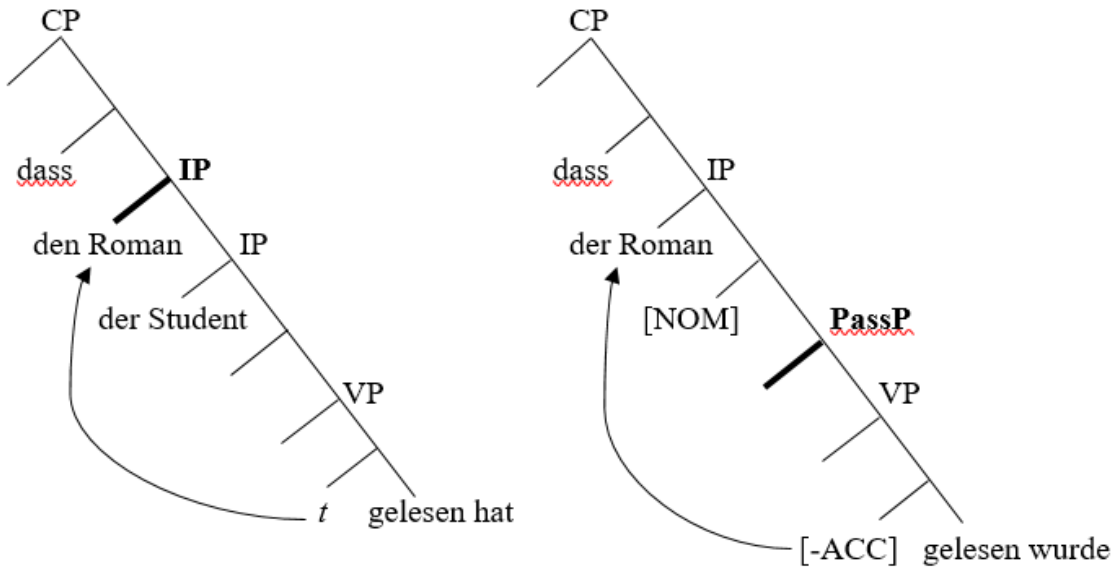
[11] Note that in the case of inversion, other factors might play a role next to discourse context. One factor that has received much attention in the literature on word order variation pertains to the animacy of arguments. The interaction between animacy and information structure constraints might sometimes lead to conflicting situations, as shown in (i).

(i) Der Lehrer hat einen Roman empfohlen. (context sentence)
[Den Studenten]$_{\text{ANIMATE}}$ interessiert **[der Roman]**$_{\text{TOPIC/INANIMATE}}$ sehr.
'The student is particularly interested in the novel.'

Although our theoretical focus lies on discourse-driven word order, we do not intend to differentiate between different functional dimensions in our empirical exploration of inversion in L2 German. Learners' use of inversion will then be approached as a marker of functionally motivated diversity, irrespective of the relative weight of formal, semantic and discourse-related factors in learners' preference for one word order alternative over others.

[12] German is an SOV language with a V2 constraint in main clauses. This implies that the linear order of constituents in V2 declaratives necessitates two further operations on the base-generated verb-final structures: (i) movement of the finite verb to C^0, and (ii) movement of the highest element of IP to SpecCP. As suggested by Frey (2004a), topicalization is thus derived by scrambling to the highest IP position, followed by formal movement of the scrambled constituent to the pre-V2 position, also known as prefield.

(5) (a) Inversion (OS order) (b) Passive



To summarize, non-canonical word order phenomena are treated as performance outcomes reflecting a dual movement of complexification: (i) a dimension of functional complexification involving the inclusion of information structure constraints, an additional layer of meaning that demonstrates learners' sensitivity to the discourse context; and (ii) a process of formal complexification that refers to the acquisition of more complex grammar representations. In this sense, the use of a wider range of forms as a function of discourse constraints can be related to "the extent to which the learner has been able to create a full syntactic tree in his or her interlanguage" (Towell, 2012: 55).

3. Research questions and hypotheses

The main research focus of the present study concerns the extent to which measures of syntactic diversity contribute to a more detailed picture of the development of syntactic complexity across proficiency levels. Considering how cross-linguistic differences might modulate syntactic complexity, the underlying rationale is that in languages like German, which exhibit a higher degree of word order flexibility compared to configurational languages like English, complexity is not only expressed in terms of syntactic elaboration, but also through variation

on the paradigmatic axis. In light of the interaction between the use of non-canonical word order and the achievement of communicative efficiency in the L2, the following research questions have been formulated:

RQ1. To what extent does syntactic diversity, as measured by the use of non-canonical word order (passives and inversions), vary in written texts of advanced L2 learners of German in relation to global proficiency?

RQ2. How does the development of syntactic diversity relate to that of syntactic elaboration?

In line with previous studies looking at experienced learners (e.g., Byrnes, 2009; Mazgutova & Kormos, 2015), we anticipate that whereas most indicators of syntactic elaboration, with the exception of phrasal length, remain relatively constant, the progression of global proficiency will lead to an increase in the use of non-canonical structures. As outlined above, advanced learners might follow a trend towards more complexity at the level of phrasal elaboration (see, e.g., Norris & Ortega, 2009). On this basis, our hypothesis is that an increase in the number of passives and/or inversions might go hand in hand with an increase in phrasal length.

4. Methodology

4.1. Data

Our investigation of syntactic complexity is based on 75 learner texts that come from the *Falko essay corpus*. The *Falko essay corpus* consists of 248 argumentative texts written by advanced learners of German (B2 to C2 levels of the CEFR) from various L1 backgrounds. Data were collected between 2006 and 2008 within the framework of a German as a foreign language class at the Humboldt University of Berlin, the Free University of Berlin, and other universities outside Germany. A similar protocol was followed at each data collection point. As a first step, learners were administered a C-test in order to assess their overall proficiency in the target

language[13]. Only learners who had obtained a score of at least 60 out of 100 were eligible to take part in the main task that consisted in writing an argumentative essay (time limit of 90 minutes). For the purpose of the present study, three sub-corpora of 25 texts were compiled based on the mapping between C-test results and CEFR proficiency levels as specified in the general description of the corpus (Reznicek et al., 2012: 23). The description of each sub-corpus, including participant information (age and L1 background), is provided in Table 2.

Table 2. Description of the sub-corpora with participant information

	Texts	**C-test scores**	**Age**	**L1 backgrounds**	**Number of words**
B2	25	*Range* 60-79 *Mean* 70.72	*Range* 19-56 *Mean* 26.7	English (8); Russian (3); Turkish (2); Japanese (2); Afrikaans (2); French (1); Polish (1); Danish (1); Italian (1); Spanish (1); Albanian (1); Korean (1); Ukrainian (1)	*Range* 234-760 *Total* 10791
C1	25	*Range* 80-89 *Mean* 84.68	*Range* 18-32 *Mean* 22.88	Danish (3); French (3); English (2); Polish (2); Russian (2); Turkish (2); Korean (1); Spanish (1); Swedish (1); Romanian (1); Catalan (1); Uzbek (1); Chinese (1); Ukrainian (1); Norwegian (1); Czech (1); Serbian-Croatian (1)	*Range* 290-785 *Total* 11235
C2	25	*Range* 90-98 *Mean* 92.36	*Range* 19-31 *Mean* 23.48	Danish (5); Dutch (3); English (3); Norwegian (2); French (2); Russian (2); Polish (2); Italian (1); Ukrainian (1); Greek (1); Spanish (1); Hungarian (1); Czech (1)	*Range* 253-897 *Total* 11964

4.2. Measures and data analysis

As a first step, data were compiled for each sub-corpus using the corpus search tool ANNIS 3 (https://korpling.german.hu-berlin.de/falko-suche/; accessed May 2020). Two types of linguistic units (clauses and noun phrases) were extracted from learner texts and the

[13] As Ortega (2015) rightly notes, the issue of how to determine proficiency is crucial, since unreliable measurements of proficiency might lead to inconsistent findings on the development of complexity across levels. In this sense, unlike numerous studies which based their assessment of global proficiency on holistic ratings of written productions or curricular levels, the strength of the *Falko corpus* is to provide a standardized measure of proficiency for gauging the progression of syntactic complexity.

corresponding structures exported to Microsoft Excel 2016. Then, clauses were manually coded for both elaboration and diversity features, and noun phrases for length only. An overview of the analyzed dataset, including text references and individual results for each complexity measure, is provided as supplementary material (see Appendix 2).

4.2.1. Non-canonical word order

The dimension of syntactic diversity is approached in this study via two sub-groups of non-canonical word order phenomena in German: passives and inversions. As repeated in Table 3, passives and inversions include in turn different types of structures.

Table 3. Indicators of syntactic diversity

Passive voice	Processual passive with the auxiliary *werden* Stative passive with the auxiliary *sein* *Sich lassen* + infinitive *Sein* + *zu*-infinitive
Inversion	Topicalization Scrambling Left-dislocation

a. Passive voice

A difficulty in coding the passive voice is related to the distinction between stative passives and predicate adjectives with a participial form. In some cases, it is possible to discriminate between the two phenomena based on syntactic criteria. First, in contrast to predicate adjectives, which can only be modified by adverbs (6a), stative passives can accommodate other types of modifiers such as event-related PPs (6b).

(6) (a) Der Student ist extrem empört.
the.NOM student is extremely outraged

(b) Der Brief ist mit blauer Tinte geschrieben.
the.NOM letter is with blue ink written

Furthermore, the processual counterpart to structures involving transitive psych-verbs is generally ruled out.

(7)	#Der	Student	wird	vom	Verhalten	des	Dozenten	empört.
	the	student	is.being	by.the	behaviour	of.the	professor	outraged

In structures of the type sein + predicative adjective, the past participle has most often been lexicalized as an adjective and registered as a separate lemma in the dictionary. Therefore, for the sake of convenience and consistency, we disqualified as stative passives all clauses including a past participle listed in the *Duden Onlinewörterbuch* (https://www.duden.de/woerterbuch; last accessed June 2020).

b. Inversion

The general guideline in identifying inversions was whether the surface order of verb arguments differed from the underlying, base-generated structure in main and embedded clauses. Concretely, we first identified all arguments realized in the clause based on the valency pattern of the lexical verb (https://grammis.ids-mannheim.de/verbvalenz; last accessed June 2020). Then, the linear order of the corresponding arguments was compared to the basic order template in (8).

(8) SUBJ > IOBJ > DOBJ > OBL

It should be noted that there is no unanimous support for the assumption of the template in (8) as the basic order of arguments in German. Although many standard grammars (e.g., Duden, 1998; Engel, 1988) and theoretical accounts (e.g., Büring, 1996; Lenerz, 2001) argue in favor of the generalization in (8), a series of experiencer verbs (e.g., *interessieren* 'to interest', *gefallen* 'to please') and ditransitive verbs (e.g., *aussetzen* 'to expose sb to sth', *unterwerfen* 'to subject sb to sth') show divergent ordering preferences (see Bader & Häussler, 2010). Since it

remains unclear whether these surface orders result from base-generation or from the influence of other factors such as animacy or discourse context, the decision was made to stick to a unique canonical order and approach divergence from this order in terms of syntactic diversity (cf. footnote 11). However, two amendments were made to this general principle. The first concerns the linearization of pronouns, which consistently obeys to a 'DOBJ > IOBJ' constraint in German (see Heylen, 2005). The second has to do with the treatment of learner errors. As illustrated in the following example from the dataset, learners can have residual difficulties in linearizing arguments, even in the presence of information structure conditions that favour the occurrence of the basic order SUBJ-IOBJ-DOBJ.

(9) #Sie verkaufen [Waffen]$_{\textbf{DOBJ}}$ den [Terroristen]$_{\textbf{IOBJ}}$.
they sell weapons to.the terrorists
(FalkoEssayL2v2.3 - usb015_2006_10_L2v2.3)

To avoid including errors in the calculation of syntactic diversity, we established an information structure criterion. This means that only inversions in which discourse-old information precedes discourse-new information were treated as genuine occurrences of argument reordering, as shown in (10).

(10) Aber heutzutage sind **Mathematik** sehr wichtig in (Context)
but nowadays are mathematics very important in
den Medizinuniversitätsabschluss.
the medical studies

[**Dieses theoretische Fach**]$_{\textbf{DOBJ}}$ wird [der zukünftige (Inversion)
discourse-old
this theoretical subject will the future
Arzt]$_{\textbf{SUBJ}}$ nach seinem Abschluss nicht benutzen.
doctor after his graduation not use

'But nowadays, mathematics is very important in medical studies. The doctor will not use this theoretical knowledge after his graduation.'
(FalkoEssayL2v2.3 - fkb042_2008_08_L2v2.3)

4.2.2. Traditional complexity measures

For the assessment of syntactic elaboration, we followed the suggestions by Wolfe-Quintero et al. (1998) and Norris and Ortega (2009) to target complexity at three syntactic levels, that is, the sentence, the T-unit and the clause. Concretely, five measures were applied to learner texts, with the aim of capturing different dimensions of complexity on the syntagmatic axis. First, we used the number of T-units per sentence (T/S) as a measure of coordination on the sentential level. Turning to the T-unit level, we calculated the mean length of T-unit (MLT) and assessed complexity by subordination via the number of clauses per T-unit (C/T). Complexity within the clause was approached in two different ways. First, we measured the length of noun phrases (LNP). This measure was applied to all constituents headed by a nominal head which were not themselves embedded in another NP or a PP. In addition, as a second index of sub-clausal elaboration, we focused on the length of the middlefield (LMF), which corresponds to the segment between the finite verb and the non-finite verb in main clauses and between the subordinating conjunction and the finite verb in embedded clauses. As pointed out by Bulté and Housen (2012), the use of clause length as an indicator of phrasal expansion is problematic, mainly because clause length also increases in proportion to the amount of subordination. The advantage of LMF as a proxy for sub-clausal complexity has to do with the fact that embedded clauses tend to occupy the external fields (prefield and postfield) in the German clause (see, e.g., Hawkins, 2009, for the motivations underlying the positioning of embedded clauses). As illustrated in (11), the adverbial clause is topicalized and the relative clause extraposed, leaving the middlefield free for non-clausal material. Another possibility to express the same proposition as in (11) is to encode the content of the relative clause as an AdjP, which reflects a shift from subordination to more phrasal intricacy and leads to an increase in middlefield length (see (12)).

(11) Wenn Sie nach Deutschland reisen, müssen$_{VFIN}$ [**Sie einen negativen COVID-Test**]$_{MIDFIELD}$ vorlegen$_{VINF}$, der weniger als 48 Stunden alt ist.
if you to Germany travel must you a negative Covid test produce which less than 48 hours old is
'If you travel to Germany, you have to produce a negative Covid test which is less than 48 hours old.'

(12) Wenn Sie nach Deutschland reisen, müssen$_{VFIN}$ [**Sie einen weniger als 48 Stunden alten negativen COVID-Test**]$_{MIDFIELD}$ vorlegen$_{VINF}$.
if you to Germany travel must you a less than 48 hours old negative Covid test produce
'If you travel to Germany, you have to produce a negative Covid test which is less than 48 hours old.'

All measures of syntactic complexity (diversity and elaboration) employed in this study are summarized in Table 4.

Table 4. Measures of syntactic complexity (diversity and elaboration)

Measure	**Code**	**Formula**
Syntactic diversity		
Inversion	INV	Number of inversion structures divided by number of clauses
Passive	PAS	Number of passive structures divided by number of clauses
Syntactic elaboration		
T-units per sentence	T/S	Number of T-units divided by number of sentences
Mean length of T-unit	MLT	Text length (in words) divided by number of T-units
Clauses per T-Unit	C/T	Number of clauses divided by number of T-units
Mean length of NP	LNP	Sum of NP words divided by number of NPs
Mean length of Midfield	LMF	Sum of midfield words divided by number of clauses

4.2.3. Statistical analyses

A first examination of histograms and QQ-plots pointed to a high degree of right skewness for almost all our outcome variables. This was notably the case for INV, probably due to the non-canonical status of inversion phenomena, which explains why several texts included no inversion, or only a very limited amount of such structures. The Shapiro-Wilk test statistics

confirmed that most variables violated the assumption of normal distribution of ANOVA and Pearson correlation. Since transformations of the variables did not help reduce the skewness in data, we used non-parametric tests. With respect to research question 1, a Kruskal-Wallis test with pairwise comparisons was carried out to examine differences between proficiency groups. Turning to research question 2, associations between complexity measures were evaluated by calculating Spearman's rho coefficients for all pairs of measures. All tests were conducted using SPSS (version 27).

5. Results

Table 5 presents the descriptive statistics for both diversity and elaboration measures. Interestingly, a first look at mean scores seems to point to a cut-off line between the B2 group on the one hand and both C1 and C2 groups on the other hand. Learners at C1 and C2 levels appear to produce more coordinated T-units than the B2 group.

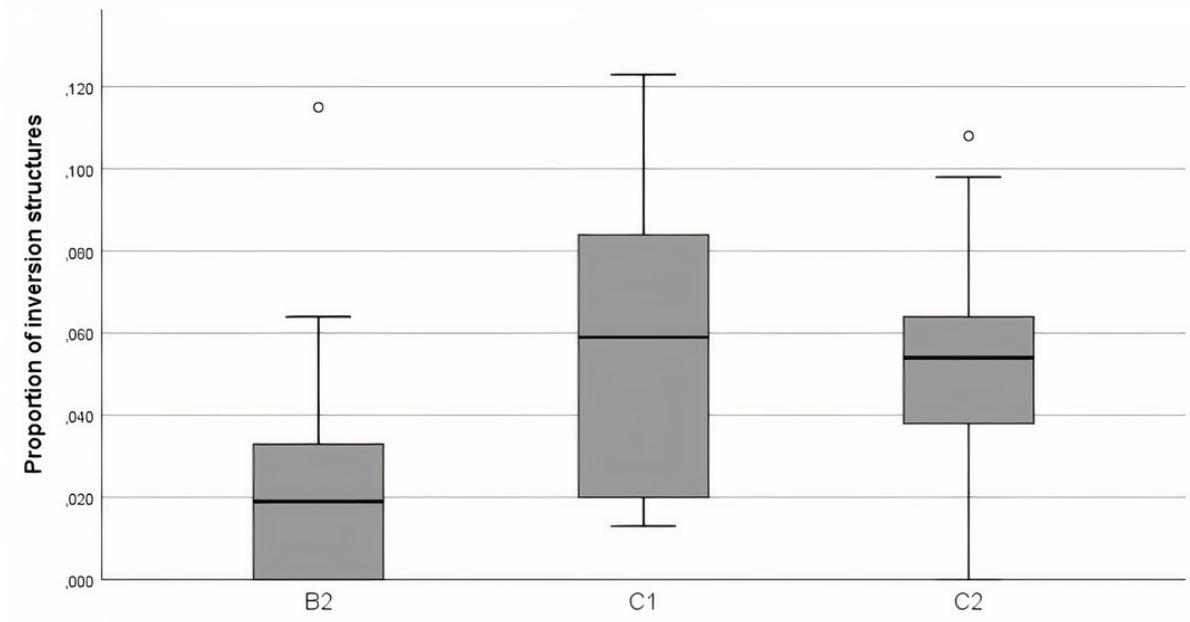


Figure 1. Proportion of inversions structures across proficiency levels

In addition, T-units in C1 and C2 texts are longer and contain more clauses, which in turn accommodate more elements in the midfield. However, contrary to expectations, NP length

shows a decreasing trend from B2 to C1. Turning to syntactic diversity, the use of passives remains fairly stable across levels, whereas the proportion of inversion structures produced at C1 and C2 levels is more than double that in B2 texts (see Figure 1). Note that the mean scores for passives and inversions are relatively low, with a high degree of within-group variation. This reflects the non-canonical status of passives and inversions. In fact, as described above, the occurrence of non-canonical word order phenomena depends on specific discourse conditions. Furthermore, even under appropriate discourse conditions, learners can dispense with non-canonical structures and favour more familiar formulations that require less processing effort.

Table 5. Mean scores (and standard deviations) for all complexity measures (diversity and elaboration)

Measure		**B2** (n = 25)	**C1** (n = 25)	**C2** (n = 25)
Diversity				
INV	Mean	.021	.058	.051
	SD	.027	.035	.027
PAS	Mean	.064	.053	.067
	SD	.069	.041	.066
Elaboration				
T/S	Mean	1.229	1.258	1.260
	SD	.205	.202	.173
MLT	Mean	13.530	14.686	14.606
	SD	2.887	4.055	3.526
C/T	Mean	1.834	1.967	1.990
	SD	.345	.335	.401
LNP	Mean	3.022	2.738	2.792
	SD	.953	.788	.574
LMF	Mean	3.978	4.124	4.179
	SD	.831	.857	.503

Regarding our first research question, the Kruskal-Wallis tests (see Table 6) revealed a statistically significant difference between groups for one measure, INV, with a value of eta-squared indicating a large effect size ($\eta^2_{[H]} = 0.23$). In addition, post-hoc tests were performed for INV via pairwise comparisons between proficiency groups (with *p*-values adjusted using

Bonferroni correction for multiple comparisons), which indicated that significant differences are situated between B2 and the two subsequent levels (B2 < C1, C2).

Table 6. Kruskal-Wallis test results for differences between proficiency levels

	INV	PAS	T/S	MLT	C/T	LNP	LMF
H(2,75)	18.53	.21	.82	1.14	2.16	1.43	1.53
p	<.001*	.90	.46	.56	.34	.49	.47

*Significance: .05

Our second research question addressed the relationship between individual measures of syntactic complexity, with an emphasis on the interaction between diversity and elaboration. As expected, there is a significant positive association between T-unit length on the one hand and C/T (r_s=.87, p<.001), LNP (r_s=.64, p<.001) and LMF (r_s=.67, p<.001) on the other hand. In contrast, learners who score higher on elaboration at the sentential level, i.e. complexity by coordination, invest less on complexity by subordination and phrasal complexity, as indicated by the negative associations between T/S and C/T (r_s=-.40, p<.001), and T/S and LNP (r_s=-.27, p=.017). Interestingly, a significant positive correlation is observed between subordination within T-units (C/T) and both indices of sub-clausal elaboration, LNP (r_s=.46, p<.001) and LMF (r_s=.34, p=.003). This parallels Neary-Sundquist's (2017) findings on L2 German speech (with the caveat that Neary-Sundquist used clause length as an indicator of phrasal complexity), but goes against the prediction that subordination recedes at advanced levels in favor of phrasal complexity (Norris & Ortega, 2009). For sub-clausal measures, a significant relationship was found between LNP and LMF (r_s=.51, p=<.001). As for the relationship between diversity and elaboration measures, only one association turned out to be statistically significant, the one between INV and LMF (r_s=.35, p=.003). Whereas LMF correlated positively with LNP and INV, no such significant relationship was found between INV and LNP (r_s=.01, p=.947); we will return to this issue in the discussion. Finally, the analysis revealed no significant association between the use of passives (PAS) and the different measures of syntactic elaboration.

6. Discussion

In this section, we propose to comment on the results in light of our two research questions. First, we focus on syntactic diversity as an index of complexification at advanced proficiency levels. Then, we intend to bridge the gap between diversity and elaboration by looking into their interaction in learner texts.

Our first research question pertained to the use of fine-grained measures of syntactic diversity to help discriminate between adjacent proficiency levels in advanced L2 German. To this end, we used non-canonical structures, inversions and passives, as an indicator of both formal and functional complexification of L2 syntax. The data showed a statistically significant increase in the use of inversions from B2 to C1/C2 CEFR levels. However, no such progression was observed for the occurrence of passives in learner texts. As described above, non-canonical structures result from alternative mappings between semantic roles, syntactic functions and constituent ordering. Whereas passives modify the canonical mapping of semantic roles onto the functional structure, inversions leave it unchanged, but reverse the order of syntactic functions at the level of constituent structure. In other words, both passives and inversions depart from the canonical agent-first alignment, but inversions go a step further by subverting the subject-first preference. In addition, passives and inversions differ slightly in their functional characterization, since inversions not only topicalize the patient referent, but also maintain at the same time the agent as a newsworthy piece of information. What the results of this study suggest is that diversity in terms of patient fronting is a dimension of syntactic complexification that develops at levels lower than B2. In contrast, the reordering of syntactic functions appears to be a marker of increased diversity as from C1. These findings are in line with results from experimental studies that have shown that constituent reordering at the interface between syntax and discourse is a hallmark of advanced and near-native learners (e.g., Hertel, 2003; Hopp, 2009; Slabakova et al., 2012). As described above, inversions require

learners to pay more attention to higher-level grammar aspects like discourse organization. In other words, inversions necessitate a threefold effort: (i) integrate the information status of referents in the discourse context; (ii) conceptualize clause formation from the perspective of non-agentive referents; and (iii) retain the original baseline for encoding the event, i.e. the representation of the event that leaves grammatical relations (subject and object) unchanged. In this sense, the use of inversions is indicative of more advanced processing skills that enable the integration of syntax-external constraints (information structure) and the derivation of more costly structures. Indeed, dealing with discourse-driven word order patterns like inversions is more demanding in terms of processing resources as it disarms more economic strategies based on a general subject-first template (Hopp, 2009; Jackson, 2007). Our corpus data thus add to prior findings which demonstrate that discourse-driven inversions are despite their formal and functional complexity accessible to L2 learners, but that the extra burden they place on processing resources explain why their use only expands at high proficiency.

Compared to inversions, measures of syntactic elaboration do not reveal statistically significant differences between proficiency groups. In particular, no increase was found for measures of phrasal complexity, which goes against our hypothesis that the production of longer nominal structures is a defining feature of advanced proficiency. In other words, assuming the three-stage model of complexity by elaboration (Norris & Ortega, 2009; Wolfe-Quintero et al., 1998), the data presented in this study would suggest that the third stage, i.e. phrasal elaboration, is mastered by level B2 at the latest. Caution is necessary, however, before drawing such a conclusion, as other factors like text genre may have inhibited the production of complex NPs in learner texts. As shown in previous research, the preference for a nominal style is typical of expository genres like academic discourse that entail a lower degree of authorial involvement as well as less explicitness in the expression of logical relations (Biber & Gray, 2010). In contrast, argumentative texts are more dependent on a verb-centered style, starting with the use

of declarative verbs (e.g., claim, argue, believe, consider, think), which are key to the writer's task to convince the audience. Apart from possible genre-related effects, an anonymous reviewer raised the question whether the stabilization of phrasal length as from B2 level could be accounted for by German-specific grammar properties. This is indeed a serious avenue to be explored considering the co-existence of various strategies to form complex nominals in German. In particular, a striking property of German grammar in usage is the frequency and productivity of single-word compounds such as *Verbesserungsvorschlag* ('suggestion for improvement') that correspond to multiple-word units in their English translation (see Schlücker, 2012). In a recent study, Zeldes (2018) demonstrated that higher compounding rates in L2 German texts are indicative of advanced proficiency levels. In other words, whereas less proficient L2 writers usually resort to combinations of nominal heads with post-modifying prepositional phrases or genitives (e.g. *Lebensziel* vs. *Ziel des Lebens*, 'life goal'), advanced learners make a more frequent use of compounding strategies, which constitute a more compressed and native-like way of articulating the same meaning. As a result, Zeldes's (2018) findings give weight to the hypothesis that typological differences between German and English would explain why the patterns of phrasal expansion typical of L2 English are not identified in L2 German data. Specifically, the conclusion that phrasal complexification no longer operates as from B2 level in L2 German should be treated with great caution, since the calculation of phrasal complexity based on the average number of words per structure may wrongly suggest that NPs including single-word forms like compounds are less complex than semantic equivalents sequenced as separate tokens. As demonstrated in this study for the clausal level, the traditional length-based approach to complexity (at least when operationalized in terms of number of words) may run up against limitations related to the typological specificities of the language(s) under investigation. This perspective is certainly also valid for the sub-clausal

domain in L2 German, encouraging future studies to select indices of phrasal complexity that are adjusted to the German word-formation system.

Leaving aside the issue of phrasal elaboration, the ceiling effects observed for elaboration measures warrant the need for more fine-grained indices of syntactic complexification that provide insights into changes which may pass under the radar of global measures such as length and clause linking. A number of explanations could account for the value of diversity measures to compile a map of syntactic complexification in high-proficient learners. A viable explanation may be found in the very nature of the language learning process which involves the acquisition of a growing range of structures including, at later stages, low-frequency forms that characterize more specific communicative purposes (cf. Lambert & Kormos, 2014; Ortega, 2012, 2015). Advanced proficiency gives rise to new concerns, among which the necessity to communicate efficiently and the desire to sound native-like. The use of inversions can be seen as an answer to these concerns, since it allows learners to overcome long paraphrases (e.g. thematic clauses) to express information structure features and create coherent transitions between utterances. In this sense, diversity sheds light on another central dimension of syntactic complexity, namely compactness (cf. Derewianka, 2003; Ryshina-Pankova, 2010).

Although the data do not indicate any relationship between syntactic elaboration and L2 proficiency, this does not imply that no connection can be established between elaboration and diversity. Turning to our second research question, the statistical analysis revealed a significant association between midfield length and inversions. Since no such correlation was found between inversions and NP length, these results cannot be attributed to the fact that learners who use more inversions also produce longer NPs. If LMF is not due to phrasal length, then an alternative explanation could be the number of constituents accommodated in the midfield. This would mean that the use of inversions is associated with shorter NPs as well as clauses that contain more constituents, arguments or adjuncts. Although we are well aware that these

assumptions should be subject to further investigation, they fit into the picture that we have sketched of high-proficient learners seeking a fluid and concise style. Longer midfields with shorter NPs suggest in the first place a more frequent use of pronouns, which also contribute next to syntactic reordering to the expression of coherence relations in discourse. In the same way as word order, the choice of referring expressions reflects learners' attention to the information status of discourse referents. A text including more pronouns and inversions ranks higher in terms of communicative efficiency, for the reason that greater effort is made to take the reader's cognitive state into account (see, e.g., Ariel, 1987; Chafe, 1996). This again is indicative of high proficiency: Expert writers not only pay attention to content and grammatical correctness, they also know how to bridge the gap between the message they want to convey and its reception by their audience (Victori, 1999). In sum, the development of syntactic diversity combines with an adjustment of syntactic elaboration in learner texts, and this in accordance with a general rule of communicative efficiency.

7. Perspectives for future research

In this article, we have focused on the relationship between measures of syntactic complexity and general proficiency in the L2. Specifically, we have introduced new measures of syntactic diversity and examined their relevance to distinguish between proficiency groups in advanced L2 German. It is however important to note that next to proficiency other factors can affect syntactic diversity. Learners' L1 background is one of them and certainly worth further investigation given the possibility of transfer of L1-familiar structures and stylistic preferences. A large number of studies provided evidence for the influence of cross-rhetorical transfer, explaining why learners at comparable proficiency levels may not develop similarly in all areas of syntactic complexity (see, e.g., Lu & Ai, 2015). Focusing on inversions, a first look at our data did not suggest any facilitative or impeding role of learners' L1 background in their access to target-language structures. Nevertheless, the issue of L1 background as a moderating variable

of syntactic diversity deserves a closer look. More concretely, the question should be addressed whether learners who can transfer similar inversion patterns from their L1 show a different developmental trend compared to a second group of learners whose L1 does not have inversion options analogous to German.

A second aspect that merits further investigation concerns the range of proficiency levels. Like previous studies on L2 syntactic complexity, this research has targeted a specific segment of L2 proficiency, with the aim of isolating appropriate measures pointing to more subtle developmental stages (e.g., Bi & Jiang, 2020; Kuiken & Vedder, 2019). However, it would be interesting to look at less advanced proficiency groups in order to gain a better view of the emergence of other structures, for instance passives, in learners' interlanguage.

8. Conclusion

This study aimed to expand the construct and measurement of syntactic complexity to fine-grained indices of syntactic diversity. Considering the importance of cross-linguistic differences for the operationalization of syntactic complexity, we argued for the use of two types of non-canonical structures, inversions and passives, as measures of diversity in L2 German. As a next step, we examined the relationship between the frequency of non-canonical word order phenomena in learner texts and L2 general proficiency. Unlike traditional measures of syntactic elaboration and passives, which remained relatively constant across proficiency groups, the use of inversions showed a significant increase at very advanced stages (C1/C2 CEFR). Furthermore, the study also uncovered areas of intersection between syntactic diversity and syntactic elaboration, in particular between learners' use of inversions and their preference for specific patterns of sub-clausal organization. While our findings corroborate those of previous studies pointing to the prominent role of variety/diversity in L2 syntactic development, they also shed light on the pragmatic-communicative competence associated with the gradual diversification of structures.

Chapter 4: Unclogging the Bottleneck: The role of case morphology in L2 acquisition at the syntax-discourse interface

1. Introduction

One of the central objectives of research on second language (L2) acquisition is to determine which components of the target-language (TL) grammar are more difficult to acquire. This has led, over the last two decades, to a growing body of evidence pointing to persistent difficulties in the use and comprehension of syntactic phenomena at the interface with discourse properties like information structure (IS) (see White, 2011; Dimroth & Narasimhan, 2012; Lozano & Callies, 2018). In particular, the observation of a disjunction between full mastery of purely syntactic constraints (e.g., the V2 constraint) and permanent problems at the syntax-discourse interface has been documented under the term *Interface Hypothesis* (IH) (Sorace, 2003, 2005, 2011; Sorace & Serratrice, 2009). Based on data on various syntax-discourse phenomena (e.g., null pronouns, subject-verb inversion, clitic doubling, scrambling) involving a large set of L1-L2 pairs, the most recent version of the IH (Sorace, 2011; Sorace & Serratrice, 2009) suggests that despite the possibility for learners to develop adequate representations of discourse-driven syntax, residual optionality may subsist as a result of differences in processing efficiency between L1 and L2. Although the impact of a processing disadvantage in the L2 is widely acknowledged, other aspects, such as the role of L1 effects, remain a matter for discussion (Dimroth & Narasimhan, 2012: 345-346; Lozano & Callies, 2018: 432-433).

Focusing on word order alternations as a function of IS categories (e.g., topic-comment, given-new), a number of studies have emphasized, in both production and comprehension, a facilitative or interfering influence of L1-like forms and processing routines (Bohnacker & Rosén, 2008; Hopp, 2009; Slabakova, 2015). The present study takes a closer look at argument reordering in L2 German and proposes to approach the issue of L1 effects from the perspective of L1-L2 typological distance. To this end, 45 university students of German (L1 French) were

tested on their word order preferences in a semi-controlled production task (element rearrangement task) with embedding context. In contrast to French, German exhibits a certain degree of word order flexibility, including the possibility to reverse the order of subject and object in V2 declaratives. This operation, known as object fronting, allows for an alignment of syntactic categories with IS properties of discourse referents, in particular their degree of activation in the context (givenness) (Lenerz, 1977; Höhle, 1982). Accordingly, learners were assessed on their ability to make use of non-canonical OVS patterns, which they cannot transfer from their L1, in accordance with principles of information packaging.

What makes argument reordering possible in German is the existence of a case system that provides for the labelling of syntactic functions, whereas syntactic functions are marked by the relative order of constituents in French. In light of its catalyst role for syntactic alternations, we treated case marking as a second measure of typological distance, next to word order (rigid vs. flexible)[14] (see VanPatten & Smith, 2019). More concretely, we formulated the hypothesis that learners' use of OS order is conditioned by their command of case morphemes as specific formal features that the TL selects to encode syntactic functions [±Subject]. It has been argued that functional morphology is the "bottleneck" of L2 acquisition, i.e. the most challenging area to acquire in L2 grammar (Slabakova 2006, 2013). Under the *Bottleneck Hypothesis* (BH), functional morphology is expected to be more difficult than other grammar areas. Importantly, syntactic operations and meaning calculation, including discourse-related meanings, are assumed to build on universal properties, whereas most language variation is concentrated in functional morphology. Difficulties in the expression of meaning in TL forms could then be brought back to deficits in functional morphology.

[14] Focusing on French and German, the World Atlas of Language Structures reports: (i) one measure of morphological distance indicating that German has four cases, whereas French exhibits no case marking (Iggesen, 2005: 202f.); (ii) one measure of syntactic distance, which stipulates that French has a dominant SVO order, whereas no such dominant pattern can be identified in German (Dryer, 2005: 330f.).

To gauge the predictions of the BH, L2 learners were also tested on their command of case in a timed fill-in-the-blanks task. The underlying rationale was the following: Given the connection between case and argument reordering in German and assuming learners' knowledge of IS properties (givenness) as universal contents of thought, an additional relationship could be postulated between case command and sensitivity to non-canonical (OS) discourse-to-syntax mappings. In other words, the present paper focuses on the question whether learners' performance on case marking can be isolated as a reliable predictor of word order preferences at the syntax-discourse interface. On this last point, performance in the fill-in-the-blanks task was compared to learners' score on a general proficiency test, so that we could provide an informed assessment of the predictive power of case.

The article is organized as follows. Section 2 provides the necessary background on syntax as shaped by IS principles (i.e. given information before new information), with an emphasis on object fronting structures in German. Section 2 also discusses previous research on word order alternations in L2 acquisition and addresses the role of case morphology as a measure of L1-L2 typological distance. Section 3 presents the research questions and hypotheses. The participants and the experimental tasks are described in Section 4. In section 5, we report and analyze the results. Section 6 discusses the main findings regarding the relationship between non-canonical discourse-to-syntax mappings (OS orders), information structure constraints and case morphology. Finally, section 7 offers a brief conclusion.

2. Background

2.1. The Interface Hypothesis and the role of the L1 in discourse-to-syntax mappings

Over the last 20 years, a large body of evidence has accumulated to document L2 learners' difficulty, even at advanced and near-native levels, in the acquisition of word order alternations triggered by IS constraints (see White, 2011; Dimroth & Narasimhan, 2012; Lozano & Callies, 2018 for a review of major findings). Non-convergence in mapping information structure onto

word order at the interface between syntax and discourse has led to the formulation of the *Interface Hypothesis* (IH) according to which syntactic phenomena involving external interfaces, i.e. the coordination of syntactic knowledge and grammar-external domains like discourse, may be persistently problematic and cause, even in near-native speakers, residual difficulties in the production and comprehension of non-target-like word order patterns (Sorace, 2011; Sorace & Serratrice, 2009). Interestingly, as competent communicators in at least one first language, L2 adult learners at beginners' level can resort to an inventory of language-independent principles of discourse organization. As demonstrated in Klein & Perdue's work (1992, 1997), beginning learners are indeed able to produce basic utterances, i.e. juxtapositions of two NPs or an NP following a PP/AdvP, according to general principles of information packaging such as the tendency to encode given information in a background position preceding information that is unknown to the hearer (focus). Moving to the subsequent learning phases, several studies show that IS principles play a much less significant role as learners deal with the acquisition of the TL syntax (e.g., Hertel, 2003; Bohnacker & Rosén, 2008). This discrepancy between sentence grammar in terms of narrow syntax operations and syntax-discourse interface phenomena continues to affect learners' L2 use and processing up to and including near-native proficiency (e.g., Sorace & Filiaci, 2006; Lozano, 2006; Belletti et al., 2007). Following the IH, advanced learners can thus reach a native-like command of sentence grammar in terms of well-formedness conditions (e.g. verb placement) and semantic relations (e.g. argument selection, scope-taking), while still facing persistent problems with syntax as a function of information structure.

Based on the investigation of null and overt subject pronouns in pro-drop languages like Spanish and Italian, an early version of the IH (Sorace, 2003) suggested that learners' overgeneralized use and comprehension of overt pronouns in relationship to topical antecedents may result from representational deficits and, more specifically, transfer of more economical

L1 pronoun resolution routines (e.g., Sorace, 2005; Belletti et al., 2007). The hypothesis of a residual influence of L1 strategies interfering with L2 knowledge representations proved however unsatisfactory, as more recent work demonstrated that even (very) advanced learners with a null-subject L1 exhibit divergent anaphora resolution patterns and overextend the use of overt subject pronouns (e.g., Kraš, 2008; Lozano, 2018). Under the revised formulation of the IH (Sorace, 2011; Sorace & Serratrice, 2009), L1 and L2 grammars were no longer considered as representationally different. Instead, it has been argued that learners' difficulties were "more quantitative than qualitative", in the sense that learners may have an adequate understanding of pronoun distribution, but still experience difficulties with the mapping of discourse information onto syntax in real time (Sorace, 2011: 20).

Although processing resources certainly affect performance at the syntax-discourse interface in the L2, studies involving linguistic features other than anaphoric linking have questioned the prediction made by the IH that processing disadvantages prevent learners from achieving native-likeness. More generally, some authors have cautioned against the temptation to treat all phenomena related to the syntax-discourse interface in the same vein (see White, 2011). First, researchers focusing on non-canonical word order phenomena like left-dislocation with clitic resumption have reported that L2 learners can reach a native-like command of constraints on clitic resumption, as demonstrated in acceptability tasks (Slabakova & Ivanov, 2011; Slabakova et al., 2012) as well as production contexts (Donaldson, 2011). Hopp (2009) came to a similar conclusion in his investigation of scrambling in L2 German, showing that convergence with natives was possible for learners with respect to discourse-driven word order alternations. Crucially, Hopp's (2009) findings involve both off-line (acceptability judgments) and on-line (self-paced reading) measurements, which runs counter to the assumption that vulnerability of syntax-discourse properties would be more a matter of performance. Second, several studies contrasting learners from different L1 backgrounds clearly emphasized that it

would be inappropriate to dismiss any impact of L1 effects on the acquisition of specific word order patterns. Regarding positive transfer, Hopp (2009) observed that at less advanced proficiency levels Russian learners, but not learners with L1 English or Dutch, performed on par with the native controls (see the section on subject-object reordering in L2 German below). L1 effects were also found – although this time in the form of negative transfer – by Bohnacker & Rosen (2008) in their corpus study on clause-initial constituents in discourse production (L1 Swedish-L2 German), as well as by Slabakova (2015) in her investigation of L2 Spanish (L1 English) and L2 English (L1 Spanish) learners' knowledge of discourse-driven left-dislocations.

2.2. Non-canonical word order in L2 German and the issue of L1-L2 typological distance

This section first describes the word order phenomena in German that are of interest to the present study, including a contrastive perspective on how German and French differ in the realization of argument reordering. Concretely, we introduce the syntax of object fronting in German and point to the centrality of case marking for making sense of how German and French diverge in their repertoire of discourse-driven structures. Then, we move to a discussion of object movement in L2 German, as investigated in both comprehension and production studies focusing on discourse-to-syntax mapping phenomena. Particular emphasis will be placed on the role of L1-L2 typological distance by discussing the contribution of case-marking command to word order flexibility in the L2.

2.2.1. Discourse-driven object fronting in German

Two main forms of discourse-driven object movement are attested in German, namely object fronting and scrambling. German is a V2 language with an underlying SOV order. This implies that while SOV is maintained in embedded clauses, in main clauses the finite verb moves from its canonical position to the second position. In embedded clauses, all arguments surface in the

so-called “middlefield” located between the complementizer and verbal elements. Depending on discourse contexts, a reordering of arguments can take place by moving the object to a higher position at the left of the subject (e.g., Haider & Rosengren, 2003). Reordering by scrambling notably holds when given, i.e. discourse active, objects leave the sentential focus domain to allow the informationally prominent subjects to bear focus (e.g., Lenerz, 1977; Höhle, 1982). By way of illustration, (1b) would be appropriate if the object or the clause as a whole is focused, whereas reordering as (2b) would be preferred in a context with the subject in focus.

(1) (a) Wer hat den Lehrling ausgebildet? (SUBJECT-Focus)
‘Who trained the apprentice?’

(b) Ich denke, dass den Lehrling der Bäcker
I think that the.ACC apprentice the.NOM baker
ausgebildet hat.
trained has

(2) (a) Wen hat der Bäcker ausgebildet? (OBJECT-Focus)

(b) Ich denke, dass der Bäcker den Lehrling
I think that the.NOM baker the.ACC apprentice
ausgebildet hat.
trained has

‘I think that the baker trained the apprentice.’

Focusing on main clauses, we start from the assumption that no argument is base-generated in the “prefield”, i.e. the position preceding V2 (see Grewendorf, 1988). Accordingly, the prototypical order of arguments in the middlefield remains under discourse-neutral conditions (wide-focus) mainly linked to lexical-semantic properties of the verb. Following Frey (2004a), prefield filling can then be considered as a consequence of formal movement causing the middlefield-initial constituent to move to the prefield in order to satisfy the V2 constraint (3b). However, when discourse factors come into play, a middlefield-non-initial argument can be

moved to the left edge of the middlefield[15], and subsequently to the prefield via formal movement. This operation serves IS purposes that include a preference for encoding given information, i.e. information with a high degree of hearer-salience, early in the sentence (4d) (see, e.g., Clark & Haviland, 1977; Sgall et al., 1986; Birner & Ward, 1998).

(3) (a) (dass) der Arzt den Blutdruck überwacht.
➔ Formal movement
(b) [Der Arzt]$_i$ überwacht t_i den Blutdruck.
the.NOM doctor monitors t_i the.ACC blood pressure

(4) (a) Wer überwacht den Blutdruck? (SUBJECT-Focus)
'Who monitors the blood pressure?'

(b) (dass) der Arzt den Blutdruck überwacht.
➔ Scrambling
(c) (dass) [den Blutdruck]$_i$ der Arzt t_i überwacht.
➔ Formal movement
(d) [Den Blutdruck]$_i$ überwacht t_i, der Arzt t_i
'The doctor monitors the blood pressure.'

Two clarifications are needed at this point. First, despite the weight of the given-new-preference, as highlighted in corpus (Weber & Müller, 2004) and psycholinguistic research (e.g., Gernsbacher & Hargreaves, 1988; Benatar & Clifton, 2014), other IS properties may interfere with it, such as the reversed new-before-given principle (see Mithun, 1992) used to emphasize newsworthy information units, or the tendency to start the sentence with scene-setting elements (typically PPs or adverbial clauses) (see Speyer, 2004). Second, object fronting structures need to be understood in terms of preferences rather than well-formedness. This means that mappings of discourse conditions onto word order patterns count as general tendencies. These mapping patterns are by no means indicative of clear-cut boundaries, as optionality is also found in native speakers' use. Given identical discourse conditions, it is in other words not always easy to determine which factors cause to prefer object fronting over

[15] Frey (2004b) suggests that German has a designated position for topics at the left periphery of the middlefield.

competing structures (e.g. canonical SVO, passivization, left-dislocation) in real time production (Dimroth & Narasimhan, 2012: 344).

2.2.2. Argument reordering in French

Unlike German, French does not permit to reorder arguments by scrambling and object fronting. Though a word-for-word equivalent for (4d) would be syntactically well-formed in French, it would trigger the implausible reading of an inanimate entity (blood pressure) acting upon an animate (doctor)[16]. Whereas the syntactic function of an argument NP is encoded by means of case in German, in French the functions of subject and object result from their structural relationship to each other. In other words, syntactic functions are deduced from the relative position of arguments in the clause. As a result of the strict SVO order in French, other devices are used for promoting given referents to left-peripheral positions: left dislocation (5a), passivization (5b) and free topic constructions (with clause embedding for instance) (5c).

(5) (a) La tension, le médecin la surveille.
'The blood pressure, the doctor monitors it.'

(b) La tension est surveillée par le médecin.
'The blood pressure is monitored by the doctor'.

(c) Pour ce qui est de la tension, le médecin la surveille.
'What the blood pressure concerns, the doctor monitors it.'

In contrast to object fronting, left-dislocations, passives and free topics do not alter the surface order of syntactic functions. Passives involve an alternative mapping of thematic roles onto syntactic functions. As for dislocated structures, the SVO surface order is preserved with a coreferential clitic pronoun inside the clause. It should be noted that, unlike object fronting, it remains a matter of discussion whether left-detached constituents are subject to movement or

[16] In other cases, inversion of subject and object leads to ungrammaticality, with incorrect agreement between verb and pre-verbal argument.

base-generated at the top of the clause structure (see De Cat, 2007). Furthermore, whereas object fronting occurs in both written and spoken discourse, dislocations are more characteristic of informal spoken language in French (Donaldson, 2011).

2.2.3. Subject-object reordering in L2 German and the role of nominal inflection

As demonstrated in previous research, a central aspect in the acquisition of word order flexibility involves the use of case for disambiguating syntactic functions. In a recent study, VanPatten & Smith (2019) demonstrated that naive learners of Latin (L1 English) who had received an input treatment consisting of only SOV sentences were more sensitive to case-marking violations in test items in comparison to a second group of learners who were exposed to exclusively SVO sentences during the treatment. Drawing on the Differential Markedness Hypothesis (Eckman, 1977, 1985), these findings suggest that the acquisition of verb-final structures, which in the present case correspond to "areas of the target-language which differ from the native language and are more marked than the native language" (Eckman, 1977: 321), may go hand in hand with greater sensitivity to the role of typologically related features of the L2, namely case. In the same vein, the typological relationship between word order flexibility and case-marking, which goes back to Greenberg's work (1963: 96), has also been shown to condition different interpretation routines, as argued within the framework of the Competition Model (see MacWhinney, 2008). Concretely, when asked to identify semantic roles in sentences like *Die Blume sucht die Tochter* ('the daughter is looking for the flower'), i.e. structures that require departure from a subject-first strategy, German native speakers were mainly directed by case marking, whereas English L2 learners relied primarily on aspects like word order and animacy (Kempe & MacWhinney, 1998, 1999).

As outlined above, specific L1-L2 configurations, and in particular familiarity with word order alternations and nominal inflection via the L1, appear to play a facilitative role in L2 acquisition at the syntax-discourse interface. The observation made by Hopp (2009) that

Russian L2 learners of German acquire native-like representations of IS constraints on scrambling at less advanced proficiency levels than L1 English and Dutch learners, may be indeed due to the fact that Russian – like German a morphologically rich language – has similar scrambling properties. Furthermore, beyond the facilitative or inhibitive role of learners' L1 background, the issue of L1-L2 typological distance also incorporates a developmental dimension in the sense that, as argued in VanPatten & Smith's study (2019), some properties of the target language (e.g., case) may come for free in learners' interlanguage grammar when learners gain sufficient awareness of other related properties (word order). Additional evidence supporting this assumption can be found in the investigation of learners' reanalysis strategies when processing non-subject-initial orders. Although reanalysis to OS orders places increased demands on the parsing system, Jackson & Dussias (2009) showed that highly proficient L1 English-L2 German learners effectively paid attention to case-marking information while reading a *wh*-question that varied according to whether the extracted *wh*-element was the subject (6a) or the object (6b) of the embedded clause.

(6) (a) Welcher Mann denkst du kennt den Professor?
which.NOM man think you knows the.ACC professor
'Which man do you think knows the professor?'

(b) Welchen Mann denkst du kennt der Professor?
which.ACC man think you knows the.NOM professor
'Which man do you think the professor knows?'

For subject-extractions, longer reading times at the matrix verb and the matrix subject – compared to object-extractions – suggest that case is what causes L2 learners to stumble while attempting to assign thematic roles. As Jackson & Bobb (2009) pointed out based on similar data, individual differences are also part of the complete picture. Indeed, focusing on reading times in the complement clause of *wh*-extractions, the authors identified a high degree of variability between learners. They assume that longer reading times for object-extractions could

be indicative of certain learners' higher sensitivity to the nominative marking of the complement clause subject. Such alertness to morpho-syntactic stimuli suggests that these learners make greater use of structure-based parsing strategies that allow them to integrate the embedded subject into the complex sentence and link it to the extracted object (see also Hopp, 2015).

2.3. *The Bottleneck Hypothesis and its implication for the acquisition of discourse-to-syntax mappings*

Research focusing on knowledge and processing of OS word order in German draws a clear picture: Even if word order flexibility and case marking are not part of their L1 grammar, learners develop the ability to handle non-canonical structures, including OS orders at the syntax-discourse interface, by means of case information. However, the question arises whether this access to target-language features like case in comprehension tasks remains operative when it comes to producing OS orders as a function of IS properties. In this regard, a recent corpus investigation of prefield constituents in the writing of intermediate to upper-intermediate L1 French-L2 German learners pointed to a clear underuse of object fronting in learners' texts compared to native controls (Lecouvet et al., 2021). A subsequent analysis of prefields based on IS criteria also revealed that learners had trouble creating smooth shifts between sentences as in (7), i.e. between-sentence transitions, which ensure both discourse coherence (backward-looking reference) and communicative dynamism (forward-looking reference)[17]. In line with Bohnacker & Rosén (2008), it was shown that learners favor L1-familiar structures – SVO and declaratives starting with adverbials –, even if such L1 transfer occurs at the cost of higher-level constraints involving information packaging and discourse organization.

[17] The constructs *backward-looking* and *forward-looking* derive from Centering Theory. Backward-looking centers denote given referents, whereas forward-looking centers refer to the elements introduced in the current utterance, which, as such, provide potential links to the subsequent discourse (see, e.g., Walker et al., 1998).

(7) (a) Der Präsident hatte versprochen, **die Obamacare**
the.NOM president had promised the.ACC Obamacare
abzuschaffen.
to repeal
'The president had promised to repeal Obamcare.'

(b) **Teile der Reform** machte er am Tag
parts the.GEN reform made he on the.DAT day
seines Amtsantritts rückgängig.
of his.GEN accession to office annulled
'He revoked parts of the reform on the day of his inauguration.'

Against this backdrop, it remains to be explained why L2 speakers, who are assumed to be skilled communicators, accustomed to discourse-to-syntax mappings in L1 use, cannot build on this competence in L2 production. Bearing in mind that problems of discourse organization are coupled with a difficulty to access TL syntactic forms, the present study explores the issue of L1-L2 typological distance, in particular the link between word order and case, as a predictor for the (under)use of TL discourse-to-syntax mappings. Inflectional morphology, including case, has been argued to be the source of much trouble in L2 acquisition. Along these lines, Slabakova (2006, 2013) suggested that inflectional morphology is the bottleneck of L2 acquisition. Drawing on the Borer-Chomsky Conjecture (see Borer, 1984; Chomsky, 1995), the Bottleneck Hypothesis adopts the observation that functional morphology is the component of human language that accommodates much of the parametric variation across language. In other words, other components of language competence – semantics, pragmatics and syntactic operations – are considered as universal and, as such, pose no real obstacle to acquisition.

Along similar lines as Lardiere's Feature Reassembly Hypothesis (2009), the BH offers a theoretical framework to explain why learners' utterances may be meaningful, syntactically well-formed and sensitive to pragmatic constraints, but still fail to express a number of functional features in a target-like manner. From a developmental point of view, the logical consequence is that properties of narrow syntax and semantics are acquired before knowledge

of functional morphology. Despite their sensitivity to tense, it could for instance be demonstrated that both Chinese learners of L2 English (Lardiere, 1998) and English learners of L2 Chinese (Duff & Li, 2002) transfer L1 encoding means to express the feature [+Past]. In addition, focusing on Germanic syntax, Prévost (1999) and Conradie (2006) provided evidence for the ultimate acquisition of the V2 parameter by learners whose L1 is [-V2]. This observation found further support in Lecouvet et al.'s corpus data (2021). The authors reported an accuracy rate of 96% for the V2 constraint, while at the same time pointing to frequent mismatches between case form and syntactic function, which is consistent with Slabakova's syntax-before-morphology view.

Coming back to the complex syntax-morphology-discourse interface in L2 German, we can assume in line with the BH that there is – as a subset of pragmatic knowledge – a universal tendency to conform to a cooperative communication principle according to which given information precedes new information in the clause. In other words, clauses encode two layers of meaning (Chomsky, 2007): Thematic relations ('who does what to whom') and discourse-related properties (given-new, topic-comment structure). Configurational languages like French exhibit a rigid syntax, which implies that other means like prosody or alternative structures (e.g. passives or left-dislocations) are needed to fulfill the given-before-new contract. As described above, given-before-new can be encoded at the clause level in German, in the form of subject-object reordering. Accordingly, French and German make use of the same underlying concepts (constituent structure and information structure), but differ in the linguistic expression of the relevant features [±Subject] and [±Given]. L1-L2 conceptual similarities go hand in hand with encoding differences and, crucially, inflectional morphology is at the core of learners' twofold task: (i) undo the tie between phrase structural positions and syntactic functions; and (ii) reassemble the corresponding features [±Subject/±Agent] into case morphology. Following the

rationale of the BH, word order could then be adjusted in parallel in learners' grammar and become available as an additional tool to encode IS properties.

3. Hypotheses and research questions

To summarize, previous research reveals the following picture: (i) L2 learners are able to acquire a target-like knowledge of discourse-driven OS orders in German; and (ii) case-marking information plays a pivotal role in the processing of non-canonical orders. Against this backdrop, the present study proposes to examine whether case command, which is active in L2 comprehension, also operates in the production of non-canonical orders at the syntax-discourse interface in L2 German. Specifically, the focus is on the interplay between the acquisition of case, defined as the ability to mark syntactic functions by the use of bound morphemes rather than by positions in the clause, and word order preferences as a function of discourse context. In light of the BH, inflectional morphology is assumed to be a particularly vulnerable component of learners' grammar. As a result, the hypothesis is made that non-canonical OS orders – in terms of both syntax and meaning – come for free when case marking develops towards a native-like level. To test this hypothesis, we formulated the following research questions:

(1) Does preference for object fronting in L2 production vary depending on learners' performance on case use?
(2) Is learners' performance on case use a reliable predictor of word order flexibility compared to L2 general proficiency?
(3) How does case use interact with IS properties (in terms of givenness) to predict object fronting at the syntax-discourse interface?

While question 1 directly addresses the relevance of the BH regarding the relationship between case and object fronting, question 2 takes the analysis a step further by comparing the predictive

strength of case command and general proficiency. The rationale for this is that learners' performance on inflectional morphology could develop consistently with L2 general proficiency. In that scenario, there would be no real gain in terms of explanatory power in isolating inflectional morphology as the locus of ultimate difficulty – i.e. as the component of grammar competence whose vulnerability would explain learners' difficulty in accessing OS orders. Finally, question 3 discusses the competing assumptions of the IH and BH. Both theoretical models have different views on what causes learners to struggle, even at advanced proficiency levels. Therefore, the present study covers the influence of both case marking and IS properties (referents' givenness) on learners' word order preferences. The indicators underlying the empirical verification of the IH and BH are summarized in Table 1.

Table 1. Empirical verification of the predictions made by the Bottleneck Hypothesis and the Interface Hypothesis

	Bottleneck Hypothesis	**Interface Hypothesis**
Confirmed	Positive relationship between performance on case and frequency of subject-object reordering	No correlation between object fronting and referents' information status (object givenness)
Not confirmed	No positive relationship between performance on case and frequency of subject-object reordering	Correlation between object fronting and referents' information status (object givenness)

4. Methodology

4.1. Participants

The data were collected according to a cross-sectional design focusing on different levels of foreign language training in higher education. A total of 49 L2 learners of German as well as 30 native German controls were recruited. All L2 learners were at the time of data collection enrolled in an undergraduate- (4^{th} and 6^{th} semester BA) or graduate-level (first year MA) program in either modern languages or translation studies at a French-speaking university. They reported German as part of their major, either as single major subject or in combination with

another modern language (English, French, Spanish or Dutch). 45 students were native speakers of French, 3 native speakers of German and 1 native speaker of Russian. Given that the present study focuses on issues of L1-L2 typological distance, the data of the four learners with a language other than French as L1 were not considered for analysis. Prior to the experiment, L2 learners were also requested to fill in a brief questionnaire on their language learning background, in particular their exposure to German (length of naturalistic and/or instructed exposure, measured in number of years). Participant information is listed in Table 2.

Table 2. Participant information

		Age	**Length of instructed learning (years)**	**Length of stay in a German-speaking country (years)**
L2 learners	range	19-30	2-10	0-1.2
(*n* = 45)	average	21.2	6.3	0.2

4.2. Tasks and procedure

L2 learners completed three tasks: A general proficiency test; a fill-in-the-blanks exercise measuring learners' performance on case; and an element rearrangement task (also known as sentence manipulation task, see White, 1991) in context focusing on word order preferences at the syntax-discourse interface. The three tasks were conducted in the following order: (1) element rearrangement task, (2) fill-in-the blanks task, (3) general proficiency test, with a 5-minute interval between tasks. The element rearrangement task was also submitted to the native controls using an online form.

Task 1: Element rearrangement task (henceforth ERT)

This task consisted of 27 items presented with context, of which 18 items involved the target structure under investigation, i.e. V2 transitive sentences, and 9 items served as distractors covering divergent argument structures (intransitives or ditransitives). The nine distractors also included a variable number of adjuncts, in contrast to the test items, which all consisted in the

same number of constituents. All test items were organized around the German verbal bracket (finite V2 - … - non-finite V-end), with in addition a subject argument (agent of the transitive verb), a direct object (patient) and an adjunct (PP or AdvP).

(8) (a) Der Regierungschef von Botsuana reagierte am Sonntag auf die umstrittene Äußerung von Donald Trump. (Context)
'The prime minister of Botswana reacted on Sunday to Donald Trump's controversial statement.'

(b) Der US-Präsident - hatte (V2) - den Binnenstaat
the.NOM US president had the.ACC Inland country
im Süden Afrikas - mit beleidigenden
in the.DAT southern Africa with insulting
Kommentaren - attackiert (V-end).
comments attacked
'The US president had attacked the inland country in southern Africa with insulting comments.'

All adjuncts were context-independent, i.e. unrelated to the preceding sentence. Furthermore, as mentioned in section 2.2., scene-setting adjuncts are highly ranked competitors for filling the sentence-initial position in German. Therefore, in order to avoid participants systematically rearranging constituents by starting sentences with scene-settings adjuncts, the proportion of adverbials of space and time was limited in the test items. Most adjuncts performed a clear function of specification of the verb meaning, as in (8b). In the remaining cases, as illustrated in (9), the adjunct could be appropriate for both functions (specification and setting).

(9) (a) Vier Jahre nach den Taten wurde Julian F. zu 25 Jahren Gefängnis für den Mord an Anja und Robert V. verurteilt. (Context)
'Four years after the deeds, Julian F. was sentenced to 25 years in jail for the murder of Anja and Robert V.'

(b) Die zwei Fußgänger hatte der 22-jährige Student
the.ACC two pedestrians had the.NOM 22-year-old student
nach einem Streit am Dortmunder
after a.ACC fight at the.DAT Dortmund
Bahnhof **(specification)** angegriffen.
station assaulted
'The 22-year-old student had assaulted the two pedestrians after a fight at Dortmund station.'

(c) Nach einem Streit am Dortmunder Bahnhof **(setting)**
After a.ACC fight at the.DAT Dortmund station
hatte der 22-jährige Student die zwei Fußgänger
had the.NOM 22-year-old student the.ACC two pedestrians
angegriffen.
assaulted
'After a fight at Dortmund station, the 22-year-old student had assaulted the two pedestrians.'

Turning to arguments, both subject and direct object were manipulated according to referents' givenness status. The factor givenness covered three different combinations: Subject given-Object new (10), Subject new-Object given (11) and Subject given-Object given in situations, as in (8) and (9), where both referents were introduced in the context sentence.

(10) (a) Im Jahr 2014 hatte unser Partner das Unternehmen mitten in (Context)
einer schweren Krise verlassen.
'In 2014, our partner had left the company in the middle of a severe crisis.'

(b) Diese Krise hat durch die Verbesserung der
this.NOM crisis has through the.ACC improvement of the.GEN
Teamorganisation einen wichtigen Veränderungsprozess
team organisation a.ACC important Transformation process
ausgelöst.
triggered
'This crisis has triggered an important transformation process through the improvement of the team organization.'

(11) (a) Ein weiteres Problem für die Zukunft ganz Europas ist der (Context)
Reformstau, der sich in Deutschland über Jahre hinweg
aufgebaut hat.
'A further problem for the future of all Europe is the reform backlog that has accumulated over the years in Germany.'

(b) Diesen Reformstau hat keine Bundesregierung mit
this.ACC reform backlog has no.NOM federal government with
nachhaltigem Erfolg auflösen können.
lasting success solve can
'No federal government could solve this reform backlog with lasting success.'

As widely documented in the literature on word order variation, various principles are assumed to exert influence on the relative order of subject and object, in parallel to given-before-new. A

first example is the animacy-first principle, which states that there is a tendency in simple transitive clauses, all other things being equal, to position animated NPs before less animated ones (Bader & Häussler, 2010). Next to animacy, the form of referents is also presented as a possible trigger for word order alternations (see Hawkins, 1994). A first dimension pertains to the fact that pronouns tend to precede full NPs, as indicated by corpus data (Weber & Müller, 2004; Chiarcos, 2009)[18]. A second dimension involves the attention-shifting role of demonstrative NPs in discourse (see Himmelmann, 1996). Due to their close relationship with deictic pointing, demonstrative NPs often perform a function of topic shifting in discourse, as illustrated in (10). This justifies that demonstrative NPs often occupy salient positions in the clause like the prefield. In other words, whereas the fronting of personal pronouns prototypically signals topic continuity, the fronting of demonstrative NPs is more related to the speaker's intention to reorient the addressee's attention to a discourse entity that was previously evoked and is now promoted to topical status (Zifonun et al., 1997: 555f.). In order to keep track of the interaction between constraints, the decision was made not to control for animacy and referring form in the test items. Variable levels of animacy and referring form were, in other words, considered as different possible expressions of the targeted IS property, i.e. givenness. Additional comments on responses as a function of feature combinations (givenness, animacy, referring form) will be provided in the results section.

The five constituents included in each test item (S – DO – Adv – Vfin – Vinf) were generated in a random order. Participants were asked to rearrange them and create grammatical sentences that also ensured appropriate transitions to the context sentence. Participants' preferred option for filling the sentence-initial position was the only criterion for assessing the

[18] Weber & Müller (2004) specify however that whereas the assumption that pronouns precede full NPs is verified for SVO sentences, the effect of constituent weight is more disputable in the case of OVS sentences. Furthermore, Chiarcos (2009) demonstrates that the tendency to position short expressions before longer ones applies primarily to the ordering of constituents within the middlefield, whereas prefield expressions are on average longer than middlefield expressions.

task. That is to say, researchers reported by item and participant the type of constituent (e.g. Subject) that was selected as prefield. No expected response was used as a baseline for rating participants' preferences. Rather, a mean score for object fronting (number of direct objects in the prefield/number of test items) was calculated for each participant. A list of all test items is reproduced in Appendix 3.

Task 2: Fill-in-the-blanks

The evaluation of learners' command of case was carried out in the form of a fill-in-the-blanks exercise (see Appendix 4). For the purposes of the present research, lexical case assignment, referring to instances of case assignment that are lexically driven by a verb, an adjective or, most often, a preposition, was left out of consideration. In accordance with our investigation of non-canonical OS orders, case use was thus limited to regular case assignment[19].

As argued by Baten (2011) with reference to Processability Theory (Pienemann, 1998), acquisition of case progresses from a position-based correspondence between case marking and constituents to more complex non-linear mappings between case morphemes and arguments. In other words, beginning L2 learners tend to identify case with the position of constituents in the clause, which requires less procedural resources. Applying this unmarked alignment strategy, learners associate the first NP with the default function of subject and the corresponding nominative case. The unmarked alignment yields a further mapping between the next NP in post-verbal position and the function of non-subject marked by non-accusative case. Following this line of reasoning, successful acquisition of case is attested once case morphology can be used functionally, in the sense that learners can deal with case forms depending on the function of arguments, irrespective of the position they occupy in the clause. Case forms and positions are no longer used redundantly to signal grammatical functions, which means that

[19] Regular case assignment designates the functional use of case in a clause in order to indicate the function of arguments, i.e. the relationships that exist between arguments and predicational elements.

learners adequately reassembled the expression of functional properties, which are shared by both the L1 and the L2, into L2-specific formal features.

Given the importance of non-linear mappings between case forms and grammatical functions for assessing case command, the blanks task covered various case contexts, including a sufficient proportion of XVS(O) inversion and non-canonical OVS structures. These structures required learners to deviate from the linear mapping of nominative and oblique case forms onto pre- and post-verbal positions respectively, as illustrated by the following sample sentences from the task:

(12) Laut ihm habe **der** Täter keine (XVSO)
according to him has the.NOM perpetrator no.NOM
kriminelle Absicht gehabt.
criminal intention had
'According to him, the perpetrator had no criminal intention.'

(13) **Den** Anschlag hatte Sergej W. schon früh (OVS)
the.ACC attack had Sergej W. already early
im Prozess gestanden.
in the.DAT trial confessed
'Sergej W. had confessed the attack early on in the trial.'

The blanks exercise comprised 40 missing article forms that were spread over 35 different clauses. Learners were asked to supply the articles using the correct case form. Furthermore, they were instructed beforehand that (i) all missing articles were definite; (ii) only masculine singular nouns were used. Since the German case paradigm exhibits a considerable degree of syncretism and homonymous case forms (e.g. feminine, neuter and plural case affixes in the nominative and accusative) do not allow detection of errors, the decision was made to restrict the exercise to the use of masculine forms, mainly in the nominative and accusative. Another methodological issue that required careful attention was the level of lexical difficulty of the task. This aspect is indeed crucial, bearing in mind that learners' understanding of lexical items was a prerequisite for identifying verb arguments and assigning them the appropriate article

form. To keep comprehension difficulties to a minimum, several strategies were used. First, a series of lexical items were chosen based on their similarity with French words (e.g. *Attentat*, *Bombe*, *Emotion*). The text was 466 words long, of which 50 words (10,73%) were proper names, 28 (6%) were similar to French and were 4 numerical expressions. Furthermore, 364 words (78,11%) appeared on the list of the 10 000 most frequent German words compiled by the project *Deutscher Wortschatz* at Leipzig University[20]. This means that only 20 items (4,29%) were considered as difficult, of which 16 were transparent compounds made up of elements that were assumed, either due to their frequency or based on their similarity to French words, to be known by learners (e.g. *Krankenurlaub*, *Mannschaftsbus*).

Finally, it should be noted that a time constraint was imposed. As mentioned in the research questions, learners' command of case was addressed in terms of performance. Based on Anderson's ACT-R model of human knowledge (see Anderson, 1996) and its application to second language learning processes by DeKeyser (1997, 2003), we approach successful feature reassembly in the form of explicit (declarative) knowledge (i.e. conscious rule-based knowledge) that extends over time to procedural routines and automatized knowledge that can be used more rapidly and cost-effectively. When applied to case, this implies that acquisition of TL form-function mappings (case forms for encoding syntactic functions) should translate into higher accuracy scores at a lower cost in terms of mental resources. In sum, we expect higher performance on case in the blanks task to be reflected by fewer errors under time pressure.

Task 3: General proficiency test

Following the ERT and the blanks task, L2 learners took a general proficiency test in two parts focusing on both lexical and grammar aspects. Part 1 consisted in a mixture of blanks, sentence

[20] http://www.wortschatz.uni-leipzig.de/Papers/top10000de.txt

reformulation and multiple-choice tasks covering the following modules: Tenses, irregular verbs, passivization, verbs with prepositions, logical connectors and adjective declension. Part 2 was based on the C-Test format for measuring general language proficiency (Grotjahn, 2002). Two texts were used, with in 25 gaps each. No time limit was set for completing both parts 1 and 2.

5. Analysis and results

5.1. The dataset

An overview of the analyzed dataset is provided in Appendices 5 and 6. Appendix 5 lists L2 learners' results on the blanks task and the general proficiency test, together with the average for object fronting per learner. Individual responses (type of constituent selected for filling the prefield in the ERT) for each test item are reported in Appendix 6 (for both L2 learners and natives).

5.2. Types of constituents in prefields

Before addressing the association between learners' use of object fronting and their command of case, we should first have a look at participants' preferred fronting options, as measured in the ERT. A preliminary remark in this respect is that the V2 constraint was rigorously respected by L2 learners, with no single instance of multiple fronting in the data. Turning to preferences for filling the sentence-initial position, Figure 1 presents the global distribution of prefield constituents for both natives (n = 540) and learners (n = 810). The most striking observation that emerges from Figure 1 is learners' overuse of subjects in the prefield, with a reverse effect on the use of both adverbials and direct objects in comparison to natives. We applied a multinomial logistic regression in SPSS (version 25) in order to evaluate to what extent groups (natives vs. learners, coded as dummy variables) impact fronting preferences for the categories

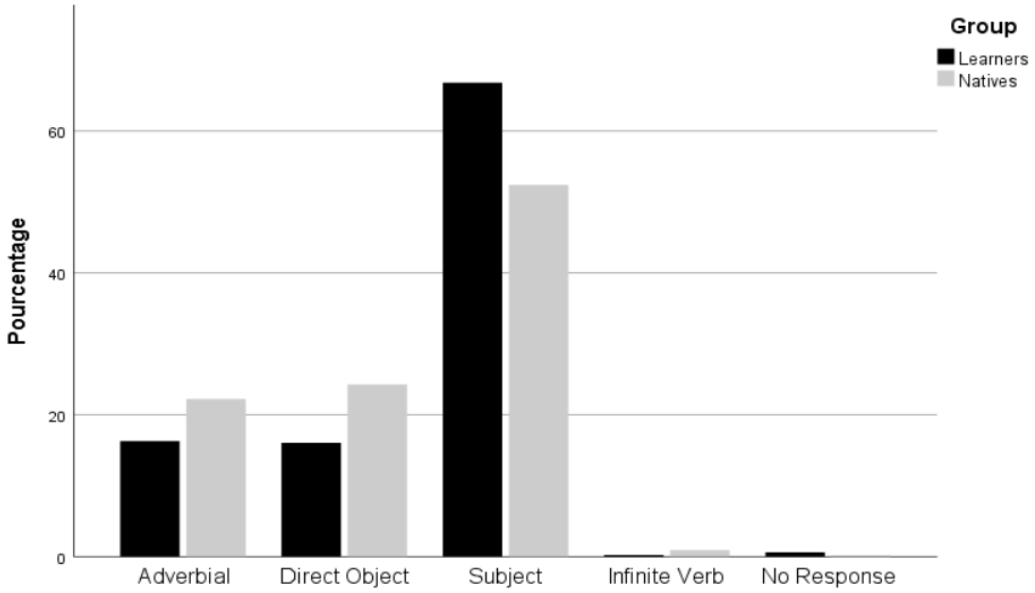


Figure 1. Cross-group comparison of constituent types (in terms of grammatical functions) in the prefield (ERT)

Subject, *Adverbial* and *Direct Object*. Adding the variable *Group* to a model that only included the intercept significantly improved the fit with the observed data ($\chi^2 = 27.486$, $p < .001$). When the syntactic function *Subject* is taken as reference category, we observe significant differences between natives and learners for the use of both adverbials and direct objects (see Table 3).

Table 3. Multinomial logistic regression model of fronting preferences across groups (natives vs. learners), with *Subject* as reference category

Fronted category	**Group**	**Coefficient (Std. Error)**	**Wald**	**Exp(Coef)**	**95% CI**	***p*-value**
Direct Object	*Intercept*	-.78 (.11)	54.46			< .001
	Learners	-.64 (.14)	20.01	.52	.40, .70	< .001
	Natives[a]	.00				
Adverbial	*Intercept*	-.86 (.11)	62.61			< .001
	Learners	-.51 (.15)	14.17	.58	.43, .77	< .001
	Natives[a]	.00				

[a]The group *Natives* was mapped on the intercept and served as a baseline for comparison with *Learners*.

Although the preference for subjects over direct objects is significantly more pronounced in learners' data, no conclusion can be drawn about possible L1 effects, i.e. the transfer of a rigid SVO order to linearization strategies in the L2, since the present study did not include data from

a second group of learners with an L1 allowing for object fronting. Furthermore, the overall subject-first preference in both L1 and L2 groups confirms previous findings from both comprehension and production studies that unanimously point to a robust association between the subject and the left periphery of the sentence. Recall that favorable discourse conditions (Object given- Subject new) do not automatically translate into OS orders. As revealed by Weber & Müller's corpus study (2004), the given-before-new principle is not strictly obeyed in native use, with a large proportion of SO orders in contexts with given objects and new subjects. Furthermore, using an experimental design based on a picture description task, Skopeteas & Fanselow (2009) showed that patient givenness was not likely to trigger object fronting. Rather, participants produced almost exclusively subject-first structures, either canonical SVO sentences or passives. Thus, leaving the issue of transfer aside, the frequencies of prefield constituents in the ERT are not so surprising in light of an overall subject-first strategy, for which evidence was found in many European languages.

5.3. Object Fronting and Case Command

As expected, the overall proportion of objects in the ERT reaffirms the marked status of object fronting. With this in mind, we now focus on the variation of OS options across L2 learners and consider in particular the association between individual results in the ERT and case command as measured through the blanks task. A first finding that emerges from Figure 2 is that a substantial proportion of observations show a low value for object fronting. The distribution of object fronting proportions across observations exhibits a declining trend, with a relatively low mean (0.16). Few observed values exceed a proportion of object fronting of 0.3 and, importantly, no observation is reported of a proportion of at least 0.5 (i.e. half of the total number of items). In other words, most L2 learners do without or with a very limited use of object fronting in the ERT, which means that other constituent types (mainly subjects) are preferred for filling the prefield, even if the preferred SO patterns cause possible violations of

given-before-new. Regarding the independent variable *Case*, a linear regression analysis was conducted to examine its association with object fronting. The standard residuals indicated that the data contained no outliers (Std. Residual Min = -1.796, Std. Residual Max = 1.836). In addition, the histogram of standard residuals showed an approximately normal distribution of errors. The regression model revealed a significant association between both variables (F (1, 43) = 32.779, $p < .001$), with an $R^2 = .433$. With a score on case increasing by one, the model predicts an increase (0.096, 95% CI [0.062, 0.130]) in the proportion of object first structures, which corresponds to 1.73 additional OS reordering, when multiplied by the number of test items in the ERT.

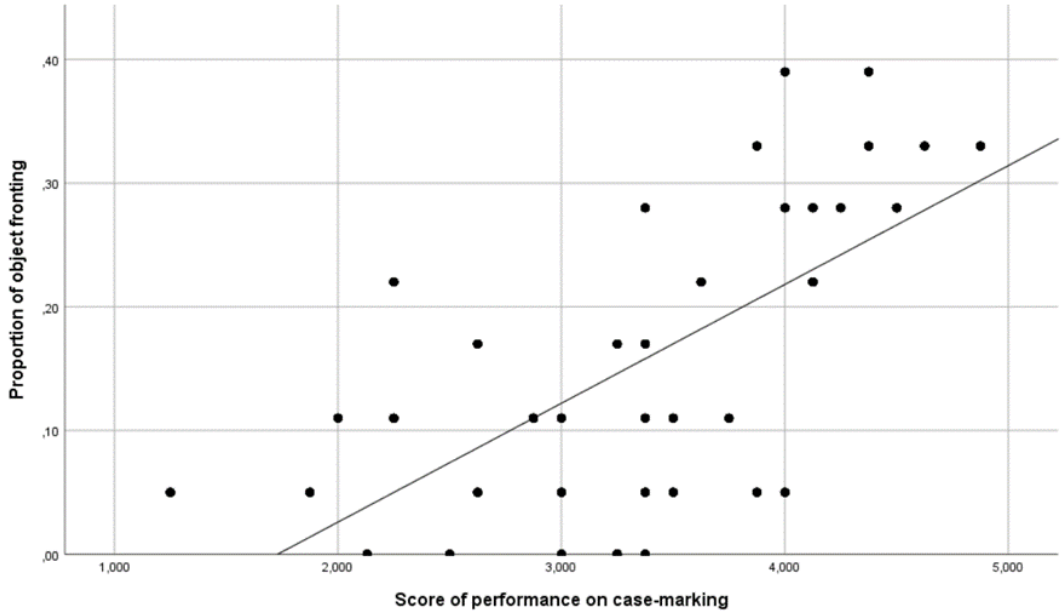


Figure 2. Proportion of object fronting per L2 learner as a function of performance on case marking. Points refer to individual observations and the line represents the best regression line fit predicting learners' selection of objects to fill the prefield position.

In light of the overall association between case and object fronting, further comments are needed regarding the observed floor effect. To put it in another way: Below a certain cut-point on the x-axis, increased performance on case does not lead to a more frequent use of object fronting, as illustrated in Figure 3.

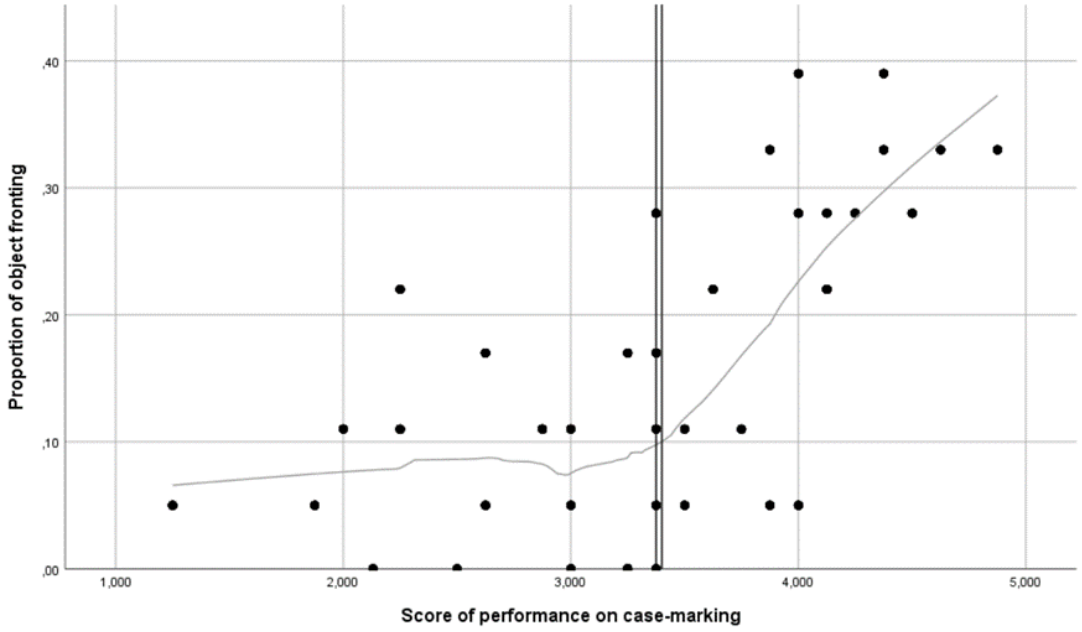


Figure 3. Proportion of object fronting per L2 learner as a function of performance on case marking. The loess curve represents the relationship between variables when adjusted to local portions of the data.

The cut-point corresponds approximately to both median (3.375) and mean (3.40) values of case scores, which are each represented by a vertical line on the plot. In other words, two regions with different data clusters and patterns of association can be identified: (i) a set of observations at the left of the median/mean cut-interval with no positive association between case score and object fronting; (ii) above-mean values of case score that show a positive association with the use of direct objects in the prefield. An approximation of the curve equation outputs a formula with a squared x variable, which stresses the extra weight of above-mean values of case in estimating the response value. To summarize, results suggest that OS reorderings do not come for free as a result of increased performance on case marking. Rather, a more frequent use of OS patterns seems to require a certain above-chance level of accuracy in supplying case forms under conditions which are close to the activation of processing (syntactic parsing) and encoding (form retrieval) abilities in real time.

5.4. Case and General Proficiency

A linear regression model was employed to make sense of the relationship between learners' case command and their score on the general proficiency test. A significant regression equation was found (F (1, 43) = 26.436, p < .001), with an R^2 = .381. A positive association, as illustrated in Figure 4, indicates that learners' accuracy in the use of case increases by 0.664 (95% CI [0.403, 0.924]) for each increase by one of the general proficiency score. However, next to the prediction that case command progresses in function of general proficiency, a non-negligible level of inter-individual variability can be observed, which makes it relevant to explore the contribution of both variables for predicting object fronting.

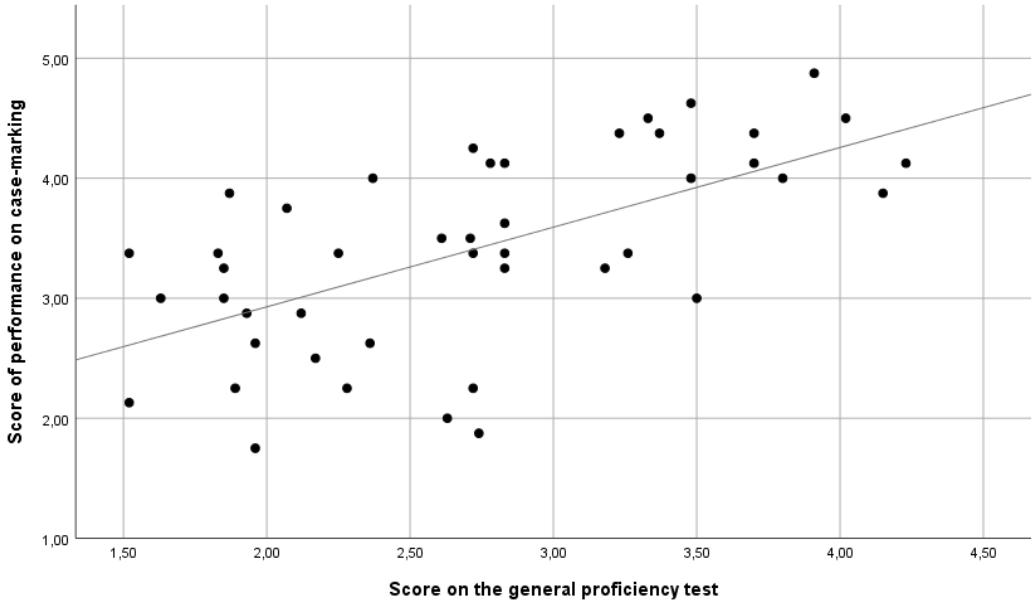


Figure 4. Case command as a function of general proficiency.

5.5. Case vs. General Proficiency vs. Givenness

As outlined in the research questions, a central objective of the present study is to assess the relative weight of case and general proficiency for predicting learners' fronting preferences. In addition, another issue of interest is related to the role of discourse context in triggering object fronting. Indeed, the question remains whether the givenness status of discourse referents

affects learners' fronting preferences, or whether both levels, syntactic reordering and sensitivity to IS properties, do not interface.

To gauge the effect of the predictor variables *Case, General Proficiency* and *Givenness,* we performed a generalized linear mixed model (with a binomial link logit function) of our dependent variable Object Fronting. Responses (fronting options in the ERT) were encoded per item and assigned binary values (Object vs. Non-Object, coded as 1 vs. 0). We introduced the fixed effects of *Case, General Proficiency* and *Givenness*. *Case* and *General Proficiency* were maintained as continuous variables. *Givenness* was encoded as a categorical variable with three levels: Subject given-Object new; Subject given-Object given; and Subject new-Object given. Finally, we also entered Participants (n = 45) and Items (n = 18) as random effects. The summary results are reported in Table 4.

Table 4. Fixed effect estimates (top) and variance estimates (bottom) for generalized linear mixed model of object fronting in the ERT (n = 810).

Fixed effects	**Coefficient**	**Std. Error**	**t value**	***p*-value**
Intercept	-7.23	1.52	-4.74	< .001
Case-marking	.94	.22	4.17	< .001
General proficiency	.06	.21	.27	.79
Subject new-Object given	2.90	.81	3.56	< .001
Subject given-Object given	1.58	.76	2.06	< .05
Subject given-Object new[a]	.00	.00		
Random effects	**Variance**	**Std. Error**		
Participant	.19	.17		
Item	1.13	.57		

[a]The category *subject given-object new* was mapped on the intercept and served as a baseline for comparison with the other values of *Givenness*.

As the table shows, there are separate independent effects of *Case* and *Givenness*. The low value of the intercept is consistent with the larger proportion of non-objects in our observations. All other things being equal, the probability of object fronting is lower than that of observing another type of constituent in the prefield. From this starting point, object fronting proves more likely as performance on case suppletion increases, as well as depending on the givenness status

of both subjects and objects. Considering the combination of a given subject and a new object as a baseline, the probability of object fronting increases significantly to the extent that the referent encoded as direct object is already established in the preceding context. The contrast to the baseline is even more striking in the presence of a newly introduced subject, as illustrated in Figure 5.

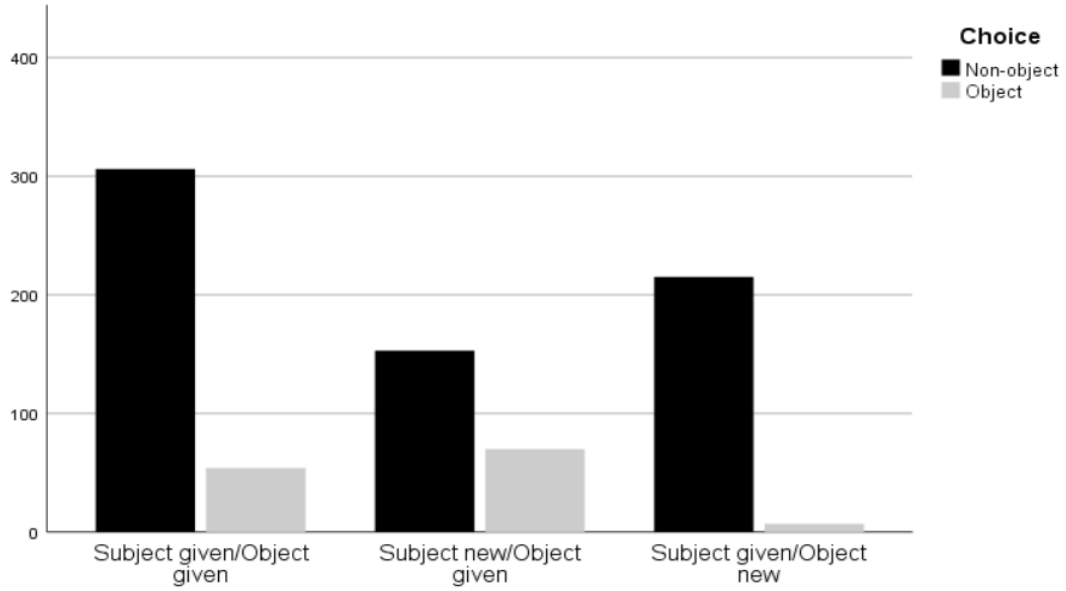


Figure 5. Summary of fronting options (object vs. non-object) in the L2 group as a function of the givenness status of subject and object referents.

Turning to general proficiency, no significant effect is reported and the low coefficient magnitude confirms that general proficiency does not lead to an improvement of the prediction performance of the model. In summary, variation in fronting preferences appears to be best captured by case marking and givenness alone.

5.6. Items

As reported in Table 4, items are an additional source of variance that should be taken into consideration. Therefore, focusing on items including a given object, we had a look at (i) the proportion of object fronting associated with each specific item (limited to learners with above

mean scores on case, *n* = 21); (ii) other cues – animacy and referring form of subject and object – which could influence learners' fronting preferences. As shown in Table 5, object fronting is more frequent in items that combine an animate subject and an inanimate object. When put into perspective with the effect of object givenness on object fronting, this suggests that the given-before-new-principle often prevails over the animacy factor in learners' linearization strategies. Regarding the form of referring expressions, it is interesting to note a tendency to front objects that are realized as demonstrative NPs. This can be attributed to the characterization of demonstratives in terms of both discourse givenness and attention shifting (Himmelmann, 1996; Zifonun et al., 1997). When associated with full NP objects, subject pronouns also seem to favor object fronting, in accordance with empirical evidence showing that the tendency to order shorter expressions from left to right applies primarily to the middlefield, while expressions in the external fields (prefield and postfield) tend to be longer (Chiarcos, 2009: 161).

Table 5. Object fronting, animacy and the form of referring expressions

Item[a]	**Object fronting**	**Subject animacy**	**Object animacy**	**Subject referring form**	**Object referring form**
1	0/21	-	+	Demonstrative NP	Definite pronoun
3	10/21	+	-	Indefinite pronoun	Definite NP
4	2/21	+	+	Definite pronoun	Definite pronoun
6	11/21	+	-	Indefinite NP	Demonstrative NP
7	11/21	+	-	Indefinite pronoun	Demonstrative NP
9	1/21	+	+	Definite NP	Definite NP
10	3/21	+	-	Definite NP	Definite NP
11	15/21	+	-	Indefinite NP	Demonstrative NP
12	7/21	+	-	Definite NP	Demonstrative NP
13	1/21	+	+	Definite NP	Definite NP
15	13/21	+	-	Definite pronoun	Definite NP
16	12/21	+	-	Definite NP	Demonstrative NP
17	5/21	-	-	Definite NP	Definite NP

[a]The numbering of items corresponds to the order of presentation in Appendix 3

6. Discussion

6.1. L2 acquisition of non-canonical OS orders and L1-L2 typological distance

The interplay between word order and case marking is not without effect on L2 acquisition, in terms of L2 learnability as well as learning strategies. On the one hand, previous studies demonstrate the extent to which the L1 facilitates or impedes the use and processing of word order alternations in the L2. This applies in particular to the tendency for L2 learners, whose L1 lacks word order flexibility, to rely on a subject-first strategy, and conversely ignore case-marking information, when computing syntactic structures (Jackson, 2007). On the other hand, evidence reveals that naive learners of a language with flexible word order tend to integrate case-marking information in L2 processing, when other cues such as word order do not provide reliable indications as to who does what to whom in the utterance (Fedzechkina et al., 2017; VanPatten & Smith, 2019). In other words, when the subject-first strategy leads to repeated misinterpretations, case marking no longer goes unnoticed as redundant information. As a result, the coordination between word order flexibility and nominal inflection is strengthened, which makes transfer blocking more effective (MacWhinney, 2008). With reference to the discourse aspects of a complex syntax-discourse-morphology interface, the present study emphasizes the correlation between word order alternations and case morphology in L2 German. Crucially, the results argue in favor of the possibility for French L1 learners to move beyond typological differences, i.e. to add additional morphology on top of L1 familiar forms, in order to express discourse-related meanings (e.g. given-before-new) in TL syntax (OS orders). Word order preferences, in particular the use of alternative patterns (SO vs. OS) appear to be in close association with performance on case suppletion, which suggests that case-proficient learners managed to (i) notice L1-L2 differences in feature packaging; (ii) update L2 representations, i.e. recode syntactic functions by means of case morphology; and (iii)

systematically reinforce L2 form-function mappings in real time at the expense of entrenched L1 reflexes.

6.2. Bottleneck Hypothesis vs. Interface Hypothesis

A central aim of the present research was to assess the predictions made by the BH and discuss them in comparison with concurrent assumptions formulated within the framework of the IH. Typically, evidence in support of the BH is based on the 'syntax-before-morphology' rationale: L2 learners show sensitivity to grammatical meanings and syntactic operations, including syntactic reflexes of functional categories, before functional morphology is in place (see, e.g., Slabakova, 2013). In the present study, BH assumptions were tackled from a different angle. That is to say, instead of approaching the acquisition path postulated by the BH *ex negativo*, i.e. by attesting command of meaning and syntax while functional morphology is still lacking, we opted to go upstream the prediction and gauge the qualitative changes in learners' output, once the 'bottleneck' has expanded. In other words, once functional morphology is available, the use of L1-familiar strategies is expected to decrease, as the ultimate obstacle to the coding of universal meanings in TL syntactic forms is lifted. By contrast, TL word order reflexes, which depend on successful feature reassembly, are rather unexpected compared to L1-familiar alternatives, under the hypothesis that features values have not been successfully reset yet.

The present study proposed a focus on information packaging in utterance production. As a starting point, we assumed that sentence formation is in essence pervasive to a given-before-new principle of information ordering. Accordingly, learners' sensitivity to this principle of communicative efficiency was regarded as a part of their pragmatic knowledge as experienced speakers of at least one language (French). Turning to syntax, our findings reflected that L2 learners had achieved full mastery of the V2 constraint in German. Subject-verb inversion was also considered to be acquired, as demonstrated by instances of Adv-V-S structures.

Given the high predictive power of case on learners' use of OS orders at the syntax-discourse interface, the *a posteriori* prediction of the BH that meaning and syntax in a L2 are conditional on the acquisition of functional morphology is borne out by the results. Case is the locus of L2 grammar whose acquisition and adequate use at a high level of automaticity enables learners to express familiar meanings (e.g. discourse-related meanings like given-before-new) by means of TL word order patterns (OS orders). An important point to note here is that the use of OS orders is not randomly distributed throughout the whole set of experimental items. The association between case and object fronting does not operate blindly, without paying attention to meaning calculation. Instead, as signaled by the impact of object givenness, argument reordering collaborates with IS properties within a domain of grammar knowledge that takes the form of a complex interface between syntax, morphology and discourse. Problems related to the integration of multiple sources of grammatical and contextual information in production, as predicted by the IH, do not seem to affect our L2 learners (Slabakova et al., 2012). However, our findings do not provide information on possible processing delays, since the ERT was not timed.

6.3. Case marking vs. general proficiency

A last aspect that merits discussion concerns the discrepancy between case and general proficiency in the prediction of object fronting. A possible explanation lies in the fact that second language learning progresses differently across linguistic subsystems, which leads us back to the widely accepted distinction between explicit and implicit knowledge as well as the cognitive circuitry involved in the use of each of the two. Explicit knowledge refers to a conscious knowledge of both grammatical and lexical form-meaning pairings, whose access is subject to more or less conscious efforts. By contrast, implicit knowledge is prototypically manifest in rule-based behavior and processing routines, which operate quickly and unconsciously, i.e. with a high level of automaticity (see, e.g., Hulstijn, 2002; Ellis, 2005). In

comparison to L1 acquisition, grammatical knowledge in the L2 depends more on declarative memory, for the reason that learning in declarative memory improves with age, whereas learning in procedural memory, which is expected to drive the acquisition of automatized rules and routines, is less effective in later language learners, including teenagers and young adult L2 learners such as included in our study (Ullman, 2001). Besides the age factor, the assumption that the grammar knowledge that our L2 learners possess is for a large part explicit is also supported by their experience of a traditional form-focused instruction in school and/or college.

Despite these qualitative differences between L1 and L2 learning processes, the deployment of L2 knowledge also evolves towards automatization over time[21], through repeated practice and effective learning strategies (DeKeyser, 1997, 2003), and taking into account the role of learner variables like working memory capacities (see, e.g., Brooks et al., 2006 for a discussion of how individual variables influence the acquisition of inflectional morphology). Overall, the picture of the interlanguage system of individual language learners is a relatively complex one, with linguistic subdomains that operate with a certain degree of automaticity, whereas other areas of knowledge fail to develop into more rapid, routinized skills, and still others have not been learned or consolidated yet in declarative memory. The blanks task and the general proficiency test not only targeted distinct knowledge areas (with the general proficiency test focusing essentially on knowledge of forms and rules and the blanks task requesting both knowledge of forms and sentence processing skills), but the test conditions also differed (timed vs. untimed). Time pressure has been shown to constrain what knowledge representations learners actually resort to when responding to test tasks, because time pressure limits conscious efforts, and therefore makes access to explicit knowledge more difficult

[21] Regarding automatization, the question whether implicit knowledge is the exclusive locus of automatic processes or whether explicit knowledge can also move towards automatized knowledge is a matter of debate. In this respect, DeKeyser (1997, 2003) argues for a distinction between implicit knowledge and automatized explicit knowledge, which are both functionally equivalent, i.e. characterized by rapid access to representations, the difference being due to the awareness criterion. Contrary to implicit knowledge, automatized explicit knowledge is assumed to involve consciousness about representations and their use.

(Godfroid et al., 2015). Although no measures of overt attention (e.g. eye-tracking data) were included in the study design, we thus formulate the hypothesis that variation in results across tasks could be (at least in part) accounted for by (i) the different types of knowledge mobilized in both tasks and (ii) varying task requirements in terms of automaticity.

7. Conclusion

In sum, the present study draws attention to the interaction of multiple interfaces on the acquisition of argument reordering in L2 German. First, new evidence is presented that confirms the central role of information structure constraints (given-before-new) in learners' word order preferences. Contra the predictions of the Interface Hypothesis, learners' preferences at the level of constituent structure reflect the information status of discourse referents, with the caveat that our data do not allow to assess learners' coordination of syntactic and discourse information under time pressure. Second, our findings emphasize the influence on L1-L2 typological distance on the use of target-language discourse-to-syntax mappings. As an indicator of typological distance, we focused on the interplay between case marking and argument reordering. Results demonstrated that learners' command of case, a property that they cannot transfer from their L1, is a reliable predictor of object fronting at the syntax-discourse interface. The observation that case marking is a prerequisite for convergence at the syntax-discourse interface provides a substantial argument in favor of the Bottleneck Hypothesis that stresses the key role of inflectional morphology in L2 acquisition.

Chapter 5: The relationship between L2 learners' writing processes and performance in syntax and discourse organization: A keystroke-logging study

1. Introduction

Even after years of practice in their native language, skilled writers may feel like they are back to square one when they start writing in a second language. Writing is an effortful activity, and this is even more true for L2 writers who may experience the process of translating complex thoughts into correct and intelligible language as an intense struggle. From the perspective of L2 writers, this struggle most often takes the form of a decrease in writing fluency. In fact, compared to L1 writing, L2 writing has been shown to involve shorter bursts of language production, as well as longer pauses and more frequent revisions that consist mainly in false starts at the point of production (Barkaoui, 2016, 2019; Breuer, 2019; Chenoweth & Hayes, 2001; Chukharev-Hudilainen et al., 2019; Lindgren et al., 2008; Spelman Miller, 2000; Van Waes & Leijten, 2015; Xu, 2018). In contrast to speech, the particularity of writing is that it leaves no marks of disfluency in the final text. Writing is by design a delayed form of communication in which writer and reader do not necessarily share the same context, which implies that the transfer of information is a priori not hindered by the writer's pauses and revisions. In other words, L2 learners, especially at lower proficiency levels, may have trouble accessing target-language words and grammar, which may in turn result in more frequent and longer interruptions of the writing flow, but the question arises whether these delays and hesitations find reflection in the quality of the written product.

In writing research, fluency has received considerable attention over the last two decades, although rarely from the perspective of its relationship to text quality. The few studies that examined the association between fluency patterns and writing performance found that human ratings of text quality increased with concomitant gains in fluency (Deane & Zhang, 2015; Spelman Miller et al., 2008; Zhang & Deane, 2015; Xu, 2018). In this sense, contrary to the

assumption that taking more time to process content and wording would improve text quality, a more fragmentary writing style was shown to correlate negatively with the quality of the final written product. In contrast to inexperienced L1 writers, L2 writers already accumulated a stock of metacognitive knowledge about how to write effectively. However, despite this L1 literacy expertise, L2 writers engage in text production with a more or less severe handicap resulting from their quantitatively more limited and qualitatively less automatized knowledge of the L2. Against this backdrop, disfluency was taken to reflect the extra share of processing resources spent by L2 writers on lexical retrieval or compliance with grammar rules (Chenoweth & Hayes, 2001; Révész et al., 2019; Schoonen et al., 2003). The omnipresence of local formulation concerns would then leave L2 writers with insufficient attentional resources for conceptualizing the development of their discourse properly (Manchón & Roca de Larios, 2007; Roca de Larios et al., 2001, 2008; Stevenson et al., 2006; Whalen & Ménard, 1995).

Assuming that language-related disfluency inhibits L2 writers' operations on the ideational component of their text, the question is to what extent this effect is discernible in the written product. Specifically, developing complex pragmatic and conceptual representations requires appropriate linguistic joints at the levels of utterance structure and discourse organization. The absence of such structural joints in learner texts may motivate lower scores of text quality, but more granularity is needed in determining how online writing processes concretely relate to the end product. Therefore, as an alternative to holistic judgments of writing performance, the present study proposes to extract a series of product features from L2 texts and examine to what extent they can be predicted by writing fluency as measured by learners' pausing and revision behaviors. Following the rationale that language-related disfluency may cause learners to ignore higher-level aspects of rhetorical organization, the emphasis was placed in the selection of product features on syntax and discourse, for the reason that these higher-

level linguistic units play a decisive role in signaling the conceptual relationships in the message (see, e.g., Bohnacker & Rosén, 2008; Crossley et al., 2016; Mazgutova & Kormos, 2015).

In short, the present study aims at building a bridge between process and product measures in L2 writing, in order to determine whether fluency indicators can be drawn upon to make predictions about the linguistic make-up of learner texts at the level of syntax and discourse. The article starts with a description of the cognitive processes active during composition, followed by a discussion of previous studies investigating pauses and revisions in L2 writing. Particular emphasis will be put in this regard on the interaction between L2 writing processes, fluency patterns, and text quality. Research questions are introduced in section 3. In section 4, we present the design of our study and the details of our process and product analysis. Results are reported in section 5 and discussed in section 6.

2. Background

2.1. Cognitive processes in writing

Numerous attempts were made since the early 1980s to develop models capable of capturing the complexity of the writing process (Bereiter & Scardamalia, 1987; Hayes, 2012; Hayes & Flower, 1980; Kellogg, 1996). Overall, these models represent writing as involving both a linear, non-reversible and a cyclical, reoccurring dimension. From its linear perspective, writing consists in the succession of four processes: planning, translation/formulation, transcription and revision. At the planning stage, writers first need to clarify the objectives they want to achieve with their text. Then, their next task is to retrieve relevant ideas from their long-term memory and organize them appropriately. At the formulation stage, writers are busy searching for the adequate language material to cast their thoughts. This supposes the activation of different sub-processes including lexical retrieval, syntactic encoding and the use of cohesive devices to ensure smooth transitions between utterances. In the course of transcription, writers execute a series of motor movements to produce a typed or handwritten piece of text. Finally, during the

revision phase, they make sure that the text created is an appropriate expression of their intended plan. It goes without saying that writing rarely takes the form of this serene succession of ideational, linguistic and mechanical processes. Instead, most often, the composing process is interactive and recursive, so that several components can operate in parallel, and information can flow back and forth between them. This complexity explains why text production is sometimes depicted in terms evoking the condition of an engine that would be pushed beyond its design limit: "As a dynamic process, writing is the act of dealing with an excessive number of simultaneous demands or constraints. Viewed in this way, a writer in the act is a thinker on fulltime cognitive overload" (Flower & Hayes, 1980: 33).

Skilled writing is a demanding task, because the large number of linguistic and non-linguistic difficulties to be resolved may exceed the limited processing resources afforded by working memory (Torrance & Galbraith, 2006). This is particularly true for L2 writers, whose language production may be more challenging and necessitate extra effort due to a lack of automatized knowledge (DeKeyser, 2007; Schoonen et al., 2003). Based on the assumption that our cognitive capacity is a limited pool of resources that are distributed among mental processes, degraded writing quality is generally taken as indication that there is competition between parallel components of the writing system for preempting cognitive capacities. (McCutchen, 1996). In this sense, the precise expression of ideas and their skillful organization in a reader-friendly way may be impeded by repeated breakdowns of lower-level translation processes that are responsible for lexical retrieval, spelling and grammatical encoding (Chenoweth & Hayes, 2001). Due to this interference of lower-level concerns, higher-level representations including syntactic and discourse strategies are temporarily halted and deprived of the necessary attention, with detrimental effects on both writing productivity and text quality (Fayol, 1999; Torrance & Galbraith, 2006). By contrast, as language skills evolve towards procedural routines, the reduction of cognitive effort on verbal activities allows writers to

exploit the full potential of their planning and rhetorical skills. Their effort is increasingly directed towards the text as a whole, as the economy of their processing resources makes it possible to operate on larger linguistic units: constituents, sentences, and paragraphs (Bereiter & Scardamalia, 1987; Chenoweth & Hayes, 2001). To gain a better understanding of how lower-level difficulties affect fluency and text quality, researchers have focused on writers' pausing and revision behaviors, following the rationale that these events are observational by-products of underlying cognitive processes involved in text composition. In the following section, we discuss previous research addressing the issue of cognitive processes in L2 writing through the investigation of pauses and revisions, with particular attention to the relationship between patterns of writing fluency and the linguistic make-up of the final product.

2.2. Fluency in L1 and L2

One of the main areas in which process-oriented measures have been used is the exploration of how L1 and L2 writers differ in the way they juggle the complex network of demands involved in text production. First, a growing body of evidence has demonstrated that writing in a foreign language causes a loss of fluency compared to L1 composition. In a pioneer study focusing on American college students writing in both L1 and L2 (French or German), Chenoweth and Hayes (2001) examined the length of writing bursts, i.e. the productivity (in terms of characters) and duration of writing episodes between two interruptions that exceed a certain threshold (in general 2000 milliseconds). When students wrote in English, bursts were significantly longer than in L2 composition, a finding that the authors related to L1-L2 discrepancies in the capacity of the translator to process more complex language structures. Recent research confirmed the observation of a decline in fluency in L2 writing and provided additional information about how L1 and L2 processes differ with respect to frequency and location of pauses. In line with the assumption that L2 composition is hindered by a poor automaticity of translation processes, several keystroke-logging studies showed based on L1-L2 within-writer comparisons that L2

process data exhibit shorter bursts as well as longer and more frequent pauses within and between words (Breuer, 2019; Chukharev-Hudilainen et al., 2019; Lindgren et al., 2008; Spelman Miller, 2000; Van Waes & Leijten, 2015). In contrast to pauses at lower textual units, data related to pauses between clauses and between sentences reveal a more nuanced picture. For instance, Chukharev-Hudilainen et al. (2019) observed that inter-keystroke intervals were significantly shorter at the beginning of non-sentence-initial finite and non-finite clauses when writing in L2. They considered these differences as indicative of a reallocation of the planning activity in L2 writing: In contrast to L1 composition, in which participants may devote more time to preplanning content and structure of clauses, planning and translation tend to overlap in L2 clause production. In other words, L2 writers seem to engage in a premature release of the linguistic output, following a preference for tackling problems as they encounter them along the way. Turning to pauses at sentence boundaries, Spelman Miller (2000) and Chukharev-Hudilainen et al. (2019) found that L2 writers are significantly slower at the beginning of new sentences. However, Van Waes and Leijten (2015) did not identify within-subject differences at the sentence level, suggesting that the bulk of disfluency in L2 is due to lower-level cognitive processes, such as those involved in spelling and lexical retrieval.

Whereas the positive effect of L2 proficiency on writing performance is well documented (see, e.g., Sasaki & Hirose, 1996; Whalen & Ménard, 1995), studies on the development of fluency patterns across proficiency levels are still scarce. Parallel to the picture that emerges from L1-L2 differences, the existing body of research focusing on the proficiency factor demonstrates an increase in fluency in the course of L2 development. As learners' L2 experience accumulates, longer stretches of text are produced, which corresponds to a reduction of pause frequency in the writing process (Chenoweth & Hayes, 2001; Spelman Miller, 2000; Tiryakioglu et al., 2019). In addition, although he found no significant differences between low- and high-proficiency learners with regard to the frequency and length of pauses across

locations, Barkaoui (2019) observed based on the segmentation of writing time in three successive intervals that more advanced learners made longer pauses at the beginning of the session, presumably in order to optimize the planning of their text. The need for writers to interrupt their flow of transcription is considered as silent evidence of cognitive effort that can take the form of conceptual and/or linguistic concerns (Barkaoui, 2016). Methodological advances in the combination of keystroke logging with other instruments like eye-tracking and stimulated recall have largely contributed to a better understanding of the processes L2 learners are dealing with while pausing. In this sense, planning has been shown to require longer pausing time, mainly at higher textual units (sentences or paragraphs), so that writers have the opportunity to reread longer portions of previously written text which come to serve as an anchor point for the generation of new content. By contrast, when they pause within or between words, learners' eye-gazes rarely venture outside the word or phrase preceding the point of inscription. Moreover, stimulated recall comments confirm that pauses at lower units are mainly due to translation difficulties (Révész et al., 2019).

In addition to planning and translation concerns, the writing flow may also be suspended for the purposes of monitoring and/or revising the produced text (Van den Bergh et al., 1993). Many studies that compared the revising process in L1 and L2 indicated that L2 writing is characterized by more frequent revisions (Chenoweth & Hayes, 2001; Roca de Larios et al., 2006). Furthermore, L2 writers were found to favor revisions on small scopes, which was interpreted as evidence of increased attention devoted to lower-level issues of grammar and lexical accuracy (Chenoweth & Hayes, 2001; Stevenson et al., 2006; Thorson, 2000). This hypothesis found further support in research focusing on the effects of L2 proficiency on the timing of revisions (online vs. end revisions) as well as the distance between the cursor of production and the revision point (immediate vs. distant revisions). In fact, these studies showed that more advanced L2 writers tend to (i) postpone linguistic revisions until the final stages of

the writing process, (ii) engage in more extensive revisions, i.e. transformations that affect larger stretches of text, and (iii) make more contextual revisions, i.e. revisions at sites that are further away from production point (Barkaoui, 2016; Xu, 2018). Taken together, these findings confirm the assumption that increased L2 proficiency allows learners to allocate a larger amount of processing resources to higher-level demands such as information management and discourse organization. By doing so, they reduce the gap with L1 writers, whose revision behaviors were shown to be primarily concerned with the formation of cohesive units throughout the text. For instance, Bowen and Thomas (2020) revealed that, compared to L2 participants, L1 writers revised more frequently across within-clause functional constituents (theme and rheme) and across clauses. Moreover, when revising within functional constituents, L1 participants paid more attention to thematic units, i.e. to the anchoring of new clauses in preceding discourse, whereas L2 participants attended instead more frequently to the rheme, i.e. the functional component that accommodates newsworthy information.

2.3. Foreign language writing processes and text quality

What the contrast with L1 writing and the role of L2 proficiency tell us in relation to patterns of fluency in L2, is that when it comes to formulating a message, the difficulty of accessing words and grammar may result in a more fragmented production that progresses in fits and starts and requires recurrent repairs. Against this backdrop, the question arises: How does this decrease in fluency in L2, mainly in less-proficient L2 writers, translate in terms of text quality? Few studies investigated the relationship between writing fluency and text quality, in particular in L2. In L1, previous research demonstrated a significant association between indicators of writing fluency (burst length and length of within-word pauses) and human ratings of text quality, suggesting that frequent disruptions of the writing process have a negative impact on the end product (Deane & Zhang, 2015; Zhang & Deane, 2015). A similar relationship between burst length (in characters) and text quality scores was found by Spelman Miller et al. (2008)

in a longitudinal study of L2 writers of English. In the same vein, Schoonen et al. (2003) investigated as part of a large-scale study about reading and writing in L1 (Dutch) and L2 (English) the interplay in both L1 and L2 between writing performance and learners' results on a series of tests measuring linguistic knowledge (grammar and vocabulary) and fluency of knowledge processing (speed of lexical retrieval and sentence formation). Compared to L1 Dutch, results indicated that writing performance in L2 English was more strongly tied to both linguistic knowledge and fluency of access to words and structures. Finally, revisions were also shown to be related to text quality. Specifically, Xu (2018) observed that whereas text quality was correlated negatively with the frequency of immediate and distant revisions, the end product benefitted from more frequent end revisions as well as more extensive (in terms of scope) distant and end revisions.

To account for changes in L2 text quality in relation to fluency patterns, the hypothesis was formulated that the extra burden that linguistic demands place on less proficient L2 writers may inhibit their ability to address higher-level concerns (i.e. content elaboration and discourse organization) with due care (Stevenson et al., 2006). As argued by Cummins (1980), the literacy skills acquired in the course of L1 writing development may well be drawn upon in L2. However, although knowledge about writing does not need to be reacquired in the context of L2 learning, its transfer from the L1 is conditional upon a sufficient threshold of L2 proficiency. In other words, the difference between L1 and L2 writing does not lie in the nature of writers' knowledge about how to compose a well-designed text, but rather in how much of this knowledge L2 writers can put into use (Manchón & Roca de Larios, 2007). In this sense, L2 writing development has been shown to involve a progression starting with an increased investment on local, language-specific issues and leading progressively to a more balanced reallocation of resources, with a substantial gain in writing performance. By way of illustration, Roca de Larios et al. (2001, 2008) found that the distribution of time between planning,

formulation and revision evolves across proficiency levels towards a reduction of the share consumed by formulation aspects. Similarly, Roca de Larios et al. (2006) reported based on think-aloud protocols that with increased L2 proficiency the nature of learners' formulation concerns changed from a prevalence of difficulties at less advanced stages to find the correct words and structures towards a dominant proportion of upgrading strategies at higher proficiency levels. Such upgrading strategies no longer signal learners' doubts about the correctness of spelling and grammar or their lasting effort to find translation equivalents for ideas that they formed beforehand in their mother tongue. Instead, they demonstrate that, when formulation can be handled with greater automaticity, the way becomes clear for the integration of semantic and textual constraints that help learners come closer to a more precise and coherent expression of their thoughts (see also Snellings et al., 2004).

Most investigations into writing quality have stressed the central contribution of higher-order linguistic units, i.e. syntax and discourse, to judgments of text quality (Crossley, 2020). Starting with syntax, research focusing on the development of syntactic complexity in L2 writing have emphasized that more proficient learners produce longer and more diverse structures (Ortega, 2003). In particular, syntactic diversity has proved to be a reliable indicator of writing development in experienced learners who may have already reached a plateau with respect to traditional metrics of syntactic elaboration (length of units and frequency of clause-linking devices) (e.g., Bi & Jiang, 2020; De Clercq & Housen, 2017; Mazgutova & Kormos, 2015). Furthermore, in their investigation of verb-second declaratives in L2 German texts, Bohnacker and Rosén (2008) found that when German natives were asked to make learner texts sound more target-like, they primarily tackled the lack of variety in learners' use of sentence-initial constituents. Sentence-initial constituents play a capital role in text quality for the reason that they anchor new utterances in previous discourse. In this sense, learners' overuse of initial subjects was perceived by natives as a cause of insufficient textual coherence. The development

of cohesion in L2 writing was directly addressed in a longitudinal corpus-based investigation by Crossley et al. (2016). Based on a series of local, global and textual cohesion features, the authors reported that learners' writing was characterized by a strong increase in noun overlap across paragraphs, a growth in semantic similarity between adjacent sentences and across paragraphs, as well as a decrease in content lemma type-token ratio, pointing to learners' tendency to reactivate content words across text segments. Interestingly, syntactic cohesion, measured by the overlap of part-of-speech tags and phrasal categories between sentences, was shown to decrease over time. This demonstrates that learners' development towards more lexical cohesion goes hand in hand with the use of a greater repertoire of syntactic patterns.

As outlined above, writing disfluency, in particular short production bursts and frequent pauses at lower-level units, appears to correlate negatively with text quality. Considering less-proficient L2 writers may have to allocate more resources to lower-level linguistic demands, and taking into account the central role of syntax and discourse aspects in assessing text quality, the question arises: how does (dis)fluency, as measured by keystroke logging programs, relate to learners' writing performance in syntax and discourse? Previous studies examining the relationship between writing fluency and text quality rely on more or less elaborate scoring rubrics for evaluating learner productions. However, even though some of these studies explicitly list syntax and discourse features as part of their rating criteria (e.g., Spelman Miller et al., 2008; Zhang & Deane, 2015), none of them established a direct relationship between fluency and linguistic indicators. In other words, no product measures were collected and that is precisely this gap that the present study seeks to fill, with a focus on syntactic diversity and discourse cohesion.

3. Research questions and hypothesis

The following research questions were formulated:

RQ1. Does L2 writers' pausing behavior predict product features of learner texts at the levels of syntactic diversity and discourse cohesion?

RQ2. Does L2 writers' revision behavior predict product features of learner texts at the levels of syntactic diversity and discourse cohesion?

As described above, at lower L2 proficiency levels, learners' repeated struggles with lower-level linguistic demands might inhibit their attention to higher-level aspects of syntax and discourse structure. Against this backdrop, our hypothesis is that disfluency in composing, as signaled by more frequent and longer interruptions of the writing process as well as more online revisions on small scopes, will go hand in hand with an end product that is characterized by lower degrees of syntactic diversity and discourse cohesion.

4. Method

4.1. Participants

Participants were 30 L2 learners of German. Twenty-eight of them reported having French as their mother tongue, one participant was a native speaker of Chinese, and another one was a native speaker of Russian. Participants were representative of different stages of L2 learning in an academic setting. Twenty-seven participants were at the time of data collection enrolled in an undergraduate- (third and fifth semester BA) or graduate-level (first year MA) program in either modern languages or translation studies at a French-speaking university in Belgium. Of the three remaining participants, two were recent graduates of an MA program in modern languages, and one participant had just completed a postgraduate program in German and comparative literature. All participants' academic curriculum included a substantial focus on German philology, either as a single major subject, or in combination with another modern

language. The group consisted of 22 female and 8 male participants. The mean age was 22.03 (*SD* = 2.32).

4.2. Writing task and procedure

Participants were asked to write an expository text about a topic that was profoundly affecting individuals and societies at the time of data collection, namely the COVID-19 pandemic. The COVID-19 pandemic was not only a major issue at the center of students' conversations, but day-to-day developments around the disease and the consequences it had on public health and at political and economic levels were also widely covered by news media. Therefore, participants were considered to have a sufficient pool of topic knowledge at disposal, which was supposed to facilitate the process of idea generation and help participants access their discourse knowledge about the type of text to be written (Olinghouse et al., 2015). Regarding text genre, our choice was motivated by the specific conceptual and linguistic demands that expository texts place on writers. In contrast to narratives, in which concepts and events are embedded in a temporal framework, expository writing is "topic oriented", which means that the topic itself drives the integration of facts and concepts within a coherent piece of discourse (Berman & Nir-sagiv, 2007: 80). To achieve this integration, expository writing requires extra attention to the ideational component, in particular by means of an appropriate marking of logical relations, a precise vocabulary as well as the use of more complex syntax (Berman & Nir-sagiv, 2007; Scott, 2004).

Data were collected in a computer classroom. Following a short introduction about the organization of the experiment, participants had two minutes to read the writing prompt (see Appendix 7). To maximize the activation of formulation processes throughout the writing session, two strategies were adopted: (i) no additional pre-planning time was allocated; and (ii) participants were asked to write as much as possible during the 50 minutes that they received to complete the task. All writing sessions were recorded using the keystroke logging program

Inputlog 8 (Leijten & Van Waes, 2013) and the screencasting software OBS (Open Broadcaster Software).

4.3. Data coding and analysis

a) Process features

Pausing behavior

As a first step, we drew on the summary analysis provided by Inputlog to compare the mean length of P-bursts (PB) in characters between L2 writers. To delimit P-bursts, we adopted a threshold of 2 seconds, following the rationale that intervals extending 2 seconds correspond to planning episodes, i.e. momentary interruptions that "occur when the translator has run out of content and time is needed to create the next of item of content" (Galbraith & Baaijen, 2019: 311).

Turning to pauses, our investigation was based on the general analysis generated by Inputlog. The general analysis tabulates the logging process as a fine-grained dataset that contains all mouse and keyboard events in linear order, their start time, end time, duration, as well as the linguistic location at which the recorded pausing intervals occur. The log file categorizes pauses according to the following linguistic locations: within word, between words, between sentences, between paragraphs, and unknown. Unknown pauses refer to process interruptions that cannot be automatically related to a specific linguistic site, such as pauses taking place between two successive deletion events or between two mouse movements. For the purposes of the present study, we limited our analysis to three pausing locations, namely within word (WW), between words (BW), and between sentences (BS).

Measures of pause length were obtained on the participants' log files using a pause threshold of 200 milliseconds. As noted by Barkaoui (2019), defining a pause threshold can be a challenging operation. The most commonly used threshold in the literature of L2 writing is 2

seconds (e.g., Barkaoui, 2019; Révész et al., 2019; Spelman Miller et al., 2008). As indicated above, this threshold is assumed to reflect higher-level thinking processes, i.e. activities related to planning. However, as emphasized by Medimorec and Risko, "adopting a minimum pause threshold implies that pauses below that threshold are not relevant for writing processes" (2017: 1270). In other words, high thresholds have the drawback that variations in fluency associated with translation activities may pass under the radar. Therefore, a 200 ms threshold offers the advantage of capturing the bulk of language- and planning-related differences in pausing, while filtering most interkey intervals, i.e. non-scribal interruptions that result solely from the motor constraint of typing (Medimorec & Risko, 2017).

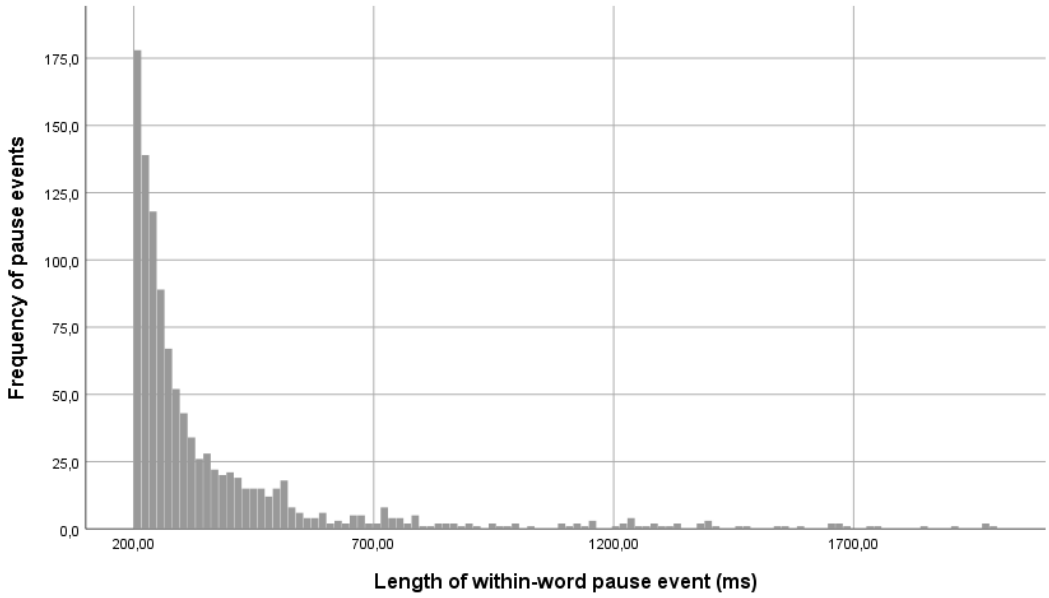


Figure 1. Frequency distribution of within-word pause lengths (in milliseconds) for a single participant

A second issue that needs consideration in analyzing pauses is related to the non-normal distribution of pause lengths. As illustrated in Figure 1, within-writer pause lengths tend to exhibit a highly positively skewed distribution, with most pauses being relatively short and a minority of them being much longer than the mean duration. As Galbraith and Baaijen put it, this would make the mean "an overestimate of the length of the typical pause" (2019: 313). To

remedy this situation, our approach was to use both mean and median to reflect the central tendency of pausing measures.

Revisions

Our analysis of revisions was based on the revision matrix generated by Inputlog. The revision matrix provides both aggregated data summarizing the whole revision process and a detailed representation of all revision events in sequential order. For the purposes of revision analysis, Inputlog distinguishes between three types of production events: (i) normal production, which identifies new text added at the end of the text composed so far; (ii) deletions, i.e. characters or strings of characters deleted in the text produced so far, either at the point of production or earlier in the text; and (iii) insertions, which correspond to the insertion of text within the current text production. In this study, online revisions were examined according to four criteria: frequency, scope, distance, and revision type (deletion or insertion). Frequency was operationalized in terms of number of revision episodes per minute, with a further distinction per revision type between the number of characters deleted and the number of characters inserted. Scope referred to the mean sum of characters involved in revision events (for both deletions and insertions). Finally, distance was operationalized as the ratio of immediate to distant revisions for each participant, depending on whether the distance between the position of the cursor and the point of revision was equal or superior to zero (Thorson, 2000).

b) Product features

As emphasized above, higher-level features of learner texts, i.e. product features related to syntax and discourse structure, were the focus of our analysis.

Syntactic features

Learners' syntactic performance was approached in terms of syntactic diversity, following the rationale that more proficient L2 writers resort to a wider variety of syntactic patterns (Deane,

2014). Each participant was attributed a score of syntactic diversity based on manual annotation of clauses according to the seven following categories:

- Clause type (Cl): main clause, coordinated clause, or subordinate clause
- Subordinate clause type (SubCl): complement, adverbial, or dependent clause
- Finiteness (Fin): Finite or non-finite clause
- Voice (Pass): Active or passive clause
- Valency (Val): This category refers to all realized verb arguments. The identification of valency patterns was carried out using the electronic valency dictionary of German verbs (*Elektronisches Valenzwörterbuch deutscher Verben*, https://grammis.ids-mannheim.de/verbvalenz; last accessed December 2020). An illustration of the coding of valency patterns is provided by the following example from our dataset:

  (1) [Die globale Tourismusindustrie]$_{\text{Subject}}$ ist [eine der am meinsten beeinflussten Sektoren]$_{\text{Predicative}}$. → Valency pattern: Sub + Prd
  'The global tourism industry was one of the most affected sectors.'

  (2) Während ungefähr vier Monaten hat [der größte Teil der Welt]$_{\text{Subject}}$ [dieses historische Lockdown]$_{\text{Accusative object}}$ erlebt. → Valency pattern: Sub + Acc
  'During approximately four months, the majority of the world has experienced this historical lockdown.'

- Number of adjuncts (Adj)
- Type of clause-initial constituents (in terms of syntactic function) in verb-second declaratives (see Bohnacker & Rosén, 2008) (PreV2): Subject (including expletives), accusative object, dative object, prepositional object, dependent, adverbial, or predicative

For each category, a diversity index was calculated using the Shannon index. As a measure of diversity, the major advantage of the Shannon index is that it not only reflects the number of different types represented in a dataset, but also considers the degree of evenness in the distribution of types in the sample of interest (Morris et al., 2014). For instance, a sample that contains 9 individuals of type A and 1 individual of type B will obtain a lower score compared

to a second sample in which both types A and B are represented by 5 individuals. The Shannon index, known as Shannon's H, is expressed as follows:

$$H = -\sum_{i=1}^{R} p_i \ln p_i \quad \text{where } p_i \text{ is the proportion of individuals belonging to the } i\text{th type in the sample}$$

As a next step, a global score of syntactic diversity (SD) was computed for each participant by summing the values of the Shannon index obtained for each of the seven categories listed above.

Discourse features

Discourse organization was operationalized in terms of cohesion cues. The underlying rationale was that the presence of overt cohesion cues in the writing product reflect learners' ability to control the flow of ideas within and across text segments and, by doing so, optimize the reader's ease of comprehension (Crossley, 2020; Deane, 2014). Three main types of cohesion features were examined: reference, connectors and ellipses.

- Reference: To code for reference, we relied on the RefLex annotation scheme (Riester & Baumann, 2017). All referents which were not discourse-new were attributed one of the five following labels:
    - Pronoun (Pro): The expression occurs in pronominal form and corefers with a referent introduced earlier in the same T-Unit or in the preceding T-unit.
    - Given (Giv): The expression is not pronominal, but coreferential with a referent occurring in the same T-unit or in the preceding T-unit.
    - Given-displaced (GivD): The expression is coreferential with a referent that occurs earlier than the preceding T-unit.
    - Bridging-contained (BrC): This label refers to non-coreferential anaphoric expressions that include a discourse-given referent as part of an embedded phrase, as illustrated by the following example from our dataset:

(3) [Die Symptome von [diesem Virus]$_{\text{given}}$]$_{\text{bridging-contained}}$ sind nicht ähnlich für jede Person.
'The symptoms of this virus are not the same for everyone.'

(4) In Restaurants müssen die Kunden mit [[ihrem]$_{\text{given}}$ Smartphone]$_{\text{bridging-contained}}$ eine Gesundheitscode scannen.

‘In restaurants, customers have to scan a QR health code with their smartphone.’

- Bridging (Br): This label applies to non-coreferential anaphoric expressions whose interpretation is dependent on a previously introduced referent, as illustrated in (5).

(5) [Die Krankheit]$_{i}$ verbreitet sich sehr schnell und [die Patienten]$_{\text{bridging-i}}$ können schwere Symptome haben.
‘The disease spreads very quickly and patients can have severe symptoms.’

- Discourse connectors (Con): Our identification of connectors relied on an inventory of adverbial connectors established based on the Potsdam Commentary Corpus (Stede, 2016: 114).
- Ellipses (El): Clauses were considered as markable units for elliptical structures. More concretely, we identified as ellipses all instances of coordinated or embedded clauses in which constituents and/or verbal elements were omitted but clearly recoverable from the immediately preceding context, as shown in (6) and (7):

(6) Viele Patienten haben Symptome aber die anderen (Patienten) (haben) keine (Symptome).
‘A lot of patients have symptoms but others do not.’

(7) Die Umwelt war weniger von Menschen getroffen, als sie normalerweise (von Menschen getroffen) ist.
‘The environment was less affected by people than it usually is.’

For each text, a general index of discourse cohesion (DC) was calculated by adding all instances of cohesion cues and dividing this sum by the number of clauses in the end text. This operation can be expressed as follows:

$$\mathrm{DC} = \frac{N\mathrm{Pro} + N\mathrm{Giv} + N\mathrm{GivD} + N\mathrm{BrC} + N\mathrm{Br} + N\mathrm{Con} + N\mathrm{El}}{N\mathrm{Clauses}}$$

The detailed coding guidelines for both syntactic diversity and discourse cohesion are provided in Appendix 8.

5. Results

5.1. Internal structure of pausing measures

As a first step, we had a look at the relationship between mean and median pause scores to determine to what extent both measures converged in estimating the central tendency of participants' pause lengths. Distributions of mean and median scores at the three pause locations of interest (WW, BW, and BS) were checked for normality with the Shapiro-Wilk test, which revealed that normality was achieved for all measures, except for the mean length of pauses between words (W = .925, df = 30, p = .037). Therefore, a square root transformation was performed on BW mean scores and the transformed variable included in the calculation of Pearson's correlation coefficients between pairs of mean and median scores. Results indicated strong correlations between measures at WW (r(28) = .675, p < .001), BW (r(28) = .775, p < .001), and BS (r(28) = .53, p = .003) locations. In view of the high degree of correlation between mean and median scores at all locations, the decision was made to keep only mean scores for the rest of the analysis.

As a next step, we had a closer look at the underlying structure in our set of four measures of writing fluency: mean length of P-burst, and mean length of pauses for WW, BW, and BS locations. Specifically, our aim was to determine whether two or more measures showed converging trends. If so, subsuming the corresponding variables under a single factor would help avoid unnecessary redundancy in subsequent analyses. Therefore, a Principal Component Analysis (PCA) was performed. A common limitation in the use of PCA is related to the ratio of participants to variables. The ratio of 5:1, which is considered as the absolute minimum (Gorsuch, 1983), was exceeded in our dataset. Additionally, the Kaiser-Meyer-Oklin (KMO) measure of sampling adequacy was .672, i.e. superior to the recommended value of .600, which confirmed the suitability of our data for PCA. The value for Bartlett's Test of Sphericity was also significant (χ^2(6) = 58.677, p < .001), indicating that there was a sufficient degree of

communality in the selected variables to run the PCA. The PCA revealed the presence of two components with an Eigenvalue exceeding 1, explaining 62.8 %, and 26.5 % of the total cumulative variance respectively. To facilitate the interpretation of the components, a varimax rotation was performed. The rotated component matrix indicates the composition of the two factors.

Table 1. Rotated component matrix based on a principle component analysis for the four variables of participants' pausing behavior

Variables	Component 1 lower-level fluency	Component 2 higher-level fluency
Mean pause length WW	**.887**	-.232
Mean pause length BW	**.902**	.260
Mean pause length BS	.078	**.978**
Mean length P-burst	**-.917**	-.210

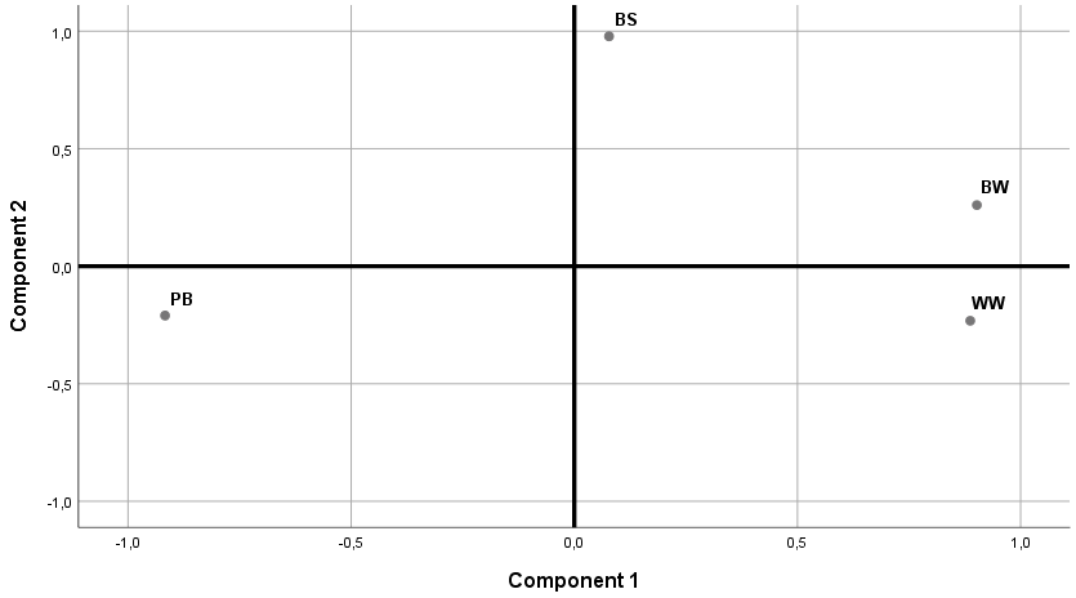


Figure 2. Visual representation of pause variables as a function of components in a 2-dimensional space

As can be seen in Table 1, WW pause length, BW pause length, and PB length have high loadings for the first component, whereas BS pause length is the only variable with a high loading for the second component. In addition, as illustrated in Figure 2, there is a negative relationship between PB and WW/BW in component 1, which is not surprising given longer

pauses at lower-level boundaries have been shown to be associated with more frequent interruptions of the writing process and, accordingly, shorter bursts of production (Van Waes & Leijten, 2015). Therefore, component 1 was interpreted as fluency at lower-level boundaries, whereas component 2 was described as fluency at higher-level boundaries. The scores obtained for both components were saved as new variables, *lower-level pausing* and *higher-level pausing*.

5.2. Pausing behavior and syntactic diversity

A sequential multiple regression was carried out with lower-level pausing and higher-level pausing as independent variables, and participants' general index of syntactic diversity as dependent variable. The hierarchical regression model revealed that at stage 1, including lower-level pausing as a predictor of syntactic diversity improved significantly the model fit ($F(1, 28) = 15.126$, $p = .001$), with an increase in the variance explained of .351. At stage 2, however, adding higher-level pausing did not contribute significantly to the model, with a small variation of F (.257, $p = .616$), and an increase of R^2 of .006. As a result, only lower-level pausing was kept as a significant predictor of syntactic diversity in the final model (Beta = -.592, $t = -3.889$, $p = .001$), in which the regression coefficient indicated that a one-unit increase of the lower-level pausing factor corresponded to a decrease of .425 (95% CI [-.649, -.201]) of the syntactic diversity index.

To determine which indicators of syntactic diversity in particular were more sensitive to variations in lower-level fluency, bivariate correlations were calculated. Examination of histograms, QQ-plots, and Shapiro-Wilk test statistics revealed that four of our seven indicators of syntactic diversity violated the assumption of normality of Pearson correlation, and attempts to transform the corresponding variables were unsuccessful in correcting non-normality. As a result, associations between lower-level pausing and diversity measures were assessed by calculating Spearman's Rho. As reported in Table 2, significant negative correlations were

found for four measures of syntactic diversity: subordinate clause type, voice, valency, and type of sentence-initial (pre-V2) constituents.

Table 2. Spearman's Rho correlations between measures of syntactic diversity and lower-level pausing

	Cl	SubCl	Fin	Pass	Val	Adj	PreV2
Lower-level pausing	-.336	-.388*	.034	-.634**	-.465**	-.229	-.491**
	(.069)	(.034)	(.858)	(<.001)	(.01)	(.224)	(.006)

* $p < .05$, ** $p < .01$

5.3. Pausing behavior and discourse cohesion

As with SD, participants' general index of discourse cohesion was entered as a dependent variable in a sequential multiple regression including lower-level pausing and higher-level pausing as predictors. Here again, the regression model was significantly improved by adding lower-level pausing ($F(1, 28) = 23.391$, $p < .001$), with an additional 45.5 % of variance explained, whereas including higher-level pausing did not improve the fit, with small changes of the F (.040, $p = .843$) and R^2 values (.001). In the final model, lower-level pausing was the only statistical predictor (Beta = -.675, $t = -4.836$, $p < .001$). With a one-unit increase of lower-level pausing, the model predicted a drop in the number of cohesion cues per clause of .181 (95% CI [-.258, -.104]).

Table 3. Pearson's correlations between frequency of cohesion cues per clause and lower-level pausing

	Pro	Giv	GivD	BrC	Br	Con	El
Lower-level pausing	-.555**	-.465**	-.342	-.517**	-.144	-.158	-.123
	(.001)	(.01)	(.064)	(.003)	(.759)	(.405)	(.516)

** $p < .01$

Pearson's correlation coefficients were calculated between lower-level fluency and each of the seven sub-components of the general index of discourse cohesion. Shapiro-Wilk test statistics indicated that bridging and bridging-contained violated the normality assumption, but log transformations were successful in generating normal distributions. As indicated in Table 3,

statistically significant negative associations were found for three types of cohesion cues: pronouns, given referents, and bridging-contained expressions.

5.4. Internal structure of revision measures

In the same way as for pauses, a principal component analysis was conducted on our five revision measures (frequency of deletions, frequency of insertions, mean length of deletions, mean length of insertions, and immediate versus distant revisions ratio) in order to identify possible latent dimensions in our dataset. The Kaiser-Meyer-Oklin (KMO) measure of sampling exceeded .600 (.704) and the value for Bartlett's Test of Sphericity also reached significance ($\chi^2(10) = 48.190$, $p < .001$), confirming that our data had patterned relationships. The PCA produced one single component accounting for 54,1 % of the total variance (Eigenvalue of 2.702). The loading values reported in the component matrix (see Table 4) show that all five revision measures have at least 50% of their variance explained by the principal component. In addition, the loading values point to an inverse relationship between frequency of deletions and the preference for immediate revisions on the one hand, and frequency of insertions and revision scope (for both inversion and deletion episodes) on the other hand.

Table 4. Component matrix based on a principle component analysis for the five variables of participants' revision behavior

Variables	Component 1 revision measures
Frequency of deletions (per minute)	**-.648**
Frequency of insertions (per minute)	**.526**
Mean length of deletion episodes (in characters)	**.780**
Mean length of insertion episodes (in characters)	**.799**
Immediate vs. distant revisions ratio	**-.871**

5.5. Revisions and syntactic diversity

A linear regression was performed to test whether the scores associated with the principal component *revisions* predicted participants' SD index. Results showed a significant effect of revisions ($F(1, 28) = 4.52$, $p = .042$), albeit with a smaller R^2 value (.139) compared to lower-

level pausing. With a one-unit increase in the revisions component, that is less frequent deletion episodes, revisions on larger scopes, and a more balanced distribution of immediate and distant revisions, participants' SD index is expected to increase by .267 (95% CI [.01, .525]).

Table 5. Spearman's Rho correlations between measures of syntactic diversity and revisions

	Cl	SubCl	Fin	Pass	Val	Adj	PreV2
Revisions component	-.003	.302	-.064	.447*	532**	.177	.190
	(.989)	(.105)	(.737)	(.013)	(.003)	(.349)	(.314)

* $p < .05$, ** $p < .01$

As indicated in Table 5, Spearman's Rho correlations between revisions and individual indicators of syntactic diversity revealed statistically significant positive associations for voice and valency, i.e. two of the four indicators for which significant correlations were also found with participants' lower-level pausing behavior.

5.6. Revisions and discourse cohesion

Like for SD, a significant effect of the revisions component on discourse cohesion was identified ($F(1, 28) = 4.42$, $p = .045$) in a linear regression, again with a lower share of variance explained compared to pausing ($R^2 = .136$). With a one-unit increase in revisions, the regression model predicted an increase by 0.099 (95% CI [.003, .196]) in the frequency of cohesion cues per clause. Focusing on the different types of cohesion cues, we calculated Pearson correlation coefficients and found significant positive relationships with revisions for two cue types: given and bridging-contained (see Table 6).

Table 6. Pearson's correlations between frequency of cohesion cues per clause and revisions

	Pro	Giv	GivD	BrC	Br	Con	El
Revisions component	.018	.449*	.235	.383*	.325	.075	-.222
	(.926)	(.013)	(.211)	(.037)	(.058)	(.692)	(.239)

* $p < .05$

5.7. Qualitative analysis

To complete our picture of the relationship between fluency measures and L2 writers' performance in syntactic diversity and discourse cohesion, we considered it opportune to illustrate based on a couple of examples from our dataset how pauses and revisions can be interpreted from the perspective of their relationship to higher-level linguistic features of learner texts. As mentioned above, a major obstacle to the successful transfer of literacy skills to L2 writing is related to difficulties in accessing content words. Formulation problems start with the activation of a contextually salient notion in the learner's mind. This notion corresponds to the utterance's aboutness topic and serves, as such, as an anchor point for scaffolding a more complex prelinguistic representation, the message (Bock & Ferreira, 2014). Hitches in lexical retrieval, i.e. the inaccessibility of suitable words to refer to the activated notion, may then leave learners with no other possibility than to shift their attention to another, more easily codable object, even if this backup strategy leads to a disruption of the flow of conceptual relations between utterances. As illustrated in (8), the word 'Gegenmittel' (remedies) in the preceding utterance activates a notion in the participant's mother tongue ('vaccins'), but the impossibility to find the target-language equivalent causes the participant to revise the message. To resume the writing process, the participant falls back on an alternative formulation that prioritizes easily namable items (here, the generic expression 'wir'). Between-words pause lengths (in milliseconds) are indicated in brackets and, following Inputlog's notation, deletion events are represented by squared brackets.

(8) Aber es gibt bis jetzt keine *Gegenmittel*. (Context)
'But there are until now no remedies.'
Die (2112) *Vaccins* (1184) könnten (1962) [Die Vaccins könnten] (6518) Wir (543) brauchen (3952) eine (256) Lösung (2528) um (1494) die (336) Pandemie (767) zu (563) kontrollieren.
'The vaccines could [The vaccines could] We need a solution to control the pandemic.'

More direct evidence for the impact of form retrieval on syntactic diversity and discourse cohesion involves voice alternation. As shown in (9), the participant's original intention is to shape the newly started sentence around the given referent 'Das Virus' (the virus). This referent was first introduced in the preceding utterance and, calling on this common ground, the writers' goal is to update their readers' state of knowledge by answering the question of the origin of the new coronavirus. The prolonged pause after 'Das Virus' and the following deletion episode suggest that the participant did not succeed in finding the adequate linguistic vehicle for extending the givenness link to a full-fledged utterance. More specifically, in view of the end product, i.e. the finished sentence, a reasonable hypothesis is that the given-before-new flow of information could not be mapped successfully onto the corresponding passive structure, motivating the observed readjustment in favor of a more familiar active structure with the agentive subject in first position.

(9) 2020 war ein sehr schwere Jahr wegen des neuen *Corona-Virus*. (Context)
'2020 was a particularly difficult year because of the new coronavirus.'
Das (368) *Virus* (8662) [Das Virus] (4528) China (3904) hat (472) das (251) Virus (3154) in (317) Dezember (384) 2019 (558) entdeckt.
'The virus [The virus] China discovered the virus in December 2019.'

6. Discussion

In this study, we investigated the relationship between L2 writers' pausing and revising behaviors and writing performance as measured in terms of higher-level product features, i.e. linguistic characteristics of learner texts at the levels of syntax and discourse structure. Overall, the patterns revealed in the results suggest that texts exhibit a lower degree of syntactic diversity and discourse cohesion to the extent that L2 writers (i) are less fluent at lower-level linguistic locations and (ii) edit their text more frequently, on smaller scopes, and mainly at the point of production. These findings are consistent with previous studies demonstrating that judgments of text quality reflect online writing processes (Spelman Miller et al., 2008; Xu, 2018, Zhang

& Deane, 2015). However, a major drawback of studies employing human judgments of text quality is that human rating is prone to vagueness and subjectivity. This is even more the case when raters are confronted to L2 texts, for the reason that raters' perceptions of writers' non-native status may cause them to favor productions that come closer to well-formedness norms, and this at the cost of other dimensions of performance such as the range and complexity of produced forms (Crossley, 2020). More importantly, even when standardized scoring rubrics are used at a high level of granularity, subsuming product features under human judgments inevitably results in a loss of information about how fluency patterns materialize in terms of linguistic features. The main purpose of this study was therefore to maintain a direct link with product features when interpreting process data.

Overall, our regression models are compatible with the hypothesis that a lack of fluency at lower linguistic levels might leave traces in the written product. Specifically, shorter bursts of production, longer interruptions within and between words, as well as repeated revisions at the point of production have been interpreted in previous studies as various expressions of formulation difficulties, i.e. difficulties for the translator to convert the prelinguistic input into appropriate language (Breuer, 2019; Chenoweth & Hayes, 2001; Van Waes & Leijten, 2015). Formulation difficulties predominate in less-proficient L2 learners who exhaust themselves in repeated struggles for finding the suitable word and avoiding grammatical errors (Roca de Larios et al., 2001, 2008; Schoonen et al., 2003; Stevenson et al., 2006, Tiryakioglu et al., 2019). At lower proficiency stages, formulation strategies have not evolved to procedural routines yet (see, e.g., DeKeyser, 2007). It still occurs on many occasions that the translator proposes bits of language that may be deemed, after prolonged monitoring, unacceptable for production. As a result, the translator is urged to generate alternative formulations that satisfy the writer's state of declarative knowledge about the target-language system. This laborious mobilization of resources not only applies to grammar encoding, but also to lexical retrieval. Less-proficient

learners' lexical knowledge is more limited, not only in terms of size, but also in terms of speed of access to already known words. Networks of words and connections between words and meanings necessitate intensive training to reach automaticity, which means that until that later stage of development is achieved, lexical retrieval keeps placing high demands on cognitive activities (Snellings et al., 2004). This might then lead to longer and more frequent interruptions of the writing flow, as well as repeated false starts that require deletions.

From the perspective of cognitive approaches to writing, the inhibition hypothesis formulated by Stevenson et al. (2006) entails that when low-level linguistic demands consume the bulk of writers' resources, little can be done to maintain an adequate degree of investment in higher-level processes, including the packaging of information within clauses, the appropriate integration of clauses into complex information units and the development of well-organized and smoothly flowing portions of discourse. This prediction is borne out by the correlation patterns that reveal a negative relationship between lower-level fluency and the use of pronouns, given referents, and bridging-contained anaphors, as well as a positive relationship between revision measures and the repetition of referents (either as given referents or bridging-contained anaphors) from one information unit to the next. This suggests that the constant vigilance on formulation causes less fluent L2 writers to relegate aspects of discourse development to a secondary status (Whalen & Ménard, 1995). The referential common ground becomes less salient and this has direct consequences on learners' ability to develop anaphoric relationships across syntactic boundaries. Ideas are no longer the expression of a genuine knowledge-transforming strategy, as would be expected if learners had more latitude to immerse themselves in the discourse context and apply their conceptual skills at higher power. By contrast, the serial mode of composition that characterizes less fluent writers is rather indicative of a knowledge-telling approach, i.e. a composition style that operates in a more disorderly manner with less ideational connections between information units (Bereiter &

Scardamalia, 1987). This phenomenon is furthermore certainly exacerbated under writing conditions that include a time constraint. Turning to syntactic diversity, the lower degree of referential cohesion between thoughts also makes it superfluous to resort to specific patterns like passives, relatives, or adverbial clauses that serve the linking of expressions within larger thematic units. Instead of fulfilling rhetorical functions, syntax also bears the cost of insufficient cognitive resources, which causes L2 writers to favor more frequent structures as well as strategies of structural persistence that stimulate the repetition of previously used patterns. In this sense, overuse of high-frequency structures and structural persistence would be part of a range of plausible factors explaining the negative association between disfluency and valency diversity.

Importantly, as illustrated in our qualitative analysis of L2 writing processes, the inhibition of higher-level rhetorical skills is not only a matter of cognitive resources and attention management. In fact, even when learners adequately spotlight what is going to be worth saying in a new utterance, their limited linguistic repertoire might prevent them from finding the optimal structure to express the intended message. In contrast to the traditional cognitive reading of the inhibition hypothesis, this explanation is not so much about achieving the right balance of attention capacities in the process of readying language. Rather, this second, language-related manifestation of inhibition has more to do with the separation between the conceptual formation of notions and propositions on the one side and the operations of syntax on the other (see Bock & Ferreira, 2014). Less-proficient L2 writers may well have a clear sense of which referents are the current focus of writer's and reader's shared interest at a given point of discourse development, but their linguistic deficits make it difficult to map discourse accessibility onto corresponding forms. These codability problems might force a readjustment of the original message, with undesired effects on within-unit information packaging and between-units cohesion. Less-proficient learners might in other words be able to retain a mental

representation of discourse segments, but formulation obstacles lead them to restructure syntactic units for compensatory purposes. Such problems in the transition from message-making to structure-building might account for the higher frequency of deletion episodes at the point of production, whereas in more skilled writers reformulation tends to operate further away from production and on larger scopes, suggesting that learners' revision activity has other objectives. Indeed, as shown by Roca de Larios et al. (1999), proficient learners' editing habits, consisting in more extensive interventions on earlier portions of text, do not simply seek formal accuracy. Instead, they can be considered as improvement strategies, i.e. strategies that reflect a desire to sharpen already composed segments in light of a global view on the meaning to be conveyed. As demonstrated in our data, the outcome is a more balanced use of syntactic patterns as well as more density in referential relationships across utterances.

On a final note, it should be pointed out that this study is not without limitations. More specifically, a main limitation concerns the difficulty to interpret why pauses occur (Barkaoui, 2019). In the early days of writing process research by means of keystroke logging data, Wengelin noted that "although it [keystroke logging] can tell us exactly when something is happening (e.g. when a pause occurs) it does not provide any information about what cognitive activity it signals" (2006: 130). Since then, studies combining keystroke logging with complementary techniques, in particular eye-tracking and verbal reports (think-aloud protocols or stimulated recalls), have provided evidence of a clear link between pausing and revision behaviors on the one hand and L2 writers' cognitive activities on the other hand (Chukharev-Hudilainen et al., 2019; Révész et al., 2019). However, future research on the interplay between writing processes and higher-level features of learner texts could certainly benefit from a mixed-methods design. In particular, including verbal reports could shed more light on the precise nature of the formulation and/or planning obstacles that may divert learners' attention from higher-level concerns related to syntactic choices and discourse organization.

Chapter 6: General discussion and conclusion

1. Summary

The four studies making up this dissertation aimed at examining L2 German learners' acquisition of non-canonical word order at the interface with discourse aspects of information structure. More precisely, the starting point of our investigation of word order phenomena in non-native German writing involved treating them as indicators of a functionally motivated diversification of learners' syntactic repertoire. Building on previous research findings (e.g., Bohnacker & Rosén, 2008; Byrnes & Sinicrope, 2008; Mazgutova & Kormos, 2015; Ryshina-Pankova, 2010, 2015; Vyatkina, 2012, 2013), L2 learners' ability to resort to a gradually wider range of syntactic strategies in their written compositions was assumed to reflect progressive gains in functional adequacy, i.e. greater success in terms of information transmission in a given communicative context. Against this backdrop, we zoomed in on argument reordering, a particular type of non-canonical syntactic phenomenon that is available in German to mark information-structure relations. Specifically, the universal tendency to position discourse-given information before discourse-new referents can call for modifications of the canonical order of subject and non-subject arguments when the subject-first order is at odds with the categories of information structure. For the sake of communicative efficiency, information structure has thus authority to trigger adjustments of the linear ordering of clause arguments – an operation facilitated in German by the role of case morphology which makes it possible to reorder constituents without losing track of their grammatical function.

The various studies that were conducted as part of this doctoral research sought to uncover four complementary dimensions of learners' acquisition challenge at the interface between syntax and discourse. The first study (Chapter 2) focused precisely on the interplay between syntax and grammar-external discourse constraints related to information structure. Learners' syntactic preferences in written production were analyzed using syntactic, semantic, and

information-structure criteria, shedding light on how a lack of syntactic flexibility may impact the coherence and communicative dynamism of learner texts. For the second study (Chapter 3), we adopted a developmental perspective, addressing the question whether the difficulties in accessing non-canonical syntactic strategies that we observed in the first study could be eventually overcome at more advanced stages of L2 proficiency. Our results aligned with previous experimental research (e.g., Hopp, 2009; Rothman, 2009; Slabakova et al., 2012) in showing that non-canonical discourse-driven syntax was a hallmark of advanced-to-near-native mastery of the target language. Whereas study 1 targeted the interface between grammar (syntax) and grammar-external (discourse) domains, the third study (Chapter 4) examined the grammar-internal obstacles that could delay learners' convergence on the use of non-canonical structures. Specifically, we asked whether case marking, a locus of typological distance between learners' mother tongue (French) and the target language (German), had a decisive influence on preferences at the syntax-discourse interface. Interestingly, our findings indicated that the appropriate mapping of referential givenness onto word order was accessible to learners in proportion of their command of case marking. Finally, the fourth study (Chapter 5) focused on the impact of the cognitive load related to non-native writers' difficulty in allocating a sufficient amount of attentional resources to rhetorical aspects of their texts. Compared to native writing, writing in a foreign language is characterized by more interruptions of the writing flow, either for solving issues of grammar accuracy or for retrieving specific lexical items from long-term memory (e.g., Chenoweth & Hayes, 2001; Révész et al., 2019; Van Waes & Leijten, 2015). In this last study, we showed that a higher degree of disfluency at lower-level linguistic locations (i.e. within and between words) had detrimental effects on two main linguistic indicators of rhetorical adequacy, namely syntactic diversity and discourse cohesion. Crucially, we identified a close relationship between characteristics of learners' writing process and product features of texts at the levels of syntax and discourse. In fact, increases in fluency at

lower-level linguistic locations were found to correspond to more cohesive and syntactically more diverse written products, in line with the assumption that gains in fluency reflect a disinhibition of learners' capacity to sharpen the textuality of their composition (Manchón & Roca de Larios, 2007; Stevenson et al., 2006).

2. The interplay between syntactic behavior and information-structural adequacy

What our first study put at the centre of attention is that discourse organization is dependent on the appropriate packaging of syntactic constituents as a function of the discourse accessibility of the corresponding referents. In addition to drawing attention to the role of word order in encoding information-structure contrasts, this first study also highlighted that typological differences between languages cause the realization of universal information-structure principles like given-before-new to be largely language-specific. In particular, syntactic strategies like object topicalization – which is a grammatical option available in German to mark the givenness of non-subject referents – are not allowed in syntactically more rigid languages like French, which was put forward as a possible explanation for learners' underuse of sentence-initial objects in our dataset.

The original intention behind our exploratory investigation of learners' preference for filling the German prefield was to dissociate syntactic and information-structure categories. What motivated this methodological choice was the dual assumption that learners may well resort to target-like structures like object fronting without conforming to the given-before-new linearization of information units, or that their syntactic choices may still depart from native preferences, but nonetheless ensure that discourse-given referents precede the discourse-new ones. With regard to this second possibility, it has indeed been well documented that L2 language users often resort to specific compensatory strategies, mainly L1-related formulation alternatives, to solve translation difficulties resulting from their insufficient competence and/or performance in the target language (Kellerman, 1995). Furthermore, this dissociation between

syntax and information structure – which makes it possible to encode categories like topicality and givenness without complying with target-language constraints – was shown to be a distinctive feature of the early stages of L2 acquisition. As demonstrated by Klein and Perdue (1992, 1997), what characterizes basic interlanguage varieties is the central role played by information structure in the linearization of constituents. The ordering of words or phrases is exclusively guided by universal principles like topic-comment or given-new and operates thus independently from the grammar particularities of both source and target language. Beyond the beginner level, syntax and information structure continue to follow disparate paths, although learners' preferred word order strategies are this time no longer modelled on language-independent principles of information packaging, but on target-language grammar constraints. Following the pre-syntactic mode of utterance organization that defines early L2 varieties, learners' interlanguage – in the same way as other language systems – goes through a gradual process of syntactization (Givón, 1979). This evolution implies that word order regularities are no longer the product of pragmatic principles like given- or topic-first. Instead, what governs learners' syntactic behavior are purely syntactic constraints such as subject-verb agreement, structural case assignment, or verb placement. In other words, the sequencing of constituents in accordance with functional categories related to information structure is progressively overshadowed by learners' concerns about the well-formedness of their utterances.

The discrepancy between the full mastery of syntactic constraints on the one hand and the non-target-like encoding of information packaging on the other hand was one of the main findings emerging from our analysis of prefield constituents in learner texts (see Chapter 2). In broad outline, the syntax-discourse interface can be understood as comprising three different components: (i) a discourse module covering speakers' knowledge about universal principles of information structure (topicality, givenness, focus, etc.); (ii) a syntactic module which includes all phrase structure and movement operation rules; and (iii) an interface module that

corresponds to a set of mapping rules specifying how information from the discourse module shapes syntactic preferences. Considering the universality of information-structure constraints, it is assumed that they no longer need to be acquired in the course of L2 acquisition (Slabakova, 2006, 2013). Turning to syntactic rules, learners' positioning of the finite verb in main declarative clauses was found to be largely accurate in our dataset. Furthermore, learners' convergence with native controls on the fronting of adverbials suggests that their underuse of object topicalization is not due to difficulties in the formation of inversion (or XVS) structures, i.e. structures in which the unmarked subject-verb order is reversed. Thus, contra the predictions formulated within the framework of the Processability Theory (Håkansson et al., 2002; Pienemann, 1998), our data indicated that the difficult access to object-first V2 clauses in L2 German cannot be reduced to problems in the processing of particular syntactic structures like inversions. The decisive criterion in the developmental acquisition sequences postulated by the proponents of the Processability Theory is verb placement. In this sense, it can be considered that learners have acquired inversions as soon as they manage to produce non-subject-first V2 clauses, instead of non-target-like XSV structures. However, if the production of object-first clauses was only dependent on the capacity to compute inversion structures, the observed discrepancy between the target-like production of adverbials in prefields and the striking underuse of clause-initial objects would be a highly unlikely outcome.

Considering our results cannot be accounted for by deficits in either information structure or syntax alone, the only relevant way to make sense of them is with reference to the third component of the syntax-discourse interface, i.e. the mapping module that ensures that information-structure categories receive a functionally adequate expression in target-language syntax. In fact, whereas our intermediate-to-upper-intermediate learners no longer faced residual difficulties in dealing with German formal constraints, they still had trouble employing specific syntactic variants in relation to their impact on the packaging of given and new

discourse referents. The observation that the pragmatic track lags behind the formal track of language use has been characterized by Romero Trillo (2002) as characteristic of foreign language acquisition. While in native speakers, both pragmatic and formal tracks develop simultaneously through naturalistic acquisition, the fact that non-native speakers usually learn the language via formal instruction in a classroom setting often results in an occultation of the functional aspects of language practice. As Romero Trillo claims, the cognitive and socio-cultural meanings associated with language forms are hard to embody in foreign language educational materials and classroom syllabi. Traditionally, language curricula begin by making learners acquainted with target-language forms, thus following a form-first learning process as opposed to the function-to-form path that defines native acquisition. The context-free register to which learners are exposed in instructional settings is in this sense responsible for their long-standing lack of familiarity with discourse-dependent forms. In production, this implies that learners' syntactic repertoire remains unequipped to manipulate information structure in a native-like fashion. Despite their irreproachable grammar, learners' non-convergence at the syntax-discourse interface inevitably affects the quality of their communication. Stylistically, L2 writers' overuse of default syntactic patterns results in a textual production that is often experienced as repetitive and tiresome; and on the functional level, their texts also suffer from critical deficits in terms of both coherence and communicative dynamism.

3. Subject-object reordering as a syntactic marker of (very) advanced L2 proficiency

Whereas the first exploratory study examined the syntax-discourse performance of intermediate-to-upper-intermediate learners, our second study (Chapter 3) targeted upper-intermediate-to-near-native L2 groups. The focus on more experienced learners was motivated by the question whether the deficits in using appropriate discourse-to-syntax mappings that we identified in the first study could eventually be overcome at more mature acquisition stages. Advanced L2 learners can be considered as having mastered the bulk of target-language formal

features. In addition, previous experimental research examining learners' representations and comprehension of L2 discourse-to-syntax mappings have highlighted that despite protracted difficulties in coordinating information structure and word order patterns, native-like behavior was in principle attainable at near-native levels of L2 proficiency (Hopp, 2009; Rothman, 2009; Slabakova et al., 2012). Nevertheless, these encouraging findings with respect to L2 competence and comprehension performance are no guarantee that learners would behave on par with natives in production contexts. The fundamental difference between comprehension and production is in fact crucial for solving the question whether ultimate attainment at the syntax-discourse interface is a realistic objective in non-native language acquisition. Whereas learners' task in comprehension is to decode a ready-made input, the learner engaged in a production process is acting *ex nihilo* in his/her attempt to give a suitable syntactic form to the pre-verbal message. More concretely, whereas the association between the pragmatic lead (i.e. the context) and the syntactic target is already available in comprehension, the extra challenge inherent in production consists in activating pragmatically-based procedures in syntax that outperform the least-effort strategies leading to the formation of canonical orders. Moreover, it should be recalled that this challenge is even more arduous that the influence exerted by discourse leads on linearization choices does not have the force of a well-formedness constraint in native German. Therefore, we could not exclude prior to our investigation that the syntactic footprint of (very) advanced L2 learners would still exhibit insufficient traces of reordering patterns like scrambling and object topicalization.

Despite the possibility that advanced learners' syntactic behavior lags behind their performance in comprehension, the results emerging from our second study confirmed the key finding of experimental research (e.g., Hopp, 2009) that non-canonical argument orders are a hallmark of advanced proficiency. Unlike the exploratory study, our analysis of object-subject structures not only targeted occurrences of object topicalization, but also extended to

scrambling phenomena affecting the clause middlefield. In upper-intermediate learners' productions (B2 CEFR level), the frequency of argument reordering patterns remained close to the low incidence of sentence-initial objects in the exploratory study on prefield-filling strategies. At advanced and near-native levels (C1-C2 CEFR levels) however, non-canonical OS patterns were found to be used significantly more often than in the preceding proficiency group, reaching a frequency of 5 to 6 percent of all produced clauses. Although the absence of L1 control group in this second study made it more difficult to draw an informed conclusion on learners' (non-)convergence with native patterns, data from previous corpus investigations of subject-object reordering in native German give credence to the view that high-proficient learners' use of argument reordering approximates its prevalence in native data. For example, Hoberg's (1981) research reported an overall rate of almost 4 percent of OS orders in middlefields containing at least one object. In addition, Hoberg's prefield examination revealed that 10,15 percent of V2 declaratives started with a non-subject argument, irrespective of the number and type of arguments surfacing in the analyzed structures. Considering the lower incidence of argument reordering in middlefields (compared to prefields), and bearing in mind that we did not restrict our calculation of reordering rates to structures featuring at least one non-subject argument, the 5 to 6 percent of reordering patterns that were obtained at C1/C2 levels can be considered as approaching Hoberg's figures. This would consequently support the assertion that convergence is achievable in L2 production, in the same way as it is in comprehension.

Aside from the issue of convergence, a central contribution of the study reported in Chapter 3 was to confirm the relevance of using measures of syntactic diversity to reconstruct the development of learners' syntactic performance up to near-native levels of L2 proficiency. In this, we followed Ortega's recommendation to broaden the construct and operationalization of syntactic complexity in relation to the "cumulative interlanguage changes [that] can occur

over time" as learners "gradually handle more complex, accurate and fluent production during real-time meaning-oriented communication in the target language" (2012: 130). In this sense, putting greater emphasis on syntactic diversity was motivated by the view that the syntactic choices made by learners are, from the perspective of the discourse as a whole, more than purely combinatory operations on the syntagmatic axis. Rather, at each stage of textual composition, L2 writers' search for optimal ways to construct and present information supposes the selection of appropriate word order patterns. The decisive role of syntactic diversity measures in detecting learners' progress in syntax was confirmed by our results which indicated that traditional elaboration-based indices of syntactic complexity were no longer typical of more advanced stages of L2 German proficiency. By contrast, argument reordering phenomena showed a significant increase from upper-intermediate to advanced and near-native levels, suggesting that the specific forms of syntactic development that affect learners' interlanguage on the threshold between B2 and C1 CEFR levels are primarily a matter of structural diversification.

Interestingly, our findings also demonstrated that whereas argument reordering by means of adjustments at the level of constituent structure (scrambling or topicalization) are associated with more advanced proficiency, passive structures are not. A possible explanation is that the discourse-to-syntax mappings involving the preposing of patient referents are, below C1 level, exclusively realized through passivization. By contrast, at C1 and C2 levels, learners seem to have overcome the one-to-many mapping problem which entails that – regardless of the subtle meaning nuances between passivization and object-subject reordering related to the prominence of agentivity – discourse-given patients can be embedded in either a passive or an OS structure (see Skopeteas & Fanselow, 2009). Acquiring a one-to-one form-function mapping is less demanding for learners, following the view that "an interlanguage system should be constructed in such a way that an intended underlying meaning is expressed with one clear invariant surface

form or construction" (Andersen, 1984: 77). If more experienced learners' syntactic strategies sound more native-like, it is in other words due to their aptitude to use less frequent form-function mappings like object-before-subject orders in addition to the default subject-first patterns involved in passivization. The question thus arises what makes it ultimately possible for advanced learners to integrate in their syntactic footprint a form that they could in principle (at least partly) dispense with on their way to more functional adequacy. A convincing answer is likely to be found is usage-based models of statistical learning. Briefly, statistical learning models stipulate that with sufficient exposure to the target language, learners gradually extract probabilistic information that makes them aware of the frequencies of specific patterns in native input (see Ellis & Larsen-Freeman, 2009). By assimilating the syntactic behavior of native speakers, L2 learners progressively adjust the distribution of forms in their output to (i) the particular contexts in which the forms in question appear in the input, and (ii) the frequencies of their occurrence across genres and registers. The large amount of exposure needed to become sufficiently sensitive to the contextual and distributional properties of low-frequency structures like scrambling and object topicalization may therefore help understand why they occur in native-like proportions at later stages than passives.

4. The facilitating role of case command at the complex syntax-morphology-discourse interface

In Chapters 2 and 3, the studies we reported on depicted L2 convergence in syntax-discourse as closely related to the degree of diversification of learners' syntactic repertoire. The adequate expression of information structure was shown to be dependent on learners' sufficient use of non-canonical syntactic patterns involving the reordering of subject and non-subject arguments – a threshold that learners are expected to meet as from an advanced (C1 CEFR) proficiency level in L2 German. Given that argument reordering can – contra the predictions of the Interface Hypothesis (Sorace, 2011; Sorace & Serratrice, 2009) – be employed in proportions

approaching native use, the next question that we sought to address in Chapter 4 was whether this syntactic strategy is a natural outcome resulting from overall gains in proficiency, or whether there are specific grammar-internal prerequisites that help predict with more precision the entrenchment of OS structures in learners' syntactic footprint. To be more explicit, we examined whether the use of OS structures is more closely tied to L2 learners' command of case morphology than to their overall proficiency. Across the languages of the world, some grammatical correlations have been shown to occur more often than expected by chance. One of these correlations (or universals) involves the presence of a case-marking system in languages that display a certain degree of constituent order freedom (Greenberg, 1966). German is one of the numerous languages that rely on case morphology to convey information about the grammatical function of arguments. Learners who are sensitive to the informativity of case endings can decouple word order and syntactic functions (Fedzechkina et al., 2017; VanPatten & Smith, 2019), thus freeing the linear structure as an exploitable device for encoding information structure. Therefore, our hypothesis was that case-sensitive learners would also be more inclined to resort to OS structures, irrespective of their overall proficiency in L2 German.

Besides pronunciation, functional morphology – including case marking – has been argued to be an area of the target language that poses persistent difficulties to L2 learners. Even in experienced L2 users, the target-like suppliance of inflection forms is subject to a non-negligible degree of variability, which makes functional morphology one of the main sources of fossilization of L2 grammars (Lardiere, 1998; Slabakova, 2013). In this sense, functional morphology has been portrayed as the "bottleneck" of L2 acquisition, for the reason that despite full access to syntax, semantics, and pragmatics, learners' residual trouble in dealing with inflectional forms causes their performance to remain divergent from the native benchmark (Slabakova, 2006, 2013). Functional morphology accommodates the bulk of cross-linguistic variation and learning difficulties are therefore expected to be particularly acute when source

and target languages differ in the way they draw on inflectional forms to encode functional features. These aspects of typological distance were assumed to play a central role in our investigation, since learners' L1 (French) does not host case forms to realize features related to grammar functions, whereas German does. In other words, reconfiguring the realization of syntactic functions using case endings might be a hard task for learners whose L1 morphological inventory does not include case marking. In fact, the risk is that learners repeatedly relapse into L1-familiar compensatory strategies involving the processing of grammar functions in relation to the position of constituents. The impact on performance at the syntax-discourse interface would be immediate: The preemption of word order in favor of grammar functions would come at the cost of the flexibility needed for optimizing information packaging.

The main finding of our analysis of the complex syntax-morphology-discourse interface was that the morphological bottleneck that hinders target-like performance in discourse-driven syntax could be resolved by learners with a typologically distant L1. Our data indicated that not a single participant achieved an error-free use of case forms, in accordance with the view that performance in inflectional morphology is a common symptom of the fragility of interlanguage grammars, even at advanced proficiency levels (Lardiere, 1998; Slabakova, 2013). Nevertheless, despite residual optionality in selecting the right case forms under time pressure, evidence was provided for a positive effect of case command on learners' syntactic strategies at the interface with information packaging. Crucially, the finding that learners' use of discourse-driven object-first structures increased as a function of their performance in supplying case forms confirmed the relevance of Slabakova's (2006, 2013) Bottleneck Hypothesis. If no statistically significant relationship had been found between case and word order preferences, the assumption of a bottleneck effect of case morphology on L2 syntax and pragmatics would have proven wrong. However, the results pointed to a positive relationship

between case command and argument reordering, confirming that juggling case forms with increased accuracy leads to immediate benefits in terms of syntactic flexibility. Interestingly, a closer look at the regression curve showed that this positive effect was not effective below a specific threshold of case performance. In this respect, our findings suggest, in line with VanPatten and Smith (2019), that the subject/agent-first strategy is particularly resistant in less advanced learners. Accordingly, case command needs to be boosted up to a sufficient above-chance level of performance before it can infuse into learners' syntactic choices in production.

To the question whether grammar-internal prerequisites related to case command are a better predictor of behavior at the syntax-discourse interface than overall proficiency, our study provided a positive answer. Not only are these findings a confirmation of the close connection between case morphology and syntactic reordering operations – object fronting is conditional upon case command and, conversely, case command does not come without gains in syntactic flexibility –; they also shed light on the decisive role of individual differences in L2 acquisition strategies. At comparable proficiency levels, L2 learners might still significantly differ from each other in their sensitivity to target-language grammar properties. Investigating the processing of subject-object ambiguities in complex clauses in L2 English, Hopp (2015) observed major differences in the type of strategies recruited by learners to solve garden-path sentences like *When the girl was playing the boy made funny noises*. In a preliminary word-monitoring task involving the comprehension of normal (e.g., *Her boyfriend gave her a beautiful diamond for Christmas*) and implausible sentences (e.g., *The gardener fly him the great diamond after mother*), Hopp identified a group of high syntactic integrators, i.e. learners who were faster in reading the structurally correct, but semantically implausible sentences. In a follow-up task focusing on the resolution of object-subject ambiguities, Hopp found that these high syntactic integrators needed less time to integrate main and embedded clauses correctly when the reanalysis was biased by the case of the object pronoun (as in *When the girl was*

playing he made some funny noises), i.e. a morpho-syntactic cue. By contrast, the participants who were labelled as low syntactic integrators were more efficient than their morpho-syntactically-driven counterparts when guided by semantic cues like plausibility. What Hopp's findings reveal is that L2 learners vary in the amount of attention they devote to morpho-syntax in non-native language acquisition. Different routes can be taken in the process of acquiring an L2, with different outcomes that may be masked by general measures of proficiency. Convergence at the syntax-discourse interface can thus be best described as making specific demands with regard to learners' sensitivity to target-language grammar properties (case marking in the case of our L2 German learners). In this sense, grammar-sensitive learners can be seen as being one step ahead on the way to native-likeness in discourse-driven syntax.

On a last note, the fine-grained analysis of participants' linearization preferences in the element rearrangement task (see Table 5, Chapter 4) revealed that some of the test items including a given object were preferred candidates for subject-object reordering. This concerns in particular the items featuring a demonstrative object NP as well as those in which the subject was pronominal. Interestingly, these configurations containing a fronted demonstrative object and/or a subject pronoun in post-verbal position were identified in previous corpus research as favoring the occurrence of OVS orders in native production (Bader & Koukoulioti, 2018). In the same way as for the acquisition of frequency patterns in the production of OS orders, explaining learners' sensitivity to the OS configurations that are the most common in native use necessitates to invoke the role of input. As often lamented (see, e.g., Callies & Keller, 2008; Hawes, 2015), functional aspects of syntax related to information structure are largely underrepresented in foreign language curricula and teaching materials. Therefore, it is highly unlikely that our participants received explicit instruction about the interplay between object fronting, givenness, and the referential form of arguments. In our opinion, the finding that case-sensitive participants also pay attention to referential form is rather a consequence of their

ability to register how OS structures appear in the input: The more often OS structures are heard in association with specific referential forms, the more likely it is then that the patterns in question survive in learners' mental representations (Ellis, 2012). Importantly, learners' high degree of responsiveness to micro-variation in native input demonstrates that there is no risk that the development of flexibility in L2 syntax would lead to an overgeneralization of OS structures, i.e. to the automatic use of object fronting every time discourse-salient objects enter the equation. What this suggests is that L2 learners are not fundamentally different from children building their L1 language representations. In fact, L1 learners are usually portrayed as "conservative learners" who would not resort to costly syntactic operations like topicalization unless there is converging evidence for this in the incoming input (Westergaard, 2021: 384). In view of our data, the same could be said about L2 learners, for the reason that their joint control over the syntax-morphology and syntax-discourse interfaces does not trigger the production of non-canonical OS orders beyond what the input-based representation of this particular L2 form entails.

To sum up, the results exposed in Chapter 4 depict the acquisition of object fronting as a complex phenomenon: Learners' target-like inclination towards specific combinations of referential forms points to a successful process of implicit learning from native input; that being said, the possibility to capitalize on native input appears to be dependent on learners' degree of control over the grammar-internal interface between morphology and syntax.

5. Disfluent writing as a symptom of inhibition effects on performance in syntactic diversity and discourse organization

Aside from the impact of language-specific issues related to the distance between source- and target-language grammar properties, previous research emphasized that convergence in higher-level components at the intersection between syntax and discourse were ultimately dependent on learners' processing ease in the L2 (Hopp, 2009; Roberts et al., 2008; Sorace, 2011). Making

an adequate use of a large syntactic repertoire to optimize information packaging and discourse organization places high demands on language users' computational resources. The processing component is even more crucial in L2 acquisition, since there is ample evidence suggesting that L2 performance is more affected by resources limitations than L1 use (see, e.g., Kilborn, 1992). The simultaneous integration of multiple sources of information (lexical, semantic, syntactic, discourse information) repeatedly fails because of learners' lower working memory resources as well as the lack of automaticity in mobilizing L2 knowledge (Segalowitz, 2003). Whereas L2 learners' processing disadvantage in coordinating syntax and discourse information has been widely documented in comprehension, mainly through the detection of interpretation errors and reading slowdowns, no research was – to the best of our knowledge – carried out on the interplay between processing efficiency and syntax-discourse performance in L2 production. To gain a foothold in this unexplored territory, we built in the context of our fourth study on the concept of fluency as established in research on L2 writing processes. As suggested by Schmidt (1992), fluency is an automatic procedural skill that, when applied to L2 performance, demonstrates the ability to produce correct and meaningful strings of words with limited effort and attention. Previous studies focusing on fluency in L2 writing, as measured through writers' pausing and revision behaviors, showed that compositions written by less experienced L2 learners are characterized by more frequent and longer interruptions at lower-level linguistic locations, i.e. within and between words, as well as more small-scope revisions occurring mainly at the point of production (e.g., Barkaoui, 2016, 2019; Chenoweth & Hayes, 2001; Xu, 2018). Importantly, these compositions resulting from a more disrupted writing style were found to correlate with lower overall ratings of text quality (Spelman Miller et al., 2008; Xu, 2018). Less fluent writers' texts were judged as rhetorically less adequate, which led to the assumption that recurring encoding problems at lower-linguistic locations would inhibit L2

writers' attempt to apply their L1-inherited literacy skills to the higher-level components of sentence and discourse organization (Schoonen et al., 2003; Snellings et al., 2004).

To gain more insights into the effect of processing efficiency on syntax-discourse performance, we focused on the question whether the competition between lower- and higher-level linguistic encoding for preempting attentional resources, which is responsible for the repeated breakdown of production bursts, would affect measures of syntactic diversity and discourse cohesion – two main indicators of the textuality of compositions. The first step of our process-product analysis involved an investigation of the factor structure of fluency measures related to L2 writers' pausing and revision behaviors. In line with previous findings (Van Waes & Leijten, 2015), the process factors revealed that the longer production bursts that characterize fluent writing evolve collinearly with a decrease in pause length at lower-level linguistic boundaries. Our regression analysis showed that this ability to encode longer strings of words at once, i.e. without prolonged interruptions, was associated with positive effects on indicators of syntactic diversity and discourse cohesion. Turning to the revision factor, our results indicated that syntax-discourse performance is mainly driven by delayed and more extensive revision episodes that favor the insertion of new linguistic material over the deletion of previously transcribed segments. As emphasized in the literature on L2 writing processes, composition styles in which shorter production bursts, longer hesitations within and between words, as well as immediate revisions of short strings of characters (also labelled as false starts) are typical of less-experienced L2 writers whose main concern is to access the appropriate words and the correct grammar forms when producing new sentences, clauses or phrases (Chenoweth & Hayes, 2001; Spelman Miller et al., 2008; Xu, 2018). In other words, the main contribution of our fourth study was to provide direct evidence of the bottleneck effects that the translator/formulator has on linguistic indicators of syntax-discourse performance. Repeated breakdowns in lower-level linguistic encoding constrain the allocation of attentional resources

(see Roca de Larios et al., 2001, 2008; Schoonen et al., 2003; Stevenson et al., 2006), inhibiting L2 writers' capacity to draw on their knowledge of constituent ordering, clause-linking, between-sentences bridging, and referential maintenance, to name only these subcomponents of learners' syntax-discourse competence.

In metaphorical terms, the L2 writers that face difficulties at the process-product interface can be pictured as enrolled in a hurdles race in which the obstacles are placed at short distance. In such conditions, one can easily imagine how hard it is to focus on overcoming each obstacle while maintaining a sufficient level of attention to the race in its entirety. In other words, in optimal conditions, i.e. with the necessary language resources at disposal, writers' main concern relates to the question "What do I want to say?" (Kaufer et al., 1986: 126). The greater linguistic and working memory resources are, the more likely it is that writers will work more intensively on the quality of the message. More experienced writers can thus prepare complex packages of ideas that the translator can in principle handle without insurmountable difficulties. In less proficient writers by contrast, formulation challenges make it impossible to deal with complex portions of message at once. Instead, writing progresses bit by bit, in accordance with the linguistic output that the translator is able to deliver (Chenoweth & Hayes, 2001). The translator's limited capacity motivates a shift in L2 writers' concerns towards questions like "How to say it?" or "What am I capable of saying?". The challenge of lower-level linguistic formulation not only takes priority in writers' cognitive activity, but it also impairs their visibility over the higher-level segments (from clauses to the text as a whole).

At this point of the discussion, a question that can be raised is whether it is not possible for less proficient L2 writers to compensate for their costly lexical, orthographic and grammar processing by using extra planning time at higher-level linguistic boundaries. Longer pauses between sentences could indeed allow for better syntactic choices and enable writers to re-read previous portions of text in search for referents which they could draw on in their subsequent

composition. However, our results did not point to this direction, as pause length between sentences did not contribute to the prediction of learners' performance in syntactic diversity and discourse cohesion. Recall that the principal component analysis that was run on the four measures of pausing behavior identified ~~Individual measures o~~the mean~~f~~ length of pause ~~length~~ between sentences as a factor on its own, independent from burst length and pause lengths at lower-level locations. Then, in the multiple regression analysis, adding between-sentences pause length as an indicator of participants' pausing habits at higher-level linguistic boundaries did not lead to an improvement of the model fit. The conclusion that can be drawn from this is that the linguistic make-up of L2 writers' texts at the levels of syntactic diversity and discourse cohesion does not vary according to pausing behavior between sentences. Interestingly, the minor role of between-sentences pauses in differentiating between product features of L2 texts also echoes a tendency emerging from previous keystroke-logging studies showing that pause patterns at higher-level boundaries (between sentences and between paragraphs) did not match differences in writer profiles, whether it be differences between L1 and L2 writers or between low- and high-proficiency groups of L2 writers (Barkaoui, 2019; Van Waes & Leijten, 2015). Thus, contrary to what a tempting assumption might suggest, learners' syntactic choices as well as their action on textual cohesion are not dependent on the duration of the cognitive activity taking place between higher-level segments. Performance in syntax and discourse organization is in other words only tied to learners' degree of automaticity at lower-level linguistic locations. Concretely, when lower-level building blocks (words, spelling, agreement forms, etc.) can be assembled seamlessly, enabling extended bursts of production, syntax and discourse remain at the forefront of attention. By contrast, when lower-level encoding repeatedly breaks down, requiring frequent conscious efforts, inhibition effects preclude attention to the higher-level operations that drive the interweaving of information units into a cohesive whole (Flower & Hayes, 1980; Snellings et al. 2004; Stevenson et al., 2006).

6. Limitations and directions for future research

The starting point of this dissertation was the assumption that the degree of functional adequacy of L2 written productions can be read off from the variety of syntactic patterns used by L2 writers. Resorting to OS structures was in this sense presented as a necessary strategy to optimize the packaging of given and new information at the crossroads between discourse context and sentence production. The previous experimental studies that provided a basis for the present research put large emphasis on this specific locus of information exchange between syntax and discourse, focusing among others on the question whether L2 learners were sensitive to the discourse cues associated with non-canonical structures. The level of granularity adopted in these experiments (e.g., Hopp, 2009; Lozano, 2006; Slabakova et al., 2012), enabling an investigation of the syntax-discourse interface in situ, i.e. at the clausal level, was however not generalized to all studies carried out as part of this doctoral research. This concerns in particular the studies presented in Chapters 2 and 5. In these two studies, syntactic and discourse indicators were treated separately and quantified at the scale of writer groups (L1 vs. L2, cf. Chapter 2) or individual compositions (cf. Chapter 5). In other words, the measurement of learners' syntax-discourse performance was untied from the syntactic level – the very level at which discourse factors translate into linearization choices. Analyzing pairs of syntactic form and givenness pattern (e.g. an OS structure with a discourse-given object) in non-native texts is not an easy task, the main reason being that non-canonical patterns are largely underrepresented in learner compositions, at least up to advanced proficiency levels. However, future investigations of discourse-driven word order in L2 writing could certainly benefit from a more fine-grained approach that would help keep track of the interplay between syntactic choices and information-structure configurations on a clause-to-clause basis. A concrete objective would be for instance to extend the process-product approach used in Chapter 5 to a sentence production experiment targeting syntactic variation at the interface with givenness. Nottbusch (2010)

provides an example of a sentence production study of the type we advocate here. Concretely, drawing on a picture description task, the author measured via keystroke logging the pausing behavior of participants who were asked to describe the sketched events by means of sentences containing either subordinated or coordinated subject NPs. Using adequate stimuli encouraging learners to produce non-canonical structures (passives or OS), it could be in principle possible to measure the onset latencies and the within-sentence time course associated with the production of (non-)canonical structures, in association with both favourable and unfavourable discourse cues. By opting for a controlled production task of this kind, we could obtain a more precise picture – across L2 proficiency levels – of the cognitive costs inherent in the formation of non-agent/subject-first structures. While it is clear that sentence production tasks are not necessarily indicative of learners' syntactic performance in text composition, such a study design would nevertheless act as a link between previous online studies examining the comprehension of discourse-to-syntax mappings and the process-product approach to learner texts that we employed in Chapter 5.

As noted above, L2 researchers focusing on the syntax-discourse interface have traditionally relied on experimental studies, based on acceptability judgment tasks and/or comprehension tests. The preference for experimental methods in the investigation of discourse-driven syntax is easy to understand. In fact, discourse-to-syntax mapping phenomena are very infrequent in learners' natural output and it is therefore better to submit them as stimuli in comprehension tasks or to create appropriate conditions to elicit their production (Mackey & Gass, 2005). This second strategy consisting in the design of a controlled production experiment favouring the use of specific target-language forms was the one we selected to examine the interplay between learners' command of case and their syntactic preferences at the interface with givenness (see Chapter 4). The main focus of this study was not on learners' *knowledge* of the interface conditions on OS reordering, but rather on learners' *behavior*, i.e. on *what they*

do with their syntactic competence when confronted to specific modulations of givenness. Given the scarcity of non-canonical OS structures in spontaneous production, the choice of a controlled task proved to be the right strategy to trigger reordering behaviors that could otherwise not be observed. Nevertheless, controlled elicitation tasks, including sentence manipulation exercises like the one we employed in Chapter 4, may bias participants to provide responses that do not necessarily coincide with their syntactic footprint in spontaneous production. In other words, the inconvenient associated with the use of a sentence manipulation task is that participants may exhibit a high degree of syntactic flexibility for the only reason that the task explicitly instructed them to juggle with the order of constituents. In view of the potential and limitations of controlled elicitation tasks, a recommendation for future research dealing with the interplay between case and reordering phenomena would be to triangulate experimental results with corpus data (see Mendikoetxea & Lozano, 2018, for more detailed comments on the need to triangulate experimental and corpus data in second language research). Concretely, learner texts could be analyzed on two different levels: (i) on the occurrence of non-canonical syntactic forms, and (ii) on learners' accuracy in supplying the declined forms of articles (according to gender, number, and case). This triangulation strategy would certainly provide valuable information about whether the positive association between morphological accuracy and syntactic flexibility that we found in our experimental study also extends to more naturalistic production data.

The results from the exploratory study presented in Chapter 2 indicated that more variety in the type of prefield constituents goes hand in hand with a higher degree of functional adequacy, as conceptualized in terms of referential givenness. However, focusing on prefield filling, it is important to remember that information structure is not the only dimension of functional adequacy that plays a role in the decision to prepose a constituent. Other factors have been shown to favour the fronting of constituents, such as animacy and weight/structural

complexity (Bader & Häussler, 2010; Siewierska, 1993). These different factors often tend to overlap, as animate referents usually have a high degree of discourse prominence, and it is in such cases difficult to distentangle their respective effect on linearization preferences. In this research project, our perspective on functional adequacy was limited to discourse givenness. Future research could however certainly benefit from a more global approach encompassing more determinants of word order variation. This would in particular enable to see whether L2 learners are motivated by the same functional concerns as natives when resorting to non-subject/agent-first structures.

7. Final words

Over the last twenty years, a large body of research has accumulated documenting persistent difficulties at the syntax-discourse interface in L2 acquisition. L2 learners' problems with non-canonical discourse-driven syntax was shown to be a matter of both competence, as revealed by inaccurate representations about the association of forms and contexts, and performance, as demonstrated by processing delays in comprehension. These previous research efforts were mainly experimental in nature, largely structure-specific, i.e. limited to the question whether formal convergence was attainable in the target language, and their perspective on performance was limited to comprehension, as few studies examined learners' syntactic strategies to achieve functional adequacy in production contexts. Against this backdrop, the motivations underlying this doctoral research were twofold: (i) shift the investigation of the interplay between syntax and discourse organization towards the study of learners' writing production; and (ii) complement the study of formal convergence with an independent analysis of discourse features in general, and of information-structure categories in particular, based on the premise that functional adequacy in discourse is not tied to a unique syntactic realization.

The exploratory study presented in Chapter 2 revealed that, contrary to the assumption that convergence with natives on the packaging of discourse-given, discourse-new, and

bridging referents can be achieved without adopting a target-like syntactic footprint, learners' difficulty in generating coherence and dynamism via information packaging was associated with signs of syntactic rigidity, in particular with an underuse of object fronting – a strategy which is favored in native German to ensure appropriate information-structure configurations. Whereas intermediate-to-upper-intermediate learners still struggled diversifying their syntactic strategies in relation to information structure, evidence was provided in Chapter 3 that at more advanced levels (C1-C2 CEFR levels), the occurrence of object-subject structures increases substantially to approach native-like frequencies. Importantly, in addition to confirming that convergence on the use of non-canonical structures serving functional adequacy is possible, Chapter 3 emphasized that OS patterns are a manifestation of syntactic complexification that defines advanced-to-near-native proficiency in L2 German.

OS orders increase as a function of learners' proficiency, but the study presented in Chapter 4 revealed that individual differences related to case command lead to a better prediction of learners' use of OS structures compared to measures of general proficiency. Specifically, case command implies the ability to reconfigure the encoding of syntactic functions through case endings, which allows case-sensitive learners to approach word order variation as a dedicated strategy for encoding information-structure contrasts. Case morphology was depicted as a bottleneck whose capacity to impede learners' syntactic flexibility decreases when accuracy in case use reaches a minimum threshold. Next to case, the investigation of the relationship between writing fluency and syntax-discourse performance exposed in Chapter 5 enabled us to identify a second bottleneck effect on the degrees of syntactic diversity and discourse cohesion exhibited by L2 writers' compositions. Similar to case command, learners' writing process features, in particular their pausing and revision behaviors, were found to be reliable predictors of the linguistic make-up of L2 texts at the levels of syntactic diversity and discourse cohesion. Writing draws on a limited pool of cognitive resources and what fluency

measures revealed is that writing sessions characterized by frequent interruptions within and between words, presumably in relation to a higher cognitive investment in solving formulation problems affecting these lower-level linguistic units, go hand and hand with less traces of rhetorical adequacy in the end product.

References

Andersen, R. W. (1984). The One to One Principle of Interlanguage Construction. *Language Learning*, 34(4), 77-95.

Anderson, J. R. (1996). ACT: A simple theory of complex cognition. *American Psychologist*, 51(4), 355-365.

Archibald, A. N. (1994). *The acquisition of discourse proficiency*. Frankfurt/Main: Peter Lang.

Ariel, M. (1988). Referring and Accessibility. *Journal of Linguistics*, 24(1), 65-87.

Ariel, M. (2001). Accessibility theory: An overview. In T. Sanders, J. Schliperoord, & W. Spooren (Eds.), *Text representation* (pp. 29-87). Amsterdam/Philadelhpia: John Benjamins.

Bachman, L. (1990). *Fundamental considerations in language testing*. Oxford: Oxford University Press.

Bader, M., & Bayer, J. (2006). *Case and linking in language comprehension: Evidence from German*. New York: Springer.

Bader, M., & Häussler, J. (2010). Word order in German: A corpus study. *Lingua*, 120, 717-762.

Bader, M., & Koukoulioti, V. (2018). When object-initial sentences are preferred to subject-initial sentences: Corpus evidence from German. In E. Fuß, M. Konopka, B. Trawinski, & U. Waßner (Eds.) *Grammar and corpora* (pp. 53-72). Heidelberg: Heidelberg University Publishing.

Bader, M., & Meng, M. (1999). Subject–object ambiguities in German embedded clauses: An across-the-board comparison. *Journal of Psycholinguistic Research*, 28(2), 121-143.

Bardovi-Harlig, K. (1992). A second look at T-unit analysis: Reconsidering the sentence. *TESOL Quarterly*, 26(2), 390-395.

Barkaoui, K. (2016). What and when second-language learners revise when responding to timed writing tasks on the computer: The roles of task type, second language proficiency, and keyboarding skills. *The Modern Language Journal*, 100(1), 320-340.

Barkaoui, K. (2019). What can L2 writers' pausing behavior tell us about their L2 writing processes? *Studies in Second Language Acquisition*, 41(3), 529-554.

Barron, A. (2003). *Acquisition in interlanguage pragmatics*. Amsterdam: John Benjamins

Baten, K. (2011). Processability Theory and German Case Acquisition. *Language Learning*, 61(2), 455-505.

Beaman, K. (1984). Coordination and subordination revisited: Syntactic complexity in spoken and written narrative discourse. In D. Tannen (Ed.), *Coherence in spoken and written discourse* (pp. 45-80). Norwood, NJ: Ablex.

Belletti, A., Bennati, E., & Sorace, A. (2007). Theoretical and developmental issues in the syntax of subjects: Evidence from near-native Italian. *Natural Language and Linguistic Theory*, 25(4), 657-89.

Benatar, A., & Clifton, C. (2014). Newness, givenness and discourse updating: Evidence from eye movements. *Journal of Memory and Language*, 71(1), 1-16.

Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Mahwah, NJ: Erlbaum.

Berman, R. A., & Nir-Sagiv, B. (2007). Comparing narrative and expository text construction across adolescence: A developmental paradox. *Discourse Processes*, 43(2), 79-120.

Bernardini, P., & Granfeldt, J. (2019). On cross-linguistic variation and measures of linguistic complexity in learner texts: Italian, French and English. *International Journal of Applied Linguistics*, 29(2), 211-232.

Bi, P., & Jiang, J. (2020). Syntactic complexity in assessing young adolescent EFL learners' writings: Syntactic elaboration and diversity. *System*, 91, 1-10.

Biber, D., & Gray, B. (2010). Challenging stereotypes about academic writing: Complexity, elaboration, explicitness. *Journal of English for Academic Purposes*, 9(1), 2-20.

Bini, M. (1993). La adquisición del italiano: más allá de las propiedades sintácticas del parámetro pro-drop. In J. M. Liceras (Ed.), *La lingüistica y el análisis de los sistemas no nativos* (pp. 126–139). Ottawa: Doverhouse.

Birdsong, D. (1999). Introduction: Whys and why nots of the critical period hypothesis for second language acquisition. In D. Birdsong (Ed.), *Second language acquisition and the critical period hypothesis* (pp. 1-22). Mahwah, NJ: Lawrence Erlbaum Associates.

Birner, B. J., & Ward, G. (1998). *Information Status and Noncanonical Word Order in English*. Amsterdam/Philadelphia: John Benjamins.

Bock, K., & Ferreira, V. (2014). Syntactically speaking. In M. Goldrick, V. Ferreira, & M. Miozzo (Eds.), *The Oxford handbook of language production* (pp. 21-46). New York: Oxford University Press.

Bock, K., & Irwin, D. E. (1980). Syntactic effects of information availability in sentence production. *Journal of Verbal Learning & Verbal Behavior*, 19(4), 467-484.

Bock, K., & Levelt, W. (1994). Language production: Grammatical encoding. In M. A. Gernsbacher (Ed.), Handbook of psycholinguistics (pp. 945-984). New York: Academic Press.

Bohnacker, U. (2005). Nonnative acquisition of Verb Second: On the empirical underpinnings of universal L2 claims. In M. den Dikken & C. Tortora (Eds.), *The function of function words and functional categories* (pp. 41-77). Amsterdam/Philadelphia: John Benjamins.

Bohnacker, U. (2006). When Swedes begin to learn German: From V2 to V2, *Second Language Research*, 22(4), 443-486.

Bohnacker, U., & Rosén, C. (2008). The Clause-initial Position in L2 German Declaratives: Transfer of Information Structure. *Studies in Second Language Acquisition*, 30(4), 511-538.

Borer, H. (1984). *Parametric Syntax: Case Studies in Semitic and Romance Languages*. Dordrecht: Foris Publications.

Bowen, N., & Thomas, N. (2020). Manipulating texture and cohesion in academic writing: A keystroke logging study. *Journal of Second Language Writing*, 50.

Breuer, E. O. (2019). Fluency in L1 and FL: an Analysis of Planning, Essay Writing and Final Revision. In E. Lindgren & K. P. H. Sullivan (Eds.). *Observing Writing. Insights from Keystroke Logging and Handwriting* (pp. 190-211). Leiden: Brill.

Brooks, P. J., Kempe, V., & Sionov, A. (2006). The role of learner and input variables in learning inflectional morphology. *Applied Psycholinguistics*, 27(2), 185-209.

Bulté, B., & Housen, A. (2012). Defining and operationalizing L2 complexity. In A. Housen, F. Kuiken, & I. Vedder (Eds.), *Dimensions of L2 performance and proficiency. Complexity, accuracy and fluency in SLA* (pp. 21-46). Amsterdam: John Benjamins.

Büring, D. (1996). *Towards an economy-theoretic treatment of German Mittelfeld word order*. Unpublished manuscript. Frankfurt University.

Byrnes, H. (2009). Emergent L2 German writing ability in a curricular context: A longitudinal study of grammatical metaphor. *Linguistics and Education*, 20(1), 50-66.

Byrnes, H. (2012). Advanced language proficiency. In S. M. Gass & A. Mackey, *The Routledge Handbook of Second Language Acquisition* (pp. 506-521). New York: Routledge.

Byrnes, H., & Sinicrope, C. (2008). Advancedness and the development of relativization in L2 German: A curriculum-based longitudinal study. In L. Ortega & H. Byrnes (Eds.), *The longitudinal study of advanced L2 capacities* (pp. 109-138). New York: Routledge.

Calabrese, A. (1986). PRONOMINA - Some properties of the Italian pronominal system. In N. Fukui, T. Rapoport, & E. Sagey (Eds.), *MIT Working Papers in Linguistics 8: Papers in Theoretical Linguistics* (1-46). Cambridge, MA: MIT Press.

Callies, M. (2013). Advancing the Research Agenda of Interlanguage Pragmatics: The Role of Learner Corpora. In J. Romero-Trillo (Ed.), *Yearbook of Corpus Linguistics and Pragmatics 2013: New Domains and Methodologies*. Yearbook of Corpus Linguistics and Pragmatics 1 (pp. 9-36). New York: Springer.

Callies, M., & Keller, W. R. (2008). The Teaching and Acquisition of Focus Constructions: An Integrated Approach to Language Awareness Across the Curriculum. *Language Awareness*, 17(3), 249-266.

Canale, M. (1983). From communicative competence to communicative language pedagogy. In J. C. Richards & R. W. Schmidt (Eds.), *Language and communication* (pp. 2-27). London/New York: Longman.

Carroll, M., Murcia-Serra, J., Watorek, M., & Bendiscioli, A. (2000). The relevance of information organization to second language acquisition studies: The descriptive discourse of advanced adult learners of German. *Studies in Second Language Acquisition*, 22(3), 441-466.

Chafe, W. (1976). Givenness, Contrastiveness, Definiteness, Subjects, Topics, and Point of View. In C. N. Li (Ed.), *Subject and Topic* (pp. 25-55). New York: Academic Press.

Chafe, W. (1994). *Discourse, Consciousness, and Time: The Flow and Displacement of Conscious Experience in Speaking and Writing*. Chicago: The University of Chicago Press.

Chenoweth, N. A., & Hayes, J. R. (2001). Fluency in Writing: Generating Text in L1 and L2. *Written Communication*, 18(1), 80-98.

Chiarcos, C. (2009). *Mental Salience and Grammatical Form: Toward a Framework for Salience Metrics in Natural Language Generation*. Potsdam: University of Potsdam dissertation.

Choi, H.-W., (1996). *Optimizing Structure in Context: Scrambling and Information Structure*. Doctoral dissertation. Stanford University.

Chomsky, N. (1995). *The minimalist program*. Cambridge, MA: MIT Press.

Chomsky, N. (2007). Approaching UG from below. In U. Sauerland & H.-M. Gärtner (Eds.), *Interfaces + Recursion = Language? Chomsky's minimalism and the view from semantics* (pp. 1-30). Berlin/New York: Mouton De Gruyter.

Chukharev-Hudilainen, E., Feng, H.-H., Saricaoglu, A., & Torrance, M. (2019). Combined deployable keystroke logging and eyetracking for investigating cognitive processes that underlie L2 writing. *Studies in Second Language Acquisition*, 41(3), 583-604.

Clahsen, H., Meisel, J. M., & Pienemann, M. (1983). *Deutsch als Zweitsprache: Der Spracherwerb ausländischer Arbeiter*. Tübingen: Narr.

Clahsen, H., & Muysken, P. (1986). The availability of Universal Grammar to adult and child learners. *Second Language Research*, 2(2), 93–119.

Clark, H. H. (1977). Bridging. In P. N. Johnson-Laird & P. C. Wason (Eds.), *Thinking: Readings in Cognitive Science* (pp. 411-420). Cambridge: Cambridge University Press.

Clark, H. H., & Haviland, S. E. (1977). Comprehension and the given-new contract. In R. O. Freedle (Ed.), *Discourse Production and Comprehension* (pp. 1-40). Hillsdale: Lawrence Erlbaum.

Conradie, S. (2006). Investigating the acquisition of the Split-IP parameter and the V2 parameter in second language Afrikaans. *Second Language Research*, 22(1), 64-94.

Cook, G. (1989). *Discourse*. Oxford: Oxford University Press.

Council of Europe. (2020). *Common European Framework of Reference for Languages: Learning, teaching, assessment*. Cambridge: Cambridge University Press.

Crossley, S. A. (2020). Linguistic features in writing quality and development: An overview. *Journal of Writing Research*, 11(3), 415-443.

Crossley, S. A., Kyle, K. & McNamara, D. S. (2016). The Development and Use of Cohesive Devices in L2 Writing and their Relations to Judgments of Essay Quality. *Journal of Second Language Writing*, 32(1), 1-16.

Cummins, J. (1980). The cross-lingual dimensions of language proficiency: Implications for bilingual education and the optimal age issue. *TESOL Quarterly*, 14(2), 175-187. doi:10.2307/3586312.

Dahl, Östen. 2004. *The growth and maintenance of linguistic complexity. Studies in Language Companion Series*. Amsterdam: John Benjamins.

Daneš, F. (1974). Functional sentence perspective and the organization of the text. In F. Daneš (Ed.), *Papers on Functional Sentence Perspective* (pp. 106-28). Prague: Academia.

De Cat, C. (2007). French dislocation without movement. *Natural Language and Linguistic Theory* 25(3). 485-534.

De Clercq, B., & Housen, A. (2017). A Cross-Linguistic Perspective on Syntactic Complexity in L2 Development: Syntactic Elaboration and Complexity. *The Modern Language Journal*, 101(2), 315-334.

Deane, P. (2014). *Using Writing Process and Product Features to Assess Writing Quality and Explore How Those Features Relate to Other Literacy Tasks* (Research Report 14-03). Princeton, NJ: Educational Testing Service.

Deane, P., & Zhang, M. (2015). *Exploring the feasibility of using writing process features to assess text production skills* (Research Report 15-26). Princeton, NJ: Educational Testing Service.

DeKeyser, R. (1997). Beyond explicit rule learning: Automatizing second language morphosyntax. *Studies in Second Language Acquisition*, 19(2), 195-221.

DeKeyser, R. (2003). Implicit and explicit learning. In C. J. Doughty & M. H. Long (Eds.), *The Handbook of Second Language Acquisition* (pp. 313-348). Oxford: Blackwell.

DeKeyser, R. (2007). *Practice in a second language: Perspectives from applied linguistics and cognitive psychology*. Cambridge: Cambridge University Press.

De Kuthy, K. (2002). The Information Structure of Discontinuous NPs in German. In F. van Eynde, L. Hellan, & D. Beermann (Eds.), *Proceedings of the 8th HPSG Conference (Norwegian University of Science and Technology, August 3-5 2001)* (pp. 148-161). Stanford: CSLI Publications.

Derewianka, B. (2003). Grammatical metaphor in the transition to adolescence. In A.-M. Simon-Vandenbergen, M. Taverniers, & L. J. Ravelli (Eds.), *Grammatical metaphor: Views from systemic-functional linguistics* (pp. 185-219). Amsterdam: Benjamins.

Dimroth, C., & Narasimhan, B. (2012). The acquisition of information structure. In M. Krifka & R. Musan (Eds.), *The Expression of Information Structure* (pp. 319-362). Berlin: Mouton De Gruyter.

Donaldson, B. (2011). Left dislocation in near-native French. *Studies in Second Language Acquisition*, 33(3), 399-432.

Dowty, D. (1991). Thematic Proto-Roles and Argument Selection. *Language*, 67(3), 547-619.

Dryer, M. S. (1995). Frequency and Pragmatically Unmarked Word Order. In M. Noonan & P. Downing (Eds.), *Word Order in Discourse* (pp. 105-135). Amsterdam/Philadelphia: John Benjamins.

Dryer, M. S. (2005). Order of Subject, Object and Verb. In M. S. Dryer & M. Haspelmath (Eds.), *The World Atlas of Language Structures Online* (pp. 330-333). New York: Oxford University Press.

Duden. (1998). Grammatik der deutschen Gegenwartssprache. In Dudenredaktion (Eds.), *Der Duden in zwölf Bänden*. 6., neu bearbeitete Auflage. Band 4. Mannheim: Dudenverlag.

Duff, P. A., & Li, D. (2002). The acquisition and use of perfective aspect in Mandarin. In R. Salaberry & Y. Shirai (Eds.), *The L2 Acquisition of Tense-Aspect Morphology* (pp. 417-453). Amsterdam: John Benjamins.

Eckman, F. R. (1977). Markedness and the contrastive analysis hypothesis. *Language Learning*, 27(2), 315-30.

Eckman, F. R. (1985). Some theoretical and pedagogical implications of the Markedness Differential Hypothesis. *Studies in Second Language Acquisition*, 7(3), 289-307.

Ellis, N. C. (2002). Frequency effects in language processing: A review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition*, 24(2), 143-188.

Ellis, N. C. (2005). At the interface: Dynamic interactions of explicit and implicit language knowledge. *Studies in Second Language Acquisition*, 27(2), 305-352.

Ellis, N. C. (2012). Frequency-based accounts of second language acquisition. In S. M. Gass & A. Mackey, *The Routledge Handbook of Second Language Acquisition* (pp. 193-210). New York: Routledge.

Ellis, N. C., & Larsen-Freeman, D. (2009). Constructing a second language: Analyses and computational simulations of the emergence of linguistic constructions from usage. *Language Learning*, 59(Supplement 1), 93-128.

Ellis, R. (2008). *The study of second language acquisition*. Oxford: Oxford University Press.

Ellis, R. (2009). The differential effects of three types of task planning on the fluency, complexity, and accuracy in L2 oral production. *Applied Linguistics*, 30(4), 474-509.

Ellis, R., & Yuan, F. (2004). The effects of planning on fluency, complexity and accuracy in second language narrative writing. *Studies in Second Language Acquisition*, 26(1), 59-84.

Engel, U. (1988). *Deutsche Grammatik*. Heidelberg: Groos.

Erteschik-Shir, N. (2007). *Information Structure: The Syntax-Discourse Interface*. New York: Oxford University Press.

Fayol, M. (1999). From on-line management problems to strategies in written composition. In M. Torrance & G. Jeffery (Eds.), *The cognitive demands of writing: processing capacity and working memory effects in text production* (pp. 15-23). Amsterdam: Amsterdam University Press.

Fedzechkina, M., Newport, E. L., & Jaeger, T F. (2017). Balancing effort and information transmission during language acquisition: Evidence from word order and case marking. *Cognitive Science*, 41(2), 416-446.

Firbas, J. (1992). *Functional Sentence Perspective in Written and Spoken Communication*. Cambridge: Cambridge University Press.

Flower, L. S., & Hayes, J. R. (1980). The dynamics of composing: Making plans and juggling constraints. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 31-50). Hillsdale, NJ: Erlbaum.

Foley, C., & Flynn, S. (2013). The role of the native language. In J. Herschensohn & M. Young-Scholten (Eds.), *The Cambridge Handbook of Second Language Acquisition* (pp. 97-113). Cambridge: Cambridge University Press.

Foster, P., & Skehan, P. (1996). The influence of planning and task type on second language performance. *Studies in Second Language Acquisition*, 18(3), 299-323.

Frajzyngier, Z., & Shay, E. (2016). *The Role of Functions in Syntax. A unified approach to language theory, description, and typology*. Amsterdam/Philadelphia: John Benjamins.

Frey, W. (2004a). The grammar-pragmatics interface and the German prefield. *Sprache und Pragmatik* 52. 1-39.

Frey, W. (2004b). A medial topic position for German. *Linguistische Berichte*, 198, 153-190.

Galbraith, D., & Baaijen, V. M. (2019). Aligning Keystrokes with Cognitive Processes in Writing. In E. Lindgren & K. P. H. Sullivan (Eds.). Observing Writing. Insights from Keystroke Logging and Handwriting (pp. 306-325). Leiden: Brill.

Gernsbacher, M. A., & Hargreaves, D. J. (1988). Accessing sentence participants: The advantage of first mention. *Journal of Memory and Language*, 27(6), 699-717.

Giacolone Ramat, A. (2003). Introduction. In A. Giacolone Ramat (Ed.), *Typology and Second Language Acquisition* (pp. 1-18). Berlin: Mouton de Gruyter.

Givón, T. (1979). *On Understanding Grammar*. New York: Academic Press.

Givón, T. (1985). Iconicity, isomorphism, and non-arbitrary coding in syntax. In J. Haiman (Ed.), *Iconicity in Syntax. Proceedings of a symposium on iconicity in syntax (Stanford, June 24–26 1983)* (pp. 187-220). Amsterdam: John Benjamins.

Givón, T. (1991). Markedness in grammar: Distributional, communicative and cognitive correlates of syntactic structure. *Studies in Language*, 15(2), 335-370.

Givón, T. (1994). The pragmatics of de-transitive voice: Functional and typogical aspects of inversion. In T. Givón (Ed.), *Voice and Inversion* (pp. 3-46). Amsterdam/Philadelphia: John Benjamins.

Givón, T. (2001). *Syntax*. 2 volumes. Amsterdam/Philadelphia: John Benjamins.

Gleitman L. R., January D., Nappa R., & Trueswell J. C. (2007). On the give and take between event apprehension and utterance formulation. *Journal of Memory and Language*, 57(4), 544-569.

Godfroid, A., Loewen, S., Jung, S., Park, J.-H., Gass, S., & Ellis, R. (2015). Timed and untimed grammaticality judgments measure different distinct types of knowledge. *Studies in Second Language Acquisition*, 37(2), 269-297.

Goldberg, A. E. (1995). *Constructions*. Chicago: The University of Chicago Press.

Gorsuch, R. L. (1983). Factor Analysis. Hillsdale, NJ: Lawrence Erlbaum Associates.

Götze, M., Weskott, T., Endriss, C., Fiedler, I., Hinterwimmer, S., Petrova, S., Schwarz, A., Skopeteas, S., & Stoel, R. (2007). Information structure. In S. Dipper, M. Götze, & S. Skopeteas (Eds.), *Interdisciplinary Studies on Information Structure*, vol. 7, *Information structure in cross-linguistic corpora: annotation guidelines for morphology, syntax, semantics, and information structure* (pp. 145-187). Potsdam: Universitätsverlag Potsdam.

Graesser, A. C., McNamara, D., Louwerse, M., & Cai, Z. (2004). Coh-Metrix: Analysis of text on cohesion and language. *Behavior Research Methods, Instruments, and Computers*, 36(2), 193-202.

Greenberg, J. H. (1963). Some universals of grammar with particular reference to the order of meaningful elements. In J. H. Greenberg (Ed.), *Universals of Language* (pp. 73-113). Cambridge, MA: MIT Press.

Greenberg, J. H. (1966). *Language Universals (with special reference to feature hierarchies)*. The Hague: Mouton.

Grewendorf, G. (1988). *Aspekte der deutschen Syntax*. Tübingen: Narr.

Grewendorf, G. (2002). *Minimalistische Syntax*. Tübingen/Basel: Francke/UTB.

Grotjahn, R. (Ed.) (2002). *Der C-Test: Theoretische Grundlagen und praktische Anwendungen*. Bochum: AKS Verlag.

Gundel, J. K. (1988). Universals of topic-comment structure. In M. Hammond, E. Moravczik, & J. Wirth (Eds.), *Studies in syntactic typology* (pp. 209-239). Amsterdam: John Benjamins.

Gyllstad, H., Granfeldt, J., Bernardini, P., & Källkvist, M. (2014). Linguistic correlates to communicative proficiency levels of the CEFR: The case of syntactic complexity in written L2 English, L3 French and L4 Italian. In L. Roberts, I. Vedder, & J. H. Hulstijn (Eds.), *EUROSLA yearbook 14*, vol. 14 (pp. 1-30). Amsterdam: John Benjamins.

Haider, H., & Rosengren, I. (2003). Scrambling: Nontriggered chain formation in OV languages. *Journal of Germanic Linguistics*, 15(3), 203-267.

Håkansson, G., Pienemann, M., & Sayehli, S. (2002). Transfer and typological proximity in the context of language processing. *Second Language Research*, 18(3), 250-273.

Halliday, M. A. K. (1967). Notes on transitivity and theme in English. Part 1. *Journal of Linguistics*, 3(1), 37-81.

Halliday, M. A. K. (1989). *Spoken and written language*. Oxford: Oxford University Press.

Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and Education*, 5(3), 93-116.

Hawes, T. (2015). Thematic progression in the writing of students and professionals. *Ampersand*, 2, 93-100.

Hawkins, J. A. (1994). *A performance theory of order and constituency*. Cambridge: Cambridge University Press.

Hawkins, J. A. (2009). An efficiency theory of complexity and related phenomena. In G. Sampson, D. Gil, & P. Trudgill (Eds.), *Language complexity as an evolving variable* (pp. 252-268). Oxford: Oxford University Press.

Hayes, J. R. (1996). A new framework for understanding cognition and affect in writing. In: C. M. Levy & S. E. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 1-27). Mahwah, NJ: Lawrence Erlbaum.

Hayes, J. R. (2012). Modeling and remodeling writing. *Written communication*, 29(3), 369-388.

Hayes, J. R., Flower, L. S. (1980). Identifying the organization of writing processes. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3-30). Hillsdale, NJ: Erlbaum.

Hendriks, H. (2000). The acquisition of topic in Chinese L1 and French L1 and L2. *Studies in Second Language Acquisition*, 22(3), 369-397.

Hertel, T. J. (2003). Lexical and discourse factors in the second language acquisition of Spanish word order. *Second Language Research*, 19(4), 273-304.

Heylen, K. (2005). A quantitative corpus study of German word order variation. In S. Kepser & M. Reis (Eds.), *Linguistic evidence* (pp. 241-264). Berlin: Mouton De Gruyter.

Himmelmann, N. P. (1996). Demonstratives in narrative discourse: A taxonomy of universal uses. In B. A. Fox (Ed.), *Studies in Anaphora* (pp. 205-254). Amsterdam/Philadelphia: John Benjamins.

Hoberg, U. (1981). *Die Wortstellung in der geschriebenen deutschen Gegenwartssprache*. München: Hueber.

Höhle, T. N. (1982). Explikation für "normale Betonung" und "normale Wortstellung". In W. Abraham (Ed.), *Satzglieder im Deutschen* (pp. 75-153). Tübingen: Narr.

Höhle, T. N. (1986). Der Begriff „Mittelfeld": Anmerkungen über die Theorie der topologischen Felder. In: W. Weiß, H. E. Wiegand, & M. Reis (Eds.), *Akten des VII. Kongresses der Internationalen Vereinigung für germanische Sprach- und Literaturwissenschaft. Göttingen 1985*, Band 3, *Textlinguistik contra Stilistik? – Wortschatz und Wörterbuch – Grammatische oder pragmatische Organisation von Rede* (Kontroversen, alte und neue 4) (pp. 329-340). Tübingen: Max Niemeyer Verlag.

Hopp, H. (2009). The syntax–discourse interface in near-native L2 acquisition: Off-line and on-line performance. *Bilingualism: Language and Cognition*, 12(4), 463-483.

Hopp, H. (2015). Individual differences in the L2 processing of object-subject ambiguities. *Applied Psycholinguistics*, 36(2), 129-173.

Hulstijn, J. (2002). Towards a unified account of the representation, processing and acquisition of second language knowledge. *Second Language Research*, 18(3), 193-223.

Hunt, K. W. (1970). Syntactic maturity in schoolchildren and adults. *Monographs of the Society for Research in Child Development*, 35, 1-67.

Hyman, L. M. (1983): Form and Substance in Language Universals. *Linguistics*, 21(1), 67-86.

Iggesen, O. A. (2005). Number of Cases. In M. S. Dryer & M. Haspelmath (Eds.), *The World Atlas of Language Structures Online* (pp. 202-205). New York: Oxford University Press.

Ivanov, I. (2009). Topicality and clitic doubling in L2 Bulgarian: a test case for the interface hypothesis. In M. Bowles, T. Ionin, S. Montrul, & A. Tremblay (Eds.), *Proceedings of the 10th Generative Approaches to Second Language Acquisition Conference (GASLA 2009)* (pp. 17-27). Somerville, MA: Cascadilla.

Jackson, C. N. (2007). The use and non-use of semantic information, word order, and case markings during comprehension by L2 learners of German. *The Modern Language Journal*, 91(3), 418-432.

Jackson, C. N., & Bobb, S. C. (2009). The processing and comprehension of wh-questions among second language speakers of German. *Applied Psycholinguistics*, 30(4), 603-636.

Jackson, C. N., & Dussias, P. E. (2009). Cross-linguistic differences and their impact on L2 sentence processing. *Bilingualism: Language and Cognition*, 12(1), 65-82.

Jaeger, T. F., & Tily, H. (2010). On language "utility": processing complexity and communicative efficiency. *WIREs Cognitive Science*, 2(3), 323-335.

Jiang, J., Bi, P., & Liu, H. (2019). Syntactic complexity development in the writings of EFL learners: Insights from a dependency syntactically-annotated corpus. *Journal of Second Language Writing*, 46, 1-13.

Jung, E. H. (2004). Topic and Subject Prominence in Interlanguage Development. *Language Learning*, 54(4), 713-718.

Kasper, G., & Dahl, M. (1991). Research methods in interlanguage pragmatics. *Studies in Second Language Acquisition*, 13(2), 215-247.

Kaufer, D., Hayes, J., & Flower, L. (1986). Composing written sentences. *Research in the Teaching of English*, 20(2), 121-140.

Kellerman, E. (1995). Crosslinguistic Influence: Transfer to Nowhere? *Annual Review of Applied Linguistics*, 15, 125-150.

Kellogg, R. (1996). A model of working memory in writing. In M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 57-72). Mahwah, NJ: Erlbaum.

Kempe, V., & MacWhinney, B. (1998). The acquisition of case marking by adult learners of Russian and German. *Studies in Second Language Acquisition*, 20(4), 543-587.

Kempe, V., & MacWhinney, B. (1999). Processing of morphological and semantic cues in Russian and German. *Language and Cognitive Processes*, 14(2), 129-171.

Kempen, G., & Harbusch, K. (2005). The relationship between grammaticality ratings and corpus frequencies: a case study into word-order variability in the midfield of German clauses. In M. Reis & S. Kepser (Eds.), *Linguistic Evidence* (pp. 329-349). Berlin: De Gruyter.

Kilborn, K. (1992). On-line integration of grammatical information in a second Language. In R. J. Harris (Ed.), *Cognitive Processing in Bilinguals* (pp. 337-350). Amsterdam: Elsevier.

Klein, W., & Perdue, C.. (1992). *Utterance Structure: Developing Grammars again*. Amsterdam: John Benjamins.

Klein, W., & Perdue, C. (1997). The Basic Variety (Or: Couldn't natural languages be much simpler?). *Second Language Research*, 13(4), 301-347.

Kraš, T. (2008). Anaphora resolution in near-native Italian grammars: Evidence from native speakers of Croatian. *EuroSLA Yearbook*, 8, 107-34.

Kuiken, F., & Vedder, I. (2017). Functional adequacy in L2 writing: Towards a new rating scale. *Language Testing*, 34(3), 321-336.

Kuiken, F., & Vedder, I. (2019). Syntactic complexity across proficiency and languages: L2 and L1 writing in Dutch, Italian and Spanish. *International Journal of Applied Linguistics*, 29(2), 192-210.

Kuiken, F., Vedder, I., Gilabert, R. (2010). Communicative adequacy and linguistic complexity in L2 writing. In I. Bartning, M. Martin, & I. Vedder (Eds.), *Communicative proficiency and linguistic development: intersections between SLA and language testing research* (pp. 81-100). EUROSLA Monograph Series 1.

Lambert, C., & Kormos, J. (2014). Complexity, accuracy, and fluency in task-based L2 research: Toward more developmentally based measures of second language acquisition. *Applied Linguistics*, 35(5), 606-614.

Lambert, Craig and Sachiko Nakamura. 2019. Proficiency-related variation in syntactic complexity: A study of English L1 and L2 oral descriptive discourse. *International Journal of Applied Linguistics* 29(2). 248-264.

Lambrecht, K. (1994). *Information Structure and Sentence Form. Topic, Focus and the Mental Representations of Discourse Referents*. Cambridge: Cambridge University Press.

Langacker, R. W. (1987). *Foundations of Cognitive Grammar*. Stanford: Stanford University Press.

Langacker, R. W. (1997). Constituency, dependency, and conceptual grouping. *Cognitive Linguistics*, 8(1), 1-32.

Langacker, R. W. (2008). *Cognitive Grammar: A Basic Introduction*. New York: Oxford University Press.

Lardiere, D. (1998). Case and tense in the "fossilized" steady state. *Second Language Research,* 14(1), 1-26.

Lardiere, D. (2009). Some thoughts on the contrastive analysis of features in second language acquisition. *Second Language Research,* 25(2), 173-227.

Larson-Hall, J. (2008). Weighing the benefits of studying a foreign language at a younger starting age in a minimal input situation. *Second Language Research*, 24(1), 35-63.

Lecouvet, M. (2021). Non-canonical word order as a measure of syntactic complexity in advanced L2 German. *International Review of Applied Linguistics in Language Teaching*, 1-31.

Lecouvet, M., Degand, L., & Suñer, F. (2021). Syntax-discourse discourse properties of prefield constituents in L2 German expository writing. *Linguistische Berichte*, 267, 277-308.

Lecouvet, M., Degand, L., & Suñer, F. (2021). Unclogging the Bottleneck: The role of case morphology in L2 acquisition at the syntax-discourse interface. *Language Acquisition*, 28(3), 241-271.

Lecouvet, M., Degand, L., & Suñer, F. (2021). The effect of L2 writers' pausing and revision behaviors on performance in syntax and discourse organization: A keystroke-logging study. Manuscript submitted for publication.

Lee, E. (2020). The universal topic prominence stage hypothesis and L1 transfer: A study of L2 Korean written narratives by L1 English and L1 Chinese speakers. *Linguistic Approaches to Bilingualism*, 10(2), 184-215.

Leijten, M., & Van Waes, L. (2013). Keystroke Logging in Writing Research: Using Inputlog to Analyze and Visualize Writing Processes. *Written Communication*, 30(3), 358-392.

Lenerz, J. (1977). *Zur Abfolge nominaler Satzglieder im Deutschen*. Tübingen: Narr.

Lenerz, J. (2001). Word order variation: competition or co-operation? In G. Müller & W. Sternefeld (Eds.), *Competition in Syntax* (pp. 249-281). Berlin/New York: Mouton De Gruyter.

Lenneberg, E. (1967). *The biological foundations of language*. New York: Wiley and Sons.

Lindgren, E., Spelman Miller, K., & Sullivan, K. P. H. (2008). Development of fluency and revision in L1 and L2 writing in Swedish high school years eight and nine. *ITL International Journal of Applied Linguistics,* 156, 133-151.

LoCastro, V. (2011). Second language pragmatics. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning*, vol. 2 (pp. 319-344). New York: Routledge.

López-Beltrán, P., Johns, M. A., Dussias, P. E., Lozano, C., & Palma, A. (2021). The effects of information structure in the processing of word order variation in the second language. *Second Language Research*, 1-32.

Lötscher, A. (1985). Syntaktische Bedingungen der Topikalisierung. *Deutsche Sprache*, 13(3), 207-229.

Lozano, C. (2006). Focus and split intransitivity: The acquisition of word order alternations and unaccusativity in L2 Spanish. *Second Language Research*, 22(2), 145-187.

Lozano, C. (2018). The development of anaphora resolution at the syntax–discourse interface: Pronominal subjects in Greek learners of Spanish. *Journal of Psycholinguistic Research*, 47(2), 411-430.

Lozano, C., & Callies, M. (2018). Word order and information structure in advanced SLA. In P. A. Malovrh & A. G. Benati (Eds.), *The Handbook of Advanced Proficiency in Second Language Acquisition* (pp. 419-441). Oxford: Wiley-Blackwell.

Lu, X., & Ai, H. (2015). Syntactic complexity in college-level English writing: Differences among writers with diverse L1 backgrounds. *Journal of Second Language Writing*, 29, 16-27.

Lu, X. (2011). A corpus-based evaluation of syntactic complexity measures as indices of college-level ESL writers' language development. *TESOL Quarterly*, 45(1), 36-62.

Mackey, A., & Gass, S. M. (2005). *Second language research: Methodology and design*. Mahwah, NJ: Lawrence Erlbaum Associates.

MacWhinney, B. (2008). A unified model. In N. C. Ellis & P. Robinson (Eds.), *Handbook of cognitive linguistics and second language acquisition* (pp. 341-371). New York: Routledge.

Mamprin, S., & Stede, M. (2016). Aboutness Topik. In M. Stede (Ed.), *Handbuch Textannotation* (pp. 89-110). Potsdam: Universitätsverlag Potsdam.

Manchón, R., & Roca de Larios, J. (2007). On the temporal nature of planning in L1 and L2 composing: A study of foreign language writers. *Language Learning*, 57(4), 549-593.

Martin, M., Mustonen, S., Reiman, N., & Seilonen, M. (2010). On becoming an independent user. In I. Bartning, M. Martin, & I. Vedder (Eds.), *Communicative proficiency and linguistic development: intersections between SLA and language testing research* (pp. 57-80). EUROSLA Monograph Series 1.

Mauranen, A. (1996). Discourse Competence Evidence from Thematic Development in Native and Nonnative Texts. In E. Ventola & A. Mauranen (Eds.), Academic Writing: Intercultural and Textual Issues (pp. 195-230). Amsterdam: John Benjamins.

Mazgutova, D., & Kormos, J. (2015). Syntactic and lexical development in an intensive English for Academic Purposes programme. *Journal of Second Language Writing*, 29,

McCutchen, D. (1996). A capacity theory of writing: Working memory in composition. *Educational Psychology Review*, 8(3), 299-325.

Medimorec, S., & Risko, E. F. (2017). Pauses in written composition: On the importance of where writers pause. *Reading and Writing*, 30, 1267-1285.

Mendikoetxea, A., & Lozano, C. (2018). From Corpora to Experiments: Methodological Triangulation in the Study of Word Order at the Interfaces in Adult Late Bilinguals (L2 learners). *Journal of Psycholinguistic Research*, 47(4), 871-898.

Menn, L., & Duffield, C. J. (2014). Looking for a 'Gold Standard' to measure language complexity: what psycholinguistics and neurolinguistics can (and cannot) offer to formal linguistics. In F. J. Newmeyer & L. B. Preston (Eds.), *Measuring Grammatical Complexity* (pp. 281-302). Oxford: Oxford University Press.

Miestamo, M. (2008). Grammatical complexity in a cross-linguistic perspective. In M. Miestamo, K. Sinnemäki, & F. Karlsson (Eds.), *Language complexity: Typology, contact, change* (pp. 23-41). Amsterdam: Benjamins.

Mithun, M. (1992). Is basic word order universal? In D. L. Payne (Ed.), *Pragmatics of Word Order Flexibility* (pp. 15-62). Amsterdam/Philadelphia: John Benjamins.

Montrul, S., & Rodriguez Louro, C. (2006). Beyond the syntax of the Null Subject Parameter: A look at the discourse-pragmatic distribution of null and overt subjects by L2 learners

of Spanish. In V. Torrens & L. Escobar (Eds.), *The Acquisition of Syntax in Romance Languages* (pp. 401-418). Amsterdam/ Philadelphia: John Benjamins.

Morris, E. K., Caruso, T., Buscot, F., Fischer, M., Hancock, C., Maier, T. S., Meiners, T., et al. (2014). Choosing and using diversity indices: insights for ecological applications from the German Biodiversity Exploratories. *Ecology and Evolution*, 4(18), 3514-3524.

Moya Guijarro, A. J. (2001). Topicality chains in two discourse genres. *Estudios Ingleses de la Universidad Complutense*, 9, 103-128.

Myachykov, A., & Tomlin, R. S. (2008). Perceptual priming and structural choice in Russian sentence production. *Journal of Cognitive Science*, 6(1), 31-48.

Nakahama, Y. (2009). Cross-linguistic influence on referent introduction and tracking in Japanese as a second language. *The Modern Language Journal*, 93(2), 241-260.

Neary-Sundquist, C. A. (2017). Syntactic complexity at multiple proficiency levels of L2 German speech. *International Journal of Applied Linguistics*, 27(1), 242-262.

Neeleman, A. (1994). *Complex predicates*. Doctoral dissertation. University of Utrecht.

Norris, J. M., & Ortega, L. (2009). Towards an organic approach to investigating CAF in instructed SLA: The case of complexity. *Applied Linguistics*, 30(4), 555-578.

Nottbusch, G. (2010). Grammatical planning, execution, and control in written sentence production. *Reading & Writing*, 23(7), 777-801.

Olinghouse, N. G., Graham, S., & Gillespie, A. (2015). The relationship of discourse and topic knowledge to fifth graders' writing performance. *Journal of Educational Psychology*, 107(2), 391-406.

Ortega, L. (2003). Syntactic complexity measures and their relationship to L2 proficiency: A research synthesis of college-level L2 writing. *Applied Linguistics*, 24(4), 492-518.

Ortega, L. (2012). Interlanguage complexity: A construct in search of theoretical renewal. In B. Kortmann & B. Szmrecsanyi (Eds.), *Linguistic complexity: Second language acquisition, indigenization, contact* (pp. 127-155). Berlin: Mouton De Gruyter.

Ortega, L. (2015). Syntactic complexity in L2 writing: Progress and expansion. *Journal of Second Language Writing*, 29, 82-94.

Pallotti, G. (2009). CAF: Defining, refining and differentiating constructs. *Applied Linguistics*, 30(4), 590-601.

Pallotti, G. (2015). A simple view of linguistic complexity. *Second Language Research*, 31(1), 117-134.

Paul, H. (1920). *Prinzipien der Sprachgeschichte*. Tübingen: Max Niemeyer (5th edition, 1st edition 1880).

Pienemann, M. (1998). *Language processing and second language development: Processability Theory*. Amsterdam: John Benjamins.

Polio, C. (2001). Research methodology in second language writing research: The case of text-based studies. In T. Silva & P. K. Matsuda (Eds.), *On second language writing* (pp. 91-115). Mahwah, NJ: Lawrence Erlbaum.

Prévost, P. (1999). The Second Language Acquisition of the Split CP Structure. In E. C. Klein & G. Martohardjono (Eds.), *The development of second language grammars: A generative approach* (pp. 45-79). Amsterdam: John Benjamins.

Prince, E. F. (1981). Towards a taxonomy of given-new information. In P. Cole (Ed.), *Radical Pragmatics* (pp. 223-256). New York: Academic Press.

Rast, R. (2008). *Foreign Language Input: Initial Processing.* Clevedon: Multilingual Matters.

Reinhart, T. (1982). *Pragmatics and linguistics: An analysis of sentence topics*. Bloomington: Indiana University Linguistics Club.

Révész, A., Kourtali, N.-E., & Mazgutova, D. (2017). Effects of task complexity on L2 writing behaviors and linguistic complexity. *Language Learning*, 67(1), 208-241.

Révész, A., Michel, M., & Lee, M. (2019). Exploring second language writers' pausing and revision behaviors: A mixed-methods study. *Studies in Second Language Acquisition*, 41, 605-631.

Reznicek, M, Lüdeling, A., Krummes, C., Schwantuschke, F., Walter, M., Schmidt, K., Hirschmann, H., & Andreas, T. (2012). *Das Falko-Handbuch: Korpusaufbau und Annotationen: Version 2.01*. Berlin: Humboldt-Universität zu Berlin.

Riester, A., & Baumann, S. (2017). *The RefLex Scheme - Annotation Guidelines*. SinSpeC, vol. 14. Working papers of the SFB 732. University of Stuttgart.

Roberts, L., Gullberg, M., & Indefrey, P. (2008). On-line pronoun resolution in L2 discourse: L1 influence and general learner effects. *Studies in Second Language Acquisition*, 30(3), 333-357.

Roca de Larios, J., Manchón, R., Murphy, L., & Marín, J. (2008). The foreign language writer's strategic behaviour in the allocation of time to writing processes. *Journal of Second Language Writing*, 17(1), 30-47.

Roca de Larios, J., Marín, J., & Murphy, L. (2001). A Temporal Analysis of Formulation Processes in L1 and L2 Writing. *Language Learning*, 51(3), 497-538.

Roca de Larios, J., Murphy, L., & Manchón, R. (1999). The use of restructuring strategies in EFL writing: A study of Spanish learners of English as a Foreign Language. *Journal of Second Language Writing*, 8(1), 13-44.

Roca de Larios, J., Manchón, R., & Murphy, L. (2006). Generating text in native and foreign language writing: A temporal analysis of problem-solving formulation processes. *The Modern Language Journal*, 90(1), 100-114.

Romero Trillo, J. (2002). The pragmatic fossilization of discourse markers in non-native speakers of English. *Journal of Pragmatics*, 34(6), 769-784

Rosén, C. (2006). *Warum klingt das nicht deutsch? Probleme der Informationsstrukturierung in deutschen Texten schwedischer Schüler und Studenten*. Stockholm: Almqvist & Wiksell International.

Rothman, J. (2009). Pragmatic deficits with syntactic consequences? L2 pronominal subjects and the syntax-pragmatics interface. *Journal of Pragmatics*, 41(5), 951-973.

Ryshina-Pankova, M. (2010). Toward Mastering the Discourses of Reasoning: Use of Grammatical Metaphor at Advanced Levels of Foreign Language Acquisition. *The Modern Language Journal*, 94(2), 181-197.

Ryshina-Pankova, M. (2015). A meaning-based approach to the study of complexity in L2 writing: The case of grammatical metaphor. *Journal of Second Language Writing*, 29, 51-63.

Sasaki, M., & Hirose, K. (1996). Explanatory variables for EFL students' expository writing. *Language Learning*, 46(1), 137-174.

Scherag, A., Demuth, L., Rösler, F., Neville, H. J., & Röder, B. (2004). The effects of late acquisition of L2 and the consequences of immigration on L1 for semantic and morpho-syntactic language aspects. *Cognition*, 93(3), 97-108.

Schleppegrell, M. J. (2006). The linguistic features of advanced language use: The grammar of exposition. In H. Byrnes (Ed.), *Advanced language learning: The contribution of Halliday and Vygotsky* (pp. 134-146). London: Continuum.

Schmidt, R. (1992). Psychological mechanisms underlying second language fluency. *Studies in Second Language Acquisition*, 14(4), 357-385.

Schoonen, R., van Gelderen, A., De Glopper, K., Hulstijn, J., Simis, A., Snellings, P., & Stevenson, M. (2003). First language and second language writing: The role of linguistic knowledge, speed of processing, and metacognitive knowledge. *Language Learning*, 53(1), 165-202.

Scott, C. M. (2004). Syntactic ability in children and adolescents with language and learning disabilities. In R. A. Berman (Ed.), *Language development across childhood and adolescence* (pp. 111-133). Amsterdam: Benjamins.

Segalowitz, N. (2003). Automaticity and second languages. In C. Doughty & M. Long (Eds.), *Handbook of second language acquisition theory and research* (pp. 382-408). Malden, MA: Blackwell.

Sgall, P., Hajičová, E., & Panevová, J. (1986). *The Meaning of the Sentence in its Semantic and Pragmatic Aspects*. Dordrecht: Reidel.

Sharwood Smith, M., & Truscott, J. (2006). Full transfer full access: a processing oriented interpretation. In S. Unsworth, T. Parodi, A. Sorace, & M. Young-Scholten (Eds.),

Paths of development in L1 and L2 acquisition: In honor of Bonnie D. Schwartz (pp. 201-216). Amsterdam: John Benjamins.

Shaw, S. D., & Weir, C. J. (2007). *Examining Writing: Research and practice in assessing second language writing.* Studies in Language Testing 26. Cambridge: Cambridge University Press.

Siewierska, A. (1993). On the interplay of factors in the determination of word order. In J. Jacobs, A. von Stechow, W. Sternefeld, & T. Vennemann (Eds.), *Syntax: An International Handbook of Contemporary Research* (pp. 826-846). Berlin: De Gruyter.

Skopeteas, S., & Fanselow, G. (2009). Effects of givenness and constraints on free word order. In M. Zimmermann & C. Féry (Eds.), *Information Structure: Theoretical, typological, and experimental perspectives* (pp. 307-331). New York: Oxford University Press.

Slabakova, R. (2006). Is there a critical period for semantics? *Second Language Research*, 22(3), 302-338.

Slabakova, R. (2013). What is easy and what is hard in second language acquisition: A generative perspective. In M. del Pilar García Mayo, M. Juncal Gutiérrez Mangado, & M. Martínez-Adrián (Eds.), *Contemporary Approaches to Second Language Acquisition* (pp. 5-28). Amsterdam: John Benjamins.

Slabakova, R. (2015). The effect of construction frequency and native transfer on second language knowledge of the syntax–discourse interface. *Applied Psycholinguistics*, 36(3), 671-699.

Slabakova, R., & Ivanov, I. (2011). A more careful look at the syntax–discourse interface. *Lingua*, 121, 637-651.

Slabakova, R., Kempchinsky, P., & Rothman, J. (2012). Clitic-doubled left dislocation and focus fronting in L2 Spanish: A case of successful acquisition at the syntax–discourse interface. *Second Language Research*, 28(3), 319-343.

Smeets, L. (2019). The acquisition of object movement in Dutch: L1 transfer and near-native grammars at the syntax–discourse interface. *Second Language Research*, 35(4), 479-504.

Snellings, P., van Gelderen, A., & De Glopper, K. (2004). The effect of enhanced lexical retrieval on L2 writing: A classroom experiment. *Applied Psycholinguistics*, 25(2), 175-200.

Sorace, A. (2003). Near-nativeness. In C. J. Doughty & M. H. Long (Eds.), *The Handbook of Second Language Acquisition* (pp. 130-151). Oxford: Blackwell.

Sorace, A. (2005). Syntactic optionality at interfaces. In L. Cornips & K. P. Corrigan (Eds.), *Syntax and variation: Reconciling the biological and the social* (pp. 46-111). Amsterdam: John Benjamins.

Sorace, A. (2011). Pinning down the concept of 'interface' in bilingualism. *Linguistic Approaches to Bilingualism*, 1(1), 1-33.

Sorace, A., & Filiaci, F. (2006). Anaphora resolution in near-native speakers of Italian. *Second Language Research*, 22(3), 339-68.

Sorace, A., & Serratrice, L. (2009). Internal and external interfaces in bilingual language development: Beyond structural overlap. *International Journal of Bilingualism*, 13(2), 195-210.

Spelman Miller, K. (2000). Academic writers on-line: Investigating pausing in the production of text. *Language Teaching Research*, 4, 123-148.

Spelman Miller, K., Lindgren, E., & Sullivan, K. P. H. (2008). The Psycholinguistic Dimension in Second Language Writing: Opportunities for Research and Pedagogy Using Computer Keystroke Logging. *TESOL Quarterly*, 42(3), 433-454.

Speyer, A. (2004). Competing Constraints on Vorfeldbesetzung in German. In B. Shaer, W. Frey, & C. Maienborn (Eds.), *Proceedings of the Dislocated Elements Workshop. ZAS Papers in Linguistics* (ZASPiL 35, vol. 2) (pp. 519-541). Berlin: Zentrum Allgemeine Sprachwissenschaft.

Spoelman, M., & Verspoor, M. (2010). Dynamic patterns in development of accuracy and complexity: A longitudinal case study in the acquisition of Finnish. *Applied Linguistics*, 31(4), 532-533.

Staples, S., Egbert, J., Biber, D., & Gray, B. (2016). Academic Writing Development at the University Level: Phrasal and Clausal Complexity across Level of Study, Discipline, and Genre. *Written Communication*, 33(2), 149-183.

Stede, M. (2016). Konnektoren und Argumente. In M. Stede (Ed.), *Handbuch Textannotation. Potsdamer Kommentarkorpus 2.0* (pp. 111-131). Potsdam: Universitätsverlag Potsdam.

Stevenson, M., Schoonen, R., & de Glopper, K. (2006). Revising in two languages: A multi-dimensional comparison of online writing revisions in L1 and FL. *Journal of Second Language Writing*, 15, 201-233.

Texeira, J. (2020). Gradient optionality in L2 acquisition at the syntax-discourse interface: Evidence from inversion in advanced and near-native English. *Lingua*, 245, 1-37.

Thorson, H. (2000). Using the computer to compare foreign and native language writing processes: A statistical and case study approach. *The Modern Language Journal*, 84(2), 155-170.

Tiryakioglu, G., Peters, E., & Verschaffel, L. (2019). The Effect of L2 Proficiency Level on Composing Processes of EFL Learners: Data from Keystroke Loggings, Think Alouds and Questionnaires. In E. Lindgren & K. P. H. Sullivan (Eds.). *Observing Writing. Insights from Keystroke Logging and Handwriting* (pp. 212-235). Leiden: Brill.

Tomaselli, A., & Schwartz, B. D. (1990). Analysing the acquisition stages of negation in L2 German: Support for UG in adult SLA. *Second Language Research*, 6(1), 1-38.

Tomlin, R. S. (1995). Focal attention, voice, and word order. An experimental, cross-linguistic study. In M. Noonan & P. Downing (Eds.), *Word Order in Discourse* (517-554). Amsterdam/Philadelphia: John Benjamins

Torrance, M., & Galbraith, D. (2006). The Processing Demands of Writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 67-80). New York: The Guilford Press.

Towell, R. (2012). Complexity, accuracy and fluency from the perspective of psycholinguistic second language acquisition research. In A. Housen, F. Kuiken, & I. Vedder (Eds.), *Dimensions of L2 performance and proficiency: Complexity, accuracy and fluency in SLA* (pp. 47-69). Philadelphia/Amsterdam: Benjamins.

Tsimpli, I., Sorace, A., Heycock, C., & Filiaci, F. (2004). First language attrition and syntactic subjects: a study of Greek and Italian near-native speakers of English. *International Journal of Bilingualism*, 8(3), 257-277.

Ullman, M. T. (2001). The Neural Basis of Lexicon and Grammar in First and Second Language: The Declarative/Procedural Model. *Bilingualism: Language and Cognition*, 4(2), 105-122.

Van den Bergh, H., Rijlaarsdam, G., & Breetvelt, I. (1993). Revision process and text quality: An empirical study. In G. Eigler & Th. Jechle (Eds.), *Writing: Current Trends in European Research* (pp. 133-147). Freiburg: Hochschulverlag.

Van Dijk, T. A. (1988). *News as Discourse*. Hillsdale, N.J.: Erlbaum.

Van Waes, L., & Leijten, M. (2015). Fluency in writing: A multidimensional perspective on writing fluency applied to L1 and L2. *Computers and Composition: An International Journal*, 38, 79-95.

VanPatten, B., & Smith, M. (2019). Word-order typology and the acquisition of case marking: A self-paced reading study in Latin as a second language. *Second Language Research*, 35(3), 397-420.

Verspoor, M., Lowie, W., Chan H. P., & Vahtrick L. (2017). Linguistic complexity in second language development: Variability and variation at advanced stages. *Recherches en didactique des langues et des cultures. Les cahiers de l'Acedle*, 14(1), 1-27.

Victori, M. (1999). An analysis of writing knowledge in EFL composing: a case study of two effective and two less effective writers. *System*, 27(4), 537-555.

von der Gabelentz, G. (1869). Ideen zu einer vergleichenden Syntax - Wort und Satzstellung. *Zeitschrift für Völkerpsychologie und Sprachwissenschaft*, 6, 376-384.

Vyatkina, N. (2012). The development of second language writing complexity in groups and individuals: A longitudinal learner corpus study. *The Modern Language Journal*, 96(4), 572-594.

Vyatkina, N. (2013). Specific Syntactic Complexity: Developmental Profiling of Individuals Based on an Annotated Learner Corpus. *The Modern Language Journal*, 97(1), 11-30.

Walker, M. A., Joshi, A. K., & Prince, E. F. (Eds.). (1998). *Centering Theory in Discourse*. Oxford: Clarendon Press.

Weber, A., & Müller, K. (2004). Word order variation in German main clauses: A corpus analysis. In S. Hansen-Schirra, S. Oepen, & H. Uszkoreit (Eds.), *Proceedings of the 5th International Workshop on Linguistically Interpreted Corpora [LINC 04]* (pp. 71-78). Geneva.

Wengelin, A. (2006). Examining pauses in writing: Theory, methods and empirical data. In K. P. H. Sullivan & E. Lindgren (Eds.), *Computer key-stroke logging: Methods and applications* (pp. 107-130). Oxford: Elsevier.

Weskott, T., Hörnig, R., Fanselow, G., & Kliegl, R. (2011). Contextual Licensing of Marked OVS Word Order in German. *Linguistische Berichte*, 225, 3-18.

Westergaard, M. (2021). Microvariation in multilingual situations: The importance of property-by-property acquisition. *Second Language Research*, 37(3), 379-407.

Whalen, K., & Ménard, N. (1995). L1 and L2 writers' strategic and linguistic knowledge: A model of multiple-level discourse processing. *Language Learning*, 45, 381-418.

White, L. (1991). Adverb placement in second language acquisition: Some effects of positive and negative evidence in the classroom. *Second Language Research*, 7(2), 133-161.

White, L. (2011). Second language acquisition at the interfaces. *Lingua*, 121, 577-90.

Whong-Barr, M. (2006). What transfers? In S. Unsworth, T. Parodi, A. Sorace, & M. Young-Scholten (Eds.), *Paths of development in L1 and L2 acquisition: In honor of Bonnie D. Schwartz* (pp. 187-199). Amsterdam: John Benjamins.

Wierzba, M., & Fanselow, G. (2020). Factors influencing the acceptability of object fronting in German. *The Journal of Comparative Germanic Linguistics*, 23(1), 77-124.

Wilson, F. (2009). *Processing at the syntax–discourse interface in second language acquisition*. Unpublished doctoral dissertation. University of Edinburgh.

Wolfe-Quintero, K., Inagaki, S., & Kim, H.-Y. (1998). *Second language development in writing: Measures of fluency, accuracy, and complexity*. Honolulu, HI: University of Hawai'I Press.

Xu, C. (2018). Understanding online revisions in L2 writing: A computer keystroke-log perspective. *System*, 78, 104-114.

Zhang, M., & Deane, P. (2015). *Process features in writing: internal structure and incremental value over product features* (Research Report 15-27). Princeton, NJ: Educational Testing Service.

Zifonun, G., Hoffmann, L., & Strecker, B. (1997). *Grammatik der deutschen Sprache*. (Schriften des Instituts für deutsche Sprache 7, Band 1). Berlin/New York: De Gruyter.

Appendices

Appendix 1. Syntactic, semantic and information-structure properties of prefield constituents in V2 declaratives: Coding guidelines

1) **Segmentation:**

- The target structures are V2 declarative clauses, i.e. main clauses at the start of a new sentence or coordinated main clauses.
- Interrogative clauses are not annotated. They serve however as discourse context for the annotation of givenness.
- Coordinated main clauses also include elliptical declarative structures starting with a finite verb and resulting from omission of the pre-verbal constituent.
- Embedded clauses (identified based on the use of subordinate conjunctions) with a non-target-like V2 structure are not included in the target segments.

2) **Prefield grammatical function:**

Possible values:

- Subject
- Expletives
- Object
- Predicative
- Adverbial
- Dependent
- Ellipsis
- Multiple prefield

Subject vs. Predicative:

- A difficulty might occur in the coding of V2 copular structures exhibiting two nominative constituents, one performing the function of grammatical subject and one being a predicative expression forming the predicate of the clause together with the copular verb. To identify inverse copular clauses, i.e., copular structures in which the unmarked positions of subject (before the finite verb) and predicative expression (after the finite verb) are reversed, attention needs to be paid to the following criteria:
    - Subject-verb agreement: In case of non-congruent agreement between the prefield-filling constituent and the finite verb, the initial constituent is to be labelled as predicative.
        - [Eine gute Nachricht für Präsident Trump]$_{\text{Predicative}}$ sind$_{\text{V2-finite verb}}$ die neuen Arbeitsmarktzahlen.
    - Referential properties of subject vs. predicative expression: In specificational-identifying clauses, which are quite frequent among all copular structures, the predicative expression acts as a variable and the subject as a value, i.e. as a specific identifiable instance of the more general set denoted by the variable. As such, the value is inherently strongly referring, meaning that the referential expression gives mental access to an actual unique entity, typically encoded as

a definite NP or as a complement clause depicting a specific state of affairs. By contrast, the variable is weakly referring, implying that it does not correspond to an exact entity that can be singled out as a unique thing in some specific environment. Note that values can be identified for both indefinite and definite variable NPs, or for whole clauses.

- [Der Plan]$_{\text{Predicative}}$ war$_{\text{V2-finite verb}}$, weniger Unternehmen zu schließen.
- [Eine Erklärung dafür]$_{\text{Predicative}}$ ist$_{\text{V2-finite verb}}$ sehr wahrscheinlich der Anstieg der Einstellungen in einigen Sektoren, wie zum Beispiel im Hotelgewerbe.
- [Was er noch gemacht hat]$_{\text{Predicative}}$, ist$_{\text{V2-finite verb}}$, die Arbeitslosigkeit zu verringern.

Multiple prefields vs Pre-prefield+Prefield:

- Multiple constituents can be accepted before V2 without affecting the well-formedness conditions stipulating the presence of max. 1 constituent in the prefield. The first case involves the use of a series of speech act adverbials, also known as discourse adverbs, whose function is to comment on the specific mode of uttering. These adverbial expressions occupy a position at the left of the prefield, i.e. in the so-called pre-prefield. As such, they are not considered as markable expressions for the analysis of prefield constituents. Examples of such pre-prefield constituents: *Ehrlich gesagt* ('honestly'), *offen gesagt* ('frankly'), *mit anderen Worten* ('in other words'), *anders gesagt* ('to put it differently'), *nebenbei bemerkt* ('by the way'), etc.
    - [Ehrlich gesagt]$_{\text{Pre-prefield}}$, [wir]$_{\text{Prefield}}$ werden$_{\text{V2-finite verb}}$ diese Wahl gewinnen.
- Cases involving the placement of designated pre-prefield elements of the type discourse adverb before the finite V2 in learner texts are to be treated as instances of empty prefields. These cases represent thus violations of well-formedness constraints, as learners erroneously identified the speech act adverbs as belonging to the core of the clause.
    - [Mit andere Wörter]$_{\text{Pre-prefield}}$ [EMPTY PREFIELD] dachte$_{\text{V2-finite verb}}$ er, dass die Gesetz eine Kostenfalle war.
- Other cases of prefield misformation include the presence of multiple prefield-filling candidates before V2. Typically, these combinations include the juxtaposition of a clause argument and an adverbial element. Such cases are labelled as multiple prefields.
    - [[Obwohl der neue amerikanische Präsident Trump mit einigen positiven Reformen Erfolg gehabt hat]$_{\text{Prefield-1}}$, [er]$_{\text{Prefield-2}}$]$_{\text{Multiple prefield}}$ hat$_{\text{V2-finite verb}}$ auch schockiert (zum Beispiel mit seiner Migrationspolitik).
- Juxtapositions of two adverbial constituents performing the same function (e.g., scene-setting elements) do not count as multiple prefields. They are labelled as adverbials, in the same vein as cases involving single constituents in clause-initial position.
    - [[Letztes Jahr]$_{\text{Scene-setting-1}}$ [in den USA]$_{\text{Scene-setting-2}}$]$_{\text{Adverbial}}$ hat$_{\text{V2-finite verb}}$ Trump viel Ärger verursacht.

Prepositional object vs. Adverbial:

- Prepositional phrases that are listed as part of the verb valency in the *Elektronisches Valenzwörterbuch deutscher Verben* are labelled as prepositional objects. When the constituents in question are not listed as part of the verb valency, their label is adverbial.
    - [Aufgrund mehrere Bedingungen]$_{\text{Adverbial}}$ hat$_{\text{V2-finite verb}}$ er beschlossen, der Obamacare aufzuheben.
        - ➔ Beschließen: sich zu etwas entschließen: SUB + ACC-OBJ
    - [Aus den Pariser Klimaverträgen]$_{\text{Prepositional object}}$ sind$_{\text{V2-finite verb}}$ die USA tatsächlich ausgestiegen.
        - ➔ Aussteigen: sich aus etwas lösen: SUB + PREP

Dependent vs. Constituent:

- Specific tests can help distinguish between immediate constituents and dependents that are extracted from an immediate constituent and moved to the prefield. For instance, if reconstructing the whole immediate constituent in the prefield leads to a well-formed clause, then proof is provided that the prefield-filling element can be considered as a dependent. Similarly, permutation tests also make it possible to identify dependents. Concretely, if permutating head and dependent does not result in a perfectly acceptable structure, then it is likely that the prefield element is structurally subordinated to the head constituent.
    - [Von den großen Versprechen in der Außenpolitik]$_{\text{Dependent}}$ wurden$_{\text{V2-finite verb}}$ bisher [nicht viele]$_{\text{Embedding constituent}}$ erreicht.
        - ➔ *Reconstruction of the immediate constituent in the prefield:* Nicht viele von den großen Versprechen in der Außenpolitik wurden bisher erreicht. → Well-formed
        - ➔ *Permutation of head and dependent:* #Nicht viele wurden bisher von den großen Versprechen in der Außenpolitik erreicht.
    - [Über seine Projekte an der Grenze mit Mexiko]$_{\text{Dependent}}$ sind$_{\text{V2-finite verb}}$ [die Meinungen]$_{\text{Embedding constituent}}$ sehr unterschiedlich.
        - ➔ *Reconstruction of the immediate constituent in the prefield:* Die Meinungen über seine Projekte an der Grenze mit Mexiko sind sehr unterschiedlich. → Well-formed
        - ➔ *Permutation of head and dependent:* ??Die Meinungen sind über seine Projekte an der Grenze mit Mexiko sehr unterschiedlich.

Ellipsis:

- Considering our focus on prefield-filling constituents, a requirement for coding elliptical structures with empty prefields is related to well-formedness conditions underlying the distribution of verbal bracket and topological fields in the German clause structure. Concretely, prior to the labelling of the prefield as elliptical, we thus need to make sure that the sequence prefield-V2 was correctly realized. Therefore, the decision is made to limit the coding of ellipses to structures featuring overt finite verb forms occurring right after the coordination marker (conjunction or comma).

- [Er richtet sich gegen schwule, Lesben und Transsexuelle]$_{\text{Clause-1}}$ und$_{\text{Conjunction}}$ [[ELLIPTICAL PREFIELD] gefährdet$_{\text{V2-finte-verb}}$ ihre Rechte]$_{\text{Clause-2}}$.

3) Prefield semantic role:

Possible values:

- Proto-agent
- Proto-patient

General guidelines:

- The coding of prefield semantic roles is limited to verb arguments (subjects, with the exception of subject expletives, or objects) occurring before V2 (including omitted subjects in elliptical V2 structures).

Proto-agent:

- The first criterion indicative of proto-agent properties is the volitional involvement in the event or state. Prototypical proto-agent elements are in this sense associated with transitive verbs like *wollen* ('to want'), *möchte,* (subjunctive II of *mögen*, 'to like'), *entscheiden/beschließen* ('to decide'), *hoffen* ('to hope'), *wünschen* ('to desire'), *gegen etwas kämpfen* ('to fight against something'), etc.
- Verbs expressing cognition or expression are also considered as indicative of a volitional involvement: *Sagen* ('to say'), *erzählen* ('to tell'), *behaupten* ('to claim', 'to assert'), *denken* ('to think'), *glauben* ('to believe'), *bedauern* ('to regret), *beteuern* ('to assert'), *reagieren* ('to react'), *sich rühmen* ('to boast'), *urteilen* ('to judge'), *planen* ('to plan'), *versprechen* ('to promise'), *ablehnen* ('to reject'), *sprechen* ('to speak'), *unterstützen* ('to support'), *kennen* ('to know'), *äußern* ('to express), *ankündigen* ('to announce'), *erklären* ('to explain'), *zugeben* ('to admit'), *halten für* ('to consider as'), *sehen als* ('to see as'), *finden, dass* ('to find that'), *wissen* ('to know'), *darstellen* ('to represent'), *zustimmen* ('to approve'), *vergleichen* ('to compare'), *widersprechen* ('to contradict'), *lachen* ('to laugh'), *antworten* ('to answer'), *lernen* ('to learn'), *leugnen* ('to deny'), *lügen* ('to lie'), *betrachten* ('to consider'), *sich fragen* ('to wonder'), etc.
- A second prototypical category denoting proto-agent properties is associated with verbs launching/performing an action or causing movement, or a change of state in another event participant. In active clauses, the subject of clauses of this type is accordingly labelled as proto-agent. Examples: *Machen* ('to make', 'to do'), *unternehmen* ('to undertake'), *ziehen* ('to pull'), *treiben* ('to drive'), *benutzen* ('to use'), *ändern* ('to change'), *umsetzen* ('to realize'), *durchführen* ('to execute'), *erledigen* ('to complete'), *bauen* ('to build'), *auslösen* ('to trigger'), *zerstören* ('to destroy'), *geben* ('to give'), *ergeben* ('to result in'), *schützen* ('to protect'), *treffen* ('to affect'), *verkaufen* ('to sell'), *kaufen* ('to buy'), *verbessern* ('to improve'), *verursachen* ('to cause'), *aufheben* ('to annul'), *entwickeln* ('to develop'), *bewirken* ('to cause'), *reduzieren* ('to reduce'), *führen zu* ('to lead to'), *sorgen für* ('to ensure', 'to enable'), *beeinflussen* ('to influence'), *ermöglichen* ('to enable'), *sich mit etwas beschäftigen* ('to deal with something'), *verwenden* ('to employ'), etc.

- A third category is related to experiential verbs (physical or psych-emotive experience). We also include as part of this category verbs of possession/gain/loss. In active-declarative clauses, the subjects of verbs of this type are also assigned the label "proto-agent". Examples: *Erfahren* ('to experience'), *verlieren* ('to lose'), *gewinnen* ('to win'), *haben* ('to have'), *wahrnehmen* ('to perceive'), *bemerken* ('to notice'), *beobachten* ('to observe'), *fühlen* ('to feel'), *sich vor etwas fürchten* ('to fear something'), *auf etwas warten* ('to wait for something'), etc.
- The subjects of verbs of movement are also attributed the label "proto-agent". Examples: *gehen* ('to go'), *erreichen* ('to reach'), *fliegen* ('to fly'), *verlassen* ('to leave'), etc.
- Subjects of intransitive verbs that do not express a change of state affecting the involved participant are also labelled as proto-agent elements. Examples: *Funktionieren* ('to work'), *wohnen* ('to live'), *schlafen* ('to sleep'), etc.

Proto-patient:

- Proto-patients are understood as undergoing a change of state or being causally affected by another participant, prototypically the proto-agent. A first category of proto-patient referents includes the subjects of passive clauses. Note that three types of structures count as passive clauses: (i) structures with the auxiliary *werden*, (ii) stative passives with the auxiliary *sein*, (iii) pseudo-passive structures with *sich lassen* or *sein+zu*.
    - [Die Migrationspolitik]$_{\text{Proto-patient}}$ ist$_{\text{V2-finite-verb}}$ durch ein Dekret stark verschärft worden.
    - [Eine Lösung für Konflikte in Syrien]$_{\text{Proto-patient}}$ wurde$_{\text{V2-finite-verb}}$ bisher nicht erreicht.
    - [Der Atom-Deal mit dem Iran]$_{\text{Proto-patient}}$ ist$_{\text{V2-finite-verb}}$ von den Amerikanern blockiert.
    - [Der neue Trend zu nachhaltigen Investitionen]$_{\text{Proto-patient}}$ lässt$_{\text{V2-finite-verb}}$ sich nicht mehr umkehren.
    - [Neue Formen von Aktivismus]$_{\text{Proto-patient}}$ sind$_{\text{V2-finite-verb}}$ zum Glück wahrzunehmen.
- A second class of verbs that select a proto-patient subject are unaccusative verbs. The corresponding subject referents do no initiate, nor are actively responsible for/volitionally active in the depicted event. They rather undergo it and present therefore patient-like characteristics. Examples: *Verschwinden* ('to disappear'), *sinken* ('to decrease'), *steigen* ('to increase'), *beginnen* ('to start'), *werden* ('to become'), *scheitern* ('to fail'), *gelingen* ('to succeed'), *geschehen* ('to occur'), *entstehen* ('to emerge', 'to arise'), *wachsen* ('to grow'), *untergehen* ('to vanish'), *zusammenbrechen* ('to collapse'), *sterben* ('to die'), etc.
    - [Seine Reichweite auf Twitter]$_{\text{Proto-patient}}$ ist$_{\text{V2-finite-verb}}$ gestiegen, von 15,2 Millionen Abonnenten auf 42 Millionen.
    - [Sein Projekt]$_{\text{Proto-patient}}$ ist$_{\text{V2-finite-verb}}$ bisher noch nicht gescheitert.
- A series of reflexive verbs also: *Sich verringern* ('to decrease'), *sich verbreitern* ('to spread'), *sich verändern* ('to change'), *sich anhaufen* ('to accumulate'), *sich verschärfen* ('to aggravate'), *sich verschlimmern* ('to worsen'), *sich entwickeln* ('to develop'), etc.

- [Die Kriminalitätsraten]$_{\text{Proto-patient}}$ haben$_{\text{V2-finite-verb}}$ sich nicht verändert.
- [Die Provokationen]$_{\text{Proto-patient}}$ haben$_{\text{V2-finite-verb}}$ sich während seiner Amtszeit angehäuft.

- Subject recipients of verbs associated with a notion of acquisition or transfer also receive the label "proto-patient". Examples: *Bekommen* ('to obtain'), *erhalten* ('to obtain'), *kriegen* ('to receive'), etc. Important: A particularity with these verbs is that both subject and object referents (respectively denoting the thematic and the recipient roles) are labelled as "proto-patient". The rationale is that verbs like *bekommen* present a semantic structure similar to ditransitive verbs like "give", the difference being that the agent initiating the transfer is not encoded as part of the event.
    - [Trump]$_{\text{Proto-patient}}$ bekommt$_{\text{V2-finite-verb}}$ nur von 40% der Bevölkerung Unterstützung.
    - [Mehr als 60% Unterstützung]$_{\text{Proto-patient}}$ hatte$_{\text{V2-finite-verb}}$ George W. Bush nach einem Jahr im Amt bekommen.
- Accusative, dative, and prepositional objects with proto-patient properties (including recipient referents), in general in association with proto-agent subjects in post-V2 position, constitute another category of proto-patient prefield referents.
    - [Beide Schritte]$_{\text{Proto-patient}}$ hatte$_{\text{V2-finite-verb}}$ er im Wahlkampf angekündigt.
    - [Auf sein neues, großartiges System]$_{\text{Proto-patient}}$ warten$_{\text{V2-finite-verb}}$ die Amerikaner noch.
    - [Dem Volk]$_{\text{Proto-patient}}$ hatte$_{\text{V2-finite-verb}}$ er Steuersenkungen versprochen.

- Clauses with a lexical verb of one of the following types are excluded from the coding of the semantic role properties of prefields:
    - State locative verbs. Examples: *sein* ('to be'), *sich befinden* ('to be situated'), *liegen* ('to be located/situated'), *bleiben* ('to stay'), etc.
    - Stative relational verbs, including copular verbs. Examples: *sein* ('to be') in both specificational-identifying and ascriptive clauses, *aussehen* ('to look'), *scheinen* ('to seem'), *bleiben* ('to remain'), etc.
        - Eines dieser Versprechen war$_{\text{V2-finite-verb}}$ der Bau einer Mauer.
        - Unterstützung für andere Länder ist$_{\text{V2-finite-verb}}$ nicht mehr so wichtig.
    - Presentational-existential verbs, typically in the structure *es gibt* ('there is').
        - Es gibt$_{\text{V2-finite-verb}}$ bereits ein Einreiseverbot für Staatsbürger aus mehreren Ländern.

4) Prefield givenness status:

Possible values:

- Given
- New
- Bridging

General guidelines:

- The coding of givenness is based on the segmentation of learner texts in V2 declarative clauses, including coordinated clauses (and elliptical structures with overt

V2). Givenness is operationalized with regard to the immediate preceding discourse context. For the sake of consistency, the domain of the immediate preceding context is limited to the previous sentence (S-1). In other words, anaphoric relationships between a referent and its antecedent that stretch beyond the preceding sentence lead to the labelling of the anaphor as discourse-new.

  - [Spätestens seit seinem Amtsantritt am 20. Januar ist **Donald Trump**$_{\text{Antecedent}}$ in aller Munde]$_{\text{S-2}}$. [Seitdem hörte man nahezu tagtäglich Neues aus den USA]$_{\text{S-1}}$. [**Trump**$_{\text{New}}$ ist mittlerweile seit einem Jahr im Amt]$_{\text{S}}$.

- Givenness is to be understood in terms of referential givenness, which means that cases of lexical givenness (see below) do not motivate the use of the label "given". In the first example below, the second occurrence of *Präsident* (president) does not refer to Donald Trump specifically. Instead, the indefinite expression receives a generic interpretation and, therefore, does not count as given. Note however that in some cases, instances of lexical givenness can still be considered as candidates for the label "bridging" (see second example).
  - Der Präsident Donald Trump ist kein gutes Vorbild. Ein Präsident sollte dem Land helfen, statt Angst zu machen.
  - Der **Präsident** Donald Trump hat deutliche Pläne: Einreiseverbot für Muslime, Bau einer Mauer an der Grenze zu Mexiko, Abschaffung von Obamacare. [Die anderen US-**Präsidenten**$_{\text{Lexically given}}$]$_{\text{Bridging}}$ hatten nicht so viel vor.
- Indefinite pronouns (specific or generic) such as *man*, generic *wir* ('we'), *jeder* ('everyone'), *jemand* ('someone') do not count as markables for givenness.
  - Wir werden in diesem Artikel die starke und schwache Punkten von Trump analysieren. Wir müssen zuerst die Verbesserung von der Wirtschaft in Amerika zugeben.
- Expletives do not count as markables for givenness.
- Adverbs (or related adverbial phrases) (*immer* ('always'), *oft* ('often'), *wahrscheinlich* ('probably'), *normalerweise* ('normally'), *hoffentlich* ('hopefully'), *glücklicherweise* ('fortunately'), *leider* ('unfortunately'), *vielleicht* ('maybe'), *eigentlich* ('actually'), *erstaunlicherweise* ('surprisingly'), etc.), AdvPs acting as discourse connectors (*erstens* ('first'), *zweitens* ('second'), *jedoch* ('however'), *trotzdem* ('despite this'), *allerdings* ('though'), *anschließend* ('subsequently'), *zudem* ('in addition'), *außerdem* ('moreover'), *zusammenfassend* ('in sum'), *kurzum* ('briefly'), *danach* ('then'), *schließlich* ('finally'), *andererseits* ('on the other hand'), *tatsächlich* ('in fact/indeed'), *ebenfalls* ('likewise/also'), *so* ('so/as a result'), *infolgedessen* ('as a result/consequently'), *deswegen* ('therefore'), *deshalb* ('therefore/hence'), *folglich* ('consequently'), *dadurch* ('thereby/through this'), *vorher* ('before'), *gleichzeitig* ('simultaneously/at the same time'), *damals* ('at that time'), *später* ('later'), *früher* ('earlier/previously'), *bisher* ('so far'), *seither* ('since then'), *zunächst* ('first'), *zusätzlich* ('additionnally'), etc.), and prepositional phrases performing similar functions (*zum Glück* ('fortunately'), *im Fazit* ('in sum'), *zum Schluss* ('finally'), *im Allgemeinen* ('in general'), *am Anfang* ('at the beginning/originally'), *im Gegenteil* ('on the contrary'), *im Vergleich* ('in comparison'), *in weniger als drei Jahren* ('in less than three years'), *im Grunde* ('basically'), etc.) are not annotated.

Given:

- Typical instances of referential givenness involve a previously mentioned referent that is taken up in the prefield of the following V2 declarative, either in the same form, or in the form of a pronoun.
    - **Donald Trump** hat protektionistische Maßnahmen untergeschrieben. [**Trump**]$_{\text{Given}}$ hat auch die Einstellung amerikanischen Bürgern gefördert.
    - Danach hat auch sich **Trump** um das Problem der Mauer zwischen den USA und Mexiko gekümmert. [**Er**]$_{\text{Given}}$ möchte, dass keine Mexikaner in die USA kommen.
    - Seine Aussage vom 20. Januar 2017 lautete: "**Wir werden Amerika wieder wohlhabend machen**". [**Dies**]$_{\text{Given}}$ war aber nur ein Versprechen.
- The label "given" is also used in the case of elliptical subjects.
    - **Donald Trump** kandidierte 2016 gegen Hillary Clinton und [**ELLIPTICAL SUBJECT**]$_{\text{Given}}$ gewann am Ende die Präsidentenwahl.
- In addition to repeated and pronominalized constituents, co-reference can also operate via paraphrase expressions.
    - Seinen Aussagen nach **sei der Klimawandel durch die Chinesen erfunden um den USA zu schaden**. [**Diese lächerliche Idee Trumps**]$_{\text{Given}}$ wird allerdings von vielen Amerikanern geteilt.
    - Vor einem Jahr hat **Donald Trump** die Wahl gewonnen. [**Der US-Präsident**]$_{\text{Given}}$ hat schon die Welt dramatisch verändert.
- Inferences based on S-2 conditioning the interpretation of an element in S-1 are also taken into account for the labelling of givenness in S.
    - [**Die verhasste Gesundheitsreform seines Vorgängers muss weg**]$_{\text{S-2}}$. [Aber der Präsident ist noch nicht sehr weit mit **seinen Ankündigungen** gekommen]$_{\text{S-1}}$. [[**Obamas Gesundheitsreform**]$_{\text{Given}}$ existiert noch immer]$_{\text{S}}$.
- The coding of givenness is not tied to the level of embedding of antecedents. This means that prefield referents whose antecedent is embedded in an immediate constituent also count as given. This also holds for parts of conjuncts (e.g. coordinated NPs) that are taken up in the prefield of the following unit.
    - [Die verhasste Gesundheitsreform **seines** Vorgängers]$_{\text{Immediate constituent}}$ muss weg. Aber [**der Präsident**]$_{\text{Given}}$ ist noch nicht sehr weit mit seinen Ankündigungen gekommen.
    - **Donald Trump** und Barack Obama sind sehr unterschiedlich. [**Trump**]$_{\text{Given}}$ hat eine umstrittene Persönlichkeit.
- Prefield referents with an antecedent in a left-detached position are also treated as given referents.
    - **Was Trump als Wahlkämpfer schlechtgeredet und als manipuliert bezeichnet hat**, [**dafür**]$_{\text{Given}}$ lässt er sich als Präsident feiern.
- Also pay attention to the fact that one and the same expression can have different interpretations. In the example below, the first occurrence of *die ganze Welt* ('the

whole world') is interpreted in terms of geographical area, whereas the following occurrence in the next sentence refers to people. In this second sentence, *die ganze Welt* (presumably a word-for-word translation from French, i.e. learners' L1) is used as an expression with a generic interpretation (similar to indefinite generic pronouns like *jeder*). As a result, this second occurrence does not count as a markable for givenness.

- Trump hat auch viel Reaktionen aus der ganzen Welt provokiert mit seiner Verschärfung der Migrationspolitik. Die ganze Welt kannte schon die Migrationspolitik von Trump.

- Indefinite expressions that do not refer to an identifiable entity/state whose description is determined in the preceding context are not considered as instances of givenness. In other words, when the referents of expressions can be traced back to the immediately preceding discourse context, the interpretation of the referents in question should be pragmatically or semantically tied to this discourse context.
    - Ein Volk muss gut regiert werden. Ein Volk braucht deswegen weise Leute, um ihn zu inspirieren. → Not considered as a case of referential givenness, labelled therefore as discourse-new
    - BUT: **Ein Volk** muss gut regiert werden. [**Ein solches Volk**]$_{\text{Given}}$ braucht deswegen weise Leute, um ihn zu inspirieren → Counts as referential givenness

Bridging:

- In its prototypical understanding, the label bridging is used in presence of non-coreferential expressions whose interpretation depends on the preceding context. In other words, bridging referents can only be interpreted correctly with reference to another expression occurring earlier in the same sentence or in S-1.
    - Abschließend merkt man also, dass **die gesamte Politik von Donald Trump, auf eine ökonomische, migratorische und soziale Ebene, die Wirtschaft profitiert**. Aber [**der Preis**]$_{\text{Bridging}}$ erscheint zu sein, dass die ärmesten und unglücklichsten Amerikaner ein noch schlechteres Leben haben werden.
    - In den USA haben fast alle Menschen **eine klare Meinung über ihren Präsidenten** und [**das Urteil**]$_{\text{Bridging}}$ fällt schlecht aus.
    - Er bestand auf die Idee **einer Mauer um Mexiko**, [**der Bau**]$_{\text{Bridging}}$ geschah aber nicht.
- A second category of bridging expressions involves referents whose interpretation does not necessarily depend on a previously introduced referent, but whose relationship with an expression from S or S-1 is based on their inclusion in a common semantic set. In other words, the denotation of these two expressions can be brought back to the same semantic supertype.
    - Seine Politik genießt nur **die Reichste**. [**Die einkommensschwächsten Haushalte**]$_{\text{Bridging}}$ sind negativ betroffen.
    - Zuerst muss man **die Verbesserung der Wirtschaft von die Vereinigten Staaten** zugeben. [**Das Wachstum**]$_{\text{Bridging}}$ hat von drei Prozent gestiegen, und [**die Börsenindexen**]$_{\text{Bridging}}$ sind günstig.

- **Nur zwischen 35 und 39 Prozent der Wähler** sind zufrieden mit dem neuen Präsidenten. [**Die Mehrheit der Bevölkerung**]$_{\text{Bridging}}$ ist enttäuscht.
- **Obama** hatte nach einem Jahr eine Zustimmungsquote von 50 Prozent, [**Bill Clinton**]$_{\text{Bridging}}$ lag bei 54 Prozent.
- Trump machte sein Volk ebenfalls glücklich mit **den 1,7 Millionen Jobs die in den USA geschaffen wurden**. [**Die Arbeitslosigkeitenrate**]$_{\text{Bridging}}$ sank auf 4,1%.

- The label "bridging", when applied to referents belonging to a common semantic superset, is not limited to definite expressions. Indefinite, non-anaphoric expressions, that (i) are interpretatively tied to a preceding expression or (ii) form a semantic superset with an expression from S or S-1 are also considered as instances of bridging.
    - Von **einer bis zu neun Meter hohen Mauer** ist weit und breit noch nichts zu sehen. [**Lediglich ein kleiner Zaun**]$_{\text{Bridging}}$ hat dort seinen Platz gefunden.
    - Innerhalb der 100 ersten Tagen seiner Amtszeit werde Trump **eine große Steuerreform** durchnehmen. [**Nur ein Gesetzentwurf**]$_{\text{Bridging}}$ liegt jedoch vor.
    - Zuerst **hat Trump viele Dinge für die Wirtschaft gemacht**. [**Ein Ergebnis**]$_{\text{Bridging}}$ ist, dass mehr Amerikaner eine Arbeit gefunden haben als vor seiner Präsidentschaft.
- Bridging is also considered as effective through the use of specific attributive adjectives that establish a continuity with the previous discourse context. Frequently, these adjectives stipulate that a newly introduced idea needs to be interpreted as part of an enumeration which started earlier.
    - Vor der Wahl hatte der neue Präsident verkündet, **einen großen Plan zur Erneuerung der maroden US-Infrastruktur vorzulegen**. [**Ein <u>weiteres</u> Versprechen von US-Präsident Trump**]$_{\text{Bridging}}$ war das Abbauen von Staatschulden, welche Ex-Präsident Obama auf unglaubliche 19 Billionen Dollar angehäuft hatte.
    - Man hat **eine Beschäftigungssicherung**, und das trotz dem Haushaltkonsumrückgang und die Wirkungen Harvey und Irma. [**Ein <u>anderer</u> Erfolg**]$_{\text{Bridging}}$ ist die Rekordhöhe der Arbeitslosenquote, die auf 4.1% verringert hat.
- The label "bridging" is extended to the category "bridging-contained". This category covers occurrences of anaphoric expressions that are part of a larger constituent. In its prototypical manifestation, bridging-contained consists in an anaphoric expression that is realized as a syntactic dependent within a larger phrase. The whole phrase is not anaphoric, but the embedded co-referential expression provides an anchor to the preceding discourse context.
    - Jedoch gibt es **keine Mauer** auf den Grenzen. [**Die Ablehnung der Finanzierung <u>dieser Mauer</u>**]$_{\text{Bridging-contained}}$ war erwartet.
    - Den USA ist es gelungen, den Terror im Irak und in **Syrien** zurückzudrängen. [**Eine Friedenlösung <u>für Syrien</u>**]$_{\text{Bridging-contained}}$ gibt es aber immer noch nicht.

    - Hat **Donald Trump** überhaupt Versprechen aus seiner Antrittsrede erfüllt? [**Trumps oberstes Ziel**]$_{\text{Bridging-contained}}$ war die Zusammenführung zu einer Nation.
    - Trump machte **viele Versprechen** und sprach von großen Vorhaben. [**Eines dieser Versprechen**]$_{\text{Bridging-contained}}$ war der Bau einer Mauer.
- Bridging-contained also involves the realization of the anchoring co-reference in the form of a pronominal expression (e.g. possessive pronouns).
    - **Er** ist der unbeliebteste Präsident der Geschichte und [**seine Zahlen**]$_{\text{Bridging-contained}}$ sprechen nicht für ihn.
    - **Donald Trump** wurde fast schon seit einem Jahr zum Präsidenten gewählt. [**Während seiner Wahlkampagne**]$_{\text{Bridging-contained}}$ hat er verschiedene Reformen versprochen.
- The category "bridging-contained" is extended to the repetition of a co-referential expression as part of an embedded clause that occupies the prefield.
    - **Sein** Umgang mit Fakten und **seine** Bereitschaft, Lügen zu verbreiten irritieren sowohl Bürger als auch Politiker. Aber [**Donald Trump nur als kontrovers zu beschreiben**]$_{\text{Bridging-contained}}$ wäre übertrieben.
    - Ein Jahr nach seinem Amtsantritt und nach der Ankündigung Mexikos, für die Kosten **der Mauer** selbstverständlich nicht aufzukommen, liegt die Erfüllung dieses Versprechens in weiter Ferne. [**Wie der Bau der Mauer, der schätzungsweise 20 Milliarden Dollar kosten könnte, finanziert werden soll**]$_{\text{Bridging-contained}}$, ist unklarer denn je.
- The category "bridging-contained" is also extended to the repetition of a co-referential expression as part of conjuncts.
    - In Bezug auf Steuererleichterungen für Unternehmen hat **er** die Steuerreform der Republikaner durchgesetzt. [**Donald Trump und Nordkoreas Führer Kim Jong Un**]$_{\text{Bridging-contained}}$ haben seit längerer Zeit einen öffentlichen Konflikt bei dem sie sich gegenseitig mit Atomwaffen drohen.
    - Seit seiner Ankunft in der Macht hat Trump alles gemacht um einen Mauern an der Grenze mit **Mexiko** zu bauen. Aber [**Mexiko und einige amerikanische Politiker**]$_{\text{Bridging-contained}}$ zeigen eine Opposition.
- The last example also illustrates that, in the same way as for given referents, the preceding referents (in S or S-1) that support bridging do not need to correspond to immediate (or full) constituents.
- The category "bridging-contained" also includes bridging expressions that are embedded in a larger constituent, bridging elements that belong to an embedded clause occupying the prefield, and bridging expressions in conjuncts.
    - Am 20. Januar 2017 wurde Donald Trump zum **US-Präsidenten** gewählt. [**Wie zufrieden die Bürger sind**]$_{\text{Bridging-contained}}$, zeigen zahlreiche Umfragewerte und Daten.
    - Immer noch, möchte der Präsident **einen Mauer an die Grenze zwischen die vereinigte Staaten und Mexiko bauen**. [**Wenn die Frage über die Kosten gestellt wird**]$_{\text{Bridging-contained}}$, behauptet Trump dass Mexiko den großen Teil bezahlen muss.

New:

- All markables that were not identified as either given or bridging (with respect to S or S-1) are coded as new.
    - [In diesem ersten Jahr gab es eine starke wirtschaftliche Entwicklung.]$_{S-2}$ [Diese wirtschaftliche Entwicklung besteht aus 3% Wachstum in das letzten Semester, eine Erhebung der Produktion, eine rekordniedriege Arbeitslosenquote, ein positiven Börsenindex und eine insgesamt wirtschaftliche Gesundheit dank der Deregulierung des Banksektors.]$_{S-1}$ [[**Dieses erstes Trumpjahr**]$_{New}$ ist bis jetzt eine Hochkonjunktur für die Vereinigte Staaten.]$_{S}$ → In this example, the antecedent is situated in S-2, which justifies the annotation of the prefield as new.
    - [Die Produktionsanhebung und die Anhebung von der Unterschreibung von Vertragen sind die Faktoren in Bezug auf diesen Erfolg.]$_{S-1}$ [[**Trump**]$_{New}$ hat auf das Zurückziehen der USA auf den Trans-Pacifischen Freihandel Vertrag bestanden.]$_{S}$
    - [Man weißt, dass ein Versprechen von der Wahlkampagne war, ein Gesetzt von Obama aufzuheben.]$_{S-1}$ [[**Die Republikaner**]$_{New}$ sehen dieses hilfreiche Gesetzt wie eine Kostenfalle.]$_{S}$
    - [Es stimmt also, dass einige Versprechen, die der US-Präsident während des Wahlkampfes angekündigt hat, nicht eingehalten wurden.]$_{S-1}$ [[**Die Zukunft**]$_{New}$ wird zeigen, ob Trump seine Versprechen noch durchsetzen wird oder daran scheitert.]$_{S}$
    - [Innerhalb der 100 ersten Tagen seiner Amtszeit werde Trump eine große Steuerreform durchnehmen.]$_{S-1}$ [[**Familien und Arbeiter**]$_{New}$ sollen entlastet werden.]$_{S}$

Appendix 2. Individual results for each complexity measure

Text reference	L1	C-Test	T/S	MLT	C/T	LNP	LMF	INV	PAS
Sub-corpus B2 level									
trk008_2006_05_L2v2.4	Turkish	60	1,32	10,04	1,68	3,07	2,95	0	0
nz002_2007_05_L2v2.4	English	61	1,13	11,84	1,59	3,19	3,67	0,029	0,043
fu122_2006_10a_L2v2.4	Korean	62	1	15,94	2,18	3,02	4,41	0	0
fkb011_2008_07_L2v2.4	English	64	1,42	11,26	1,83	2	3,05	0,019	0,047
fu135_2007_11c_L2v2.4	Japanese	65	1	20,7	2,6	5,48	5,08	0,115	0,115
sa002_2006_09_L2v2.4	Afrikaans	67	1,16	18,22	2,17	3,04	4,5	0	0,077
trk001_2006_05_L2v2.4	Turkish	67	1,22	11,07	1,55	2,28	4,07	0	0,074
fkb007_2008_07_L2v2.4	Russian	68	1,17	12,2	1,34	3,9	5,55	0,043	0,064
fkb016_2008_07_L2v2.4	Italian	69	2	11,26	1,26	2,53	5,33	0	0,021
usb008_2006_10_L2v2.4	Russian	69	1,29	10,58	1,73	2,32	3,29	0,043	0,014
fkb012_2008_07_L2v2.4	Spanish	70	1,05	14,46	2,05	2,63	4,31	0,022	0,044
sa010_2006_09_L2v2.4	English	70	1,22	15,15	1,88	4,98	4,21	0	0,21
fu123_2006_10a_L2v2.4	English	71	1,05	10,23	1,81	1,83	2,96	0	0,038
fkb015_2008_07_L2v2.4	Albanian	73	1,22	10,36	1,43	2,81	2,9	0	0,075
fkb040_2008_08_L2v2.4	English	73	1,25	14,83	2	2,36	3,55	0,017	0,1
sa001_2006_09_L2v2.4	Afrikaans	73	1,46	17	2,09	2,72	4,23	0	0,014
fkb010_2008_07_L2v2.4	Danish	74	1,44	11,83	1,57	2,67	3,85	0,042	0,153
usb015_2006_10_L2v2.4	Russian	74	1,19	9,47	1,78	1,96	2,39	0	0,105
fkb033_2008_07_L2v2.4	English	75	1,1	14,47	1,47	3,51	5,45	0,064	0,191
fu120_2006_10c_L2v2.4	English	75	1,29	12,29	1,52	2,98	4,23	0,021	0,021
fu134_2007_11c_L2v2.4	Japanese	76	1,23	12,53	1,53	2,23	4,33	0,02	0,082
fu127_2006_10a_L2v2.4	Ukrainian	77	1,04	15,81	2,35	2,71	3,82	0,033	0,016
fk003_2006_07_L2v2.4	Polish	78	1,25	15,6	2,13	5,1	3,91	0,031	0
fk010_2006_07_L2v2.4	French	78	1,16	15,2	2,1	3,3	4,17	0,038	0,105
hu009_2006_10_L2v2.4	English	79	1,09	15,92	2,25	2,93	3,24	0	0
Sub-corpus C1 level									
fkb061_2008_08_L2v2.4	Spanish	80	1,43	15,7	2,04	2,31	4,03	0,059	0,049
nz001_2007_05_L2v2.4	English	80	1,25	11,42	1,96	2	3,01	0,09	0,045
usb005_2006_10_L2v2.4	Uzbek	80	1,16	15,09	1,86	3,34	4,44	0,073	0,024
fk018_2006_08_L2v2.4	Chinese	81	1,62	9,68	1,47	2	3,76	0,04	0
fkb042_2008_08_L2v2.4	French	81	1,22	16,89	2,32	2,55	3,88	0,015	0,108
cbs016_2006_09_L2v2.4	Danish	83	1,45	13,97	2	2,41	4,29	0,103	0,034
fkb036_2008_07_L2v2.4	Catalan	83	1,84	8,29	1,4	1,94	2,35	0,02	0,02
fu130_2007_11c_L2v2.4	Chinese	83	1,13	16,56	2,04	2,91	4,71	0,036	0,073
fk014_2006_07_L2v2.4	English	84	1,14	16,47	1,88	3,32	4,35	0,05	0,033
fk022_2006_08_L2v2.4	Swedish	84	1,32	13,68	1,92	2,39	4,02	0,083	0,083
fk023_2006_07_L2v2.4	Serbian-Croatian	84	1,07	15,07	2,28	3,39	3,48	0,015	0,015
fkb023_2008_07_L2v2.4	Turkish	84	1,04	21,69	2,19	3,43	5,75	0,123	0,105
fkb043_2008_08_L2v2.4	Turkish	84	1,11	16,9	1,93	2,83	5,21	0,121	0,034
fkb047_2008_08_L2v2.4	Romanian	84	1,3	9,29	1,48	1,9	3,27	0,059	0,02
fkb044_2008_08_L2v2.4	Russian	85	1,06	10,51	1,81	2,25	3,19	0,015	0,03
fk001_2006_07_L2v2.4	French	86	1,62	21,71	2,81	3,75	4,34	0,017	0,169
cbs001_2006_09_L2v2.4	Danish	87	1,08	22,36	2,43	2,51	6,15	0,059	0,029

fkb006_2007_09_L2v2.4	Polish	87	1,07	10,48	1,62	2,21	3,49	0,107	0,043
fkb063_2008_08_L2v2.4	Czech	87	1,18	20,6	2,3	3,83	4,98	0,087	0,043
cbs007_2006_09_L2v2.4	Danish	88	1,2	12,74	1,69	1,91	4,17	0,084	0,12
fkb008_2007_09_L2v2.4	Polish	88	1,14	13,88	1,96	1,9	4,04	0,02	0,02
hu012_2006_09_L2v2.4	Norwegian	88	1,10	12,7	2,04	3,1	3,7	0,055	0,102
usb001_2006_10_L2v2.4	Russian	88	1,33	11,31	1,72	2,35	3,47	0,055	0,018
fk019_2006_08_L2v2.4	Ukrainian	89	1,33	11,78	1,68	2,76	4,04	0,06	0,06
fkb009_2007_09_L2v2.4	French	89	1,27	18,39	2,36	5,17	4,99	0,013	0,038
Sub-corpus C2 level									
cbs007_2007_10_L2v2.4	Danish	90	1,05	24,65	3,09	4,31	4,37	0,056	0,056
fk015_2006_08_L2v2.4	Czech	90	1,46	11,06	1,54	2,19	4,16	0,108	0
fkb012_2007_09_L2v2.4	English	90	1,28	11	1,61	2,22	3,49	0,054	0,108
fkb052_2008_08_L2v2.4	Russian	90	1,39	12,31	1,62	2,43	4,52	0,063	0
fu126_2006_10c_L2v2.4	English	90	1,22	17,7	2,36	2,64	4,35	0,064	0,27
hu003_2006_09_L2v2.4	French	90	1,15	14,68	2,13	3,03	3,91	0	0,167
hu004_2006_09_L2v2.4	English	90	1,56	13,98	1,88	2,93	3,73	0,038	0,051
fkb001_2007_09_L2v2.4	French	91	1,33	9,91	1,43	2,62	3,44	0,048	0,048
fkb011_2007_09_L2v2.4	Polish	91	1,29	15,68	2,13	3,07	5,21	0,045	0
fkb048_2008_08_L2v2.4	Danish	91	1,32	15,4	2	2,33	4,68	0,08	0,06
fu128_2006_10a_L2v2.4	Norwegian	91	1,32	13,35	1,76	2,63	4,55	0,098	0
hu002_2006_09_L2v2.4	Polish	91	1,14	18,4	2,32	3,36	4,74	0,069	0,086
fk016_2006_08_L2v2.4	Italian	92	1,21	14	1,85	2,6	4,3	0,048	0,143
fkb037_2008_07_L2v2.4	Ukrainian	92	1,08	17,52	2,19	2,68	4,54	0,017	0,153
hu005_2006_09_L2v2.4	Spanish	92	1,12	16,57	2,51	3,12	4,02	0,032	0,011
cbs015_2006_09_L2v2.4	Danish	93	1,24	17,87	2,29	3,84	4,79	0,085	0,042
fk006_2006_07_L2v2.4	Greek	94	1,13	13,43	2	2,3	3,66	0	0,023
fk024_2006_07_L2v2.4	Dutch	94	1,15	9,39	1,42	1,95	3,5	0,068	0
fkb032_2008_07_L2v2.4	Hungarian	94	1,13	12,46	1,63	2,55	4,14	0,06	0,06
hu007_2006_10_L2v2.4	Norwegian	94	1,08	20,86	2,71	3,32	4,29	0,053	0
hu013_2006_10_L2v2.4	Dutch	94	1,2	13,63	1,9	3,23	4,62	0,055	0,11
cbs010_2006_09_L2v2.4	Danish	95	1,31	14,14	1,81	3,43	4,34	0,026	0,026
cbs001_2007_10_L2v2.4	Danish	96	1,32	14	1,92	1,93	4,31	0,042	0,104
fkb038_2008_07_L2v2.4	Dutch	96	1,84	12,43	1,91	2,57	3,66	0,06	0,06
fkb002_2007_09_L2v2.4	Russian	98	1,21	10,75	1,75	2,51	3,16	0,014	0,086

Appendix 3. Experimental items in the Element Rearrangement Task (ERT)

(1)	Dort lebte Ulrich Tag und Nacht in einer kleinen Zelle und bekam kaum Essen.	"Ulrich lived there day and night in a small call and got very little to eat."
	stark getroffen / hat / ihn / trotz großer Widerstandsressourcen / diese Situation	*strongly affected / has / him / despite big resistance resources / this situation*
(2)	Natürlich ist ein Blick auf das, was im letzten Jahr in der Welt geschehen ist, unlöslich mit der Krise der europäischen Banken und deren Folgen verbunden.	"A look at what happened in the world last year is of course intrinsically linked to the crisis of European banks and its consequences."
	viele soziale Ungerechtigkeiten / in einem Zeitraum von wenigen Jahren / die europäischen Banken / haben / verursacht	*many social injustices / in the space of a few years / European banks / have / caused*
(3)	Deutschland ist erst 1995 in die Untersuchung des Genoms eingestiegen – als letztes großes Industrieland.	"Germany joined the investigation of human genome only in 1995, as last major industrial country."
	nicht mehr kompensieren / kann / den Fehler / man / durch substanzielle Investitionen in Forschung	*no longer compensate / can / the mistake / we / by substantial investment in research*
(4)	Mark Zuckerberg hat die Lösung gefunden, um den Marketing-Chef von Konkurrent Twitter anzuziehen.	"Mark Zuckerberg found a way of attracting rival Twitter's Chief Marketing Officer."
	ihn / er / mit einer signifikanten Gehaltserhöhung / will / motivieren	*him / he / with a significant pay rise / wants to / motivate*
(5)	TurmEisen hat einen Vertrag geschlossen mit dem großen brasilianischen Bergbauunternehmen Companhia Dos Rios in Bezug auf das Eisernerz-Projekt.	"TurmEisen closed a deal with the major Brasilian mining company Companhia Dos Rios on the Eisenerz project."
	zwischen 2017 und 2022 / der Vertrag / generieren / ein Umsatzvolumen / soll	*between 2017 and 2022 / the contract / generate / sales volume / should*
(6)	Ein weiteres Problem für die Zukunft ganz Europas ist der Reformstau, der sich in Deutschland über Jahre hinweg aufgebaut hat.	"A further problem for the future of all Europe is the reform backlog that has accumulated over the years in Germany."
	diesen Reformstau / mit nachhaltigem Erfolg / auflösen können / keine Bundesregierung / hat	*this reform backlog / with lasting success / been able to solve / no federal government / has*
(7)	Unsere Demokratie ist durch und durch von ihrem eigenen Bürokratismus beeinflusst.	"Our democracy is strongly influenced by its own bureaucracy."
	man / kann / finden / diesen Bürokratismus / in vielen Organisation, Institutionen und politischen Parteien	*we / back / find / this bureaucracy / in many organizations, institutions and political parties*

(8)	Im November 2008 stimmte das argentinische Parlament der Maßnahme von Präsidentin Cristina Kirchner zu, die zur Nationalisierung der zwei größten Privatbanken führte.	"In November 2008, the Argentinean Parliament approved President Cristina Kirchner's measure, which led to the nationalization of the two largest private banks."
	musste / im Gefolge des weltweiten Börsenkrachs / ein finanzielles Chaos / die starke Maßnahme / verhindern	*was intended to / in the wake of the global stock market crash / a financial chaos / the strong measure / avoid*
(9)	Der Regierungschef von Botsuana reagierte am Sonntag auf die umstrittene Äußerung von Donald Trump.	"The prime minister of Botswana reacted on Sunday to Donald Trump's controversial statement."
	attackiert / den Binnenstaat im Süden Afrikas / hatte / mit beleidigenden Kommentaren / der US-Präsident	*attacked / the inland country in Southern Africa / had / with insulting comments / the US president*
(10)	Dank dem neuen Immobiliengesetz will die SPD/CDU-Regierung den Anstieg der Wohnungspreise verlangsamen.	"Thanks to the new real estate law, the SPD/CDU government wants to slow down the rise in house prices."
	die große Koalition / beschlossen / hat / mit den Stimmen der Linke / das Gesetz	*the grand coalition / adopted / has / with the votes of the Left Party / the law*
(11)	Kunden, die einen Plasmabildschirm iTV2000 gekauft haben, werden gebeten, das Produkt nicht zu benutzen und ihre Verkaufsfiliale zurückzubringen.	"Customers, who bought an iTV2000 plasma screen, are requested not to use the product and to return it to the store."
	mit 100% ökologischen Mitteln / produziert / diese Fernsehapparate / hat / ein japanischer Hersteller	*with 100% ecological materials / produced / these televisions / has / a Japanese manufacturer*
(12)	In Ostafrika sind unterschiedliche Kulturen aufeinander gestoßen, die sich laut Präsident Macron mit der Zeit anpassen müssen.	"In East Africa, different cultures have collided that must, according to President Macron, adapt over time."
	diesen Prozess / will / mitgestalten / mit Hilfe der lokalen Partner / er	*this process / wants to / help shape / with the help of the local partners / he*
(13)	Vier Jahre nach den Taten wurde Julian F. zu 25 Jahren Gefängnis für den Mord an Anja und Robert V. verurteilt.	"Four years after the deeds, Julian F. was sentenced to 25 years in jail for the murder of Anja and Robert V."
	hatte / nach einem Streit am Dortmunder Bahnhof / angegriffen / der 22-jährige Student / die zwei Fußgänger	*had / after a fight at Dortmund station / assaulted / the 22 year-old student / the two pedestrians*
(14)	Im Jahr 2014 hatte unser Partner das Unternehmen mitten in einer schweren Krise verlassen.	"In 2014, our partner had left the company in the middle of a severe crisis."

	einen wichtigen Veränderungsprozess / diese Krise / durch die Verbesserung der Teamorganisation / ausgelöst / hat	*an important transformation process / this crisis / through the improvement of the team organization / triggered / has*
(15)	Unser Praktikant, der zurzeit eine Erzieherausbildung macht, hat ein Projekt zum Thema ‚Konfliktlösungen' gestartet.	"Our intern, who is currently enrolled in an educator training, has started a project on 'conflict resolution'."
	entwickelt / das Projekt / hat / er / in 4 Schulen der Gemeinde Aachen	*developed / the project / has / he / in 4 public schools in Aachen*
(16)	1998 haben Zhong und Wang gezeigt, dass Tumoren langsamer bei Mäusen wachsen, die geistige sowie körperliche Anstrengungen erleben.	"In 1998, Zhong and Wang showed that tumors grow more slowly in mice that undergo mental and physical effort."
	haben / die zwei chinesischen Immunologen / im Rahmen der Entwicklung von Impfstoffen / entdeckt / diesen Effekt	*have / the two Chinese immunologists / during the development of vaccines / discovered / this effect*
(17)	Der erste Platz ging an Siegfried Müller, der bereits im ersten Wahlgang mit 53,9 Prozent der Stimmen gewann.	"The first place went to Siegfried Müller, who won in the first round with 53,9 percent of the votes."
	durch ihren Effekt auf die linken Wähler / ermöglicht / die Korruptionsvorwürfe gegen Jens Braun / haben / den klaren Sieg	*through their effect on left-wing voters / made possible / the allegations of corruption against Jens Braun / have / the clear victory*
(18)	Citroën nimmt einen radikalen Strategiewechsel mit seinem Projekt von umweltfreundlichem Auto.	"Citroën takes a radical change in strategy with eco-friendly car project."
	eine Allianz mit dem Elektromotoren-Konzern NIDEC / bereits / angekündigt / der französische Hersteller / hat	*an alliance with the manufacturer of electric motors NIDEC / already / announced / the French constructor / has*

Appendix 4. Fill-in-the-blanks task

14 Jahre Gefängnis nach Attentat auf den Mannschaftsbus von Borussia Dortmund

Sergej W. hat im April 2017 ein Attentat auf den Mannschaftsbus von Dortmund verübt. Er wird wegen Mordversuches für schuldig erklärt.

Elf Monate hat …… Dortmunder Richter Helmut B. gegen Sergej W. ermittelt. Nun hat er …… Urteilsspruch ausgesprochen: …… Mann, der am 11. April 2017 drei Bomben neben dem Bus von Borussia Dortmund gelegt hat, hat das Dortmunder Gericht zu 15 Jahren Gefängnis verurteilt.

…… Anschlag hatte Sergej W. schon früh im Prozess gestanden, aber bestritten, er habe mit Explosivstoffen Menschen schwer verletzen wollen. …… Mann hatte erzählt, durch den Anschlag …… Aktienkurs des Borussia Dortmund manipulieren zu wollen. In kurzer Zeit sollte …… Aktienkurs stark sinken, für diesen Fall hatte sich Sergej W. Wertpapiere gekauft, die ihm …… profitablen Verkauf seiner Aktien garantiert hätten. …… Kurs hatte die Operation allerdings nur wenig getroffen.

Carl Heydenreich, …… Rechtsanwalt Sergej W.s, hatte vergangene Woche eine Gefängnisstrafe von deutlich unter zehn Jahren beantragt. Laut ihm habe …… Täter keine kriminelle Absicht gehabt, sondern nur Angst und Schrecken provozieren wollen. Staatsanwalt Carsten D. argumentierte, der Bombenanschlag hätte in jedem Fall …… Tod zahlreicher Opfer angestrebt.

Sergej W. habe gewusst, dass …… Börsenindex schwere Störungen nur dann zugefügt werden können, wenn …… Wert der Aktiengesellschaft massiv zerstört werde, sagte Dombert damals. Und die Spieler sind eigentlich nun mal …… "Wirtschaftsmotor" des Borussia Dortmund. ……. Terror war jedoch nicht genug. Und die Erklärungen konnte daher …… Richter nicht ernst nehmen.

Vor Gericht zweifelte …… Sprengstoffexperte Oliver V. an der Aussage des Angeklagten. "Wenn es nur um Angst und Schrecken ginge, würde …… Sprengkörper keine Splitter enthalten oder …… Gangster hätte die Bombe so manipuliert, dass die Splitter nur nach oben in die Luft fliegen", sagte er. Das sei bei der Bombe von Sergej W. aber nicht …… Fall gewesen. …… Täter habe mit der Möglichkeit gerechnet, dass Menschen sterben, sagte in der Presse …… Richter Helmut B.

Bei der Explosion war …… Spieler Marc Bartra im Bus schwer verletzt worden. Auch …… Sicherheitsmann, der den Bus auf dem Weg vom Mannschaftshotel zum Stadion begleiten sollte, hat …… Knall getroffen. …… Mitarbeiter ist inzwischen im Krankenurlaub.

In dem Prozess hatte …… Richter aus allen anwesenden Spielern …… Verteidiger als Zeugen eingeladen. Wegen der Emotion konnte …… Bericht Bartras …… heute für Hamburg spielende Fußballstar Matthias Ginter nicht ohne Tränen zuhören. Dabei fügte noch …… Tormann Roman Weidenfeller hinzu: "Mein Leben hat …… Anschlag verändert."

…… Trainer Tuchel publizierte nach dem Ereignis …… folgenden Bericht: „ich wäre nach der Saison weiter in Dortmund geblieben, hätte es …… Anschlag nie gegeben“. Was …… Oberstaatsanwalt Carsten D. betrifft, er beschrieb das Gerichtsverfahren als …… Höhepunkt seiner Karriere. Zur Erinnerung: …… Elektroniker aus Russland Sergej W. hat …… Richter am Dienstag für schuldig erklärt.

Appendix 5. L2 learners' results in the Blanks Task, the General Proficiency Test and proportion of object fronting in the Element Rearrangement Task

L2 learners	***Score case suppletion (/5)***	***General proficiency (/5)***	***Object fronting proportion***
1	2,25	1,89	0,11
2	2,625	1,96	0,17
3	2,875	1,93	0,11
4	2,625	2,36	0,05
5	4,5	3,33	0,28
6	2,25	2,72	0,11
7	4,25	2,72	0,28
8	3,875	1,87	0,05
9	2,875	2,12	0,11
10	4	3,8	0,28
11	2,13	1,52	0
12	4,875	3,91	0,33
13	2	2,63	0,11
14	3,375	1,83	0,17
15	3,375	2,25	0,05
16	1,25	1,96	0,05
17	4,5	4,02	0,28
18	4,375	3,37	0,39
19	4	3,48	0,05
20	3,625	2,83	0,22
21	4,625	3,48	0,33
22	4,125	4,23	0,22
23	3	1,63	0,11
24	3,25	2,83	0
25	1,875	2,74	0,05
26	4	2,37	0,39
27	3,5	2,71	0,05
28	3,375	3,26	0,05
29	3,25	1,85	0,17
30	3	1,85	0
31	4,125	2,83	0,28
32	2,5	2,17	0
33	2,25	2,28	0,22
34	3,375	2,83	0,11
35	3,875	4,15	0,33
36	4,375	3,23	0,33
37	4,125	2,78	0,22
38	3,375	2,72	0
39	4,375	3,7	0,39
40	3,5	2,61	0,11
41	3,25	3,18	0
42	3,75	2,07	0,11
43	4,125	3,7	0,22
44	3,375	1,52	0,28
45	3	3,5	0,05

Appendix 6. Participants' fronting preferences (per test item) in the Element Rearrangement Task (L = learner; N = native)

Items

Participantsco	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***
L1	A	S	S	S	S	O	A	N	S	S	S	S	S	A	S	S	S	O
L2	V	O	O	S	A	O	S	S	S	S	A	S	S	S	S	S	S	S
L3	A	S	O	S	A	O	S	A	S	S	S	S	S	A	S	S	S	S
L4	A	S	A	S	S	S	S	S	S	S	S	A	S	S	S	S	S	O
L5	S	S	O	S	S	O	S	S	S	S	O	O	S	S	O	A	S	S
L6	S	S	S	S	A	O	S	S	S	O	S	S	S	S	S	A	S	S
L7	S	A	O	S	S	O	A	S	S	S	O	O	S	S	S	O	S	S
L8	S	S	O	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
L9	S	S	S	A	A	O	S	S	S	S	S	S	O	A	S	S	S	S
L10	S	A	O	S	S	S	O	A	S	S	O	O	A	A	O	S	S	S
L11	S	A	S	S	S	S	S	S	S	S	S	S	S	A	S	S	S	S
L12	S	S	O	S	A	O	O	A	S	S	O	S	S	O	S	O	A	S
L13	S	S	S	S	S	O	A	S	S	S	S	S	S	S	O	S	S	S
L14	S	S	O	S	S	S	V	S	S	S	S	O	S	S	O	S	S	S
L15	S	S	S	S	A	O	S	A	S	S	S	S	S	S	S	S	S	S
L16	S	S	S	S	S	S	S	S	S	S	S	S	O	S	S	S	N	N
L17	A	A	S	S	S	O	O	A	S	S	O	O	S	S	O	S	S	S
L18	S	A	O	O	A	O	A	S	A	A	O	A	S	O	O	O	A	A
L19	S	A	S	S	A	A	A	S	A	A	O	S	A	S	S	S	A	S
L20	A	O	A	A	S	O	O	S	S	S	S	S	A	S	S	O	A	S
L21	A	S	S	O	S	S	O	A	A	S	O	S	A	S	O	O	O	S
L22	S	A	O	S	S	S	A	A	S	S	O	S	S	A	S	O	O	S
L23	S	S	A	S	S	A	O	A	S	A	S	S	S	S	S	O	A	S
L24	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
L25	S	S	S	S	A	O	S	A	S	S	S	S	S	S	S	A	S	S
L26	A	S	A	A	A	O	A	A	A	O	O	O	A	A	O	O	O	S
L27	A	A	A	S	S	S	A	S	S	S	S	S	A	A	O	S	S	S
L28	S	A	S	S	S	O	S	S	S	S	S	S	S	S	S	S	S	S
L29	A	A	A	A	S	O	S	S	S	O	S	S	S	S	O	S	S	S
L30	S	S	S	S	A	S	S	S	S	S	S	S	A	S	S	S	S	S
L31	A	S	S	S	S	O	O	S	S	S	O	S	A	S	O	O	S	S
L32	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
L33	A	S	O	S	S	O	S	S	S	S	O	S	S	A	S	O	S	S
L34	S	S	A	S	S	S	A	S	S	O	O	S	S	S	S	S	S	S
L35	A	S	A	S	S	O	O	S	S	O	O	S	O	S	O	S	N	N
L36	S	A	O	S	S	O	O	S	S	S	O	S	S	S	O	O	S	S
L37	A	A	O	S	A	S	A	A	S	O	O	S	A	S	O	S	S	S
L38	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
L39	A	A	O	A	S	S	O	S	S	S	O	O	S	S	O	O	O	S
L40	A	O	A	S	A	S	O	A	S	S	S	S	S	S	S	S	S	S
L41	S	A	S	S	A	S	A	S	S	S	S	S	A	S	S	S	S	S
L42	A	A	S	A	S	S	A	S	S	S	S	S	A	S	S	O	O	S
L43	A	S	S	S	S	S	O	S	S	S	S	O	S	S	O	O	S	S
L44	A	A	S	S	S	S	A	S	O	O	S	S	S	A	O	O	S	S
L45	A	S	S	S	S	S	S	S	S	S	S	A	S	S	S	O	S	S
N1	S	A	O	S	S	O	O	S	S	O	S	O	S	S	A	O	A	S
N2	S	S	A	S	A	S	S	S	S	S	S	O	S	S	S	O	A	S
N3	S	S	A	S	A	S	S	S	S	S	S	O	S	S	O	O	O	S
N4	A	A	O	S	S	O	O	A	S	O	O	O	S	S	O	O	O	S
N5	A	A	O	A	A	S	S	A	S	O	S	A	S	S	A	V	V	S
N6	S	S	O	S	S	O	A	S	S	S	O	A	A	S	O	A	S	S
N7	S	A	O	S	S	O	O	A	S	S	S	O	A	S	O	S	S	S

N8	S	A	O	S	S	O	O	S	S	S	S	O	S	S	V	O	O	S
N9	A	A	O	S	A	S	O	A	S	S	O	O	S	S	S	O	S	S
N10	A	A	A	S	S	S	S	A	S	S	O	O	S	A	O	O	S	S
N11	S	S	O	S	S	O	S	S	S	A	S	A	A	S	O	O	S	S
N12	A	S	O	S	S	O	S	S	S	S	O	O	S	S	O	O	O	S
N13	A	S	A	S	A	S	A	A	S	S	S	O	S	S	O	A	S	O
N14	A	A	A	S	S	S	S	A	S	S	S	O	A	A	S	S	S	S
N15	A	S	O	S	S	S	A	S	S	A	S	O	S	S	S	O	O	S
N16	S	S	S	A	A	S	A	A	S	S	S	O	A	A	O	O	S	S
N17	A	S	O	S	S	S	O	A	S	S	O	O	S	S	S	O	S	S
N18	S	S	S	S	A	O	N	S	S	S	O	O	A	S	S	S	S	S
N19	A	A	O	S	S	O	A	S	S	S	O	A	A	S	O	S	O	S
N20	S	A	O	A	A	S	O	S	S	V	S	O	S	A	S	O	O	S
N21	S	A	A	A	S	A	A	A	A	A	S	A	S	O	A	A	S	S
N22	S	A	A	A	S	S	V	S	S	O	O	O	A	A	O	O	O	S
N23	A	S	O	S	S	O	O	S	S	S	O	O	A	S	O	O	S	S
N24	S	A	O	S	S	S	S	S	S	S	O	O	S	S	O	O	S	S
N25	A	A	A	S	S	S	A	S	A	O	S	A	A	A	O	A	S	S
N26	A	S	S	S	A	S	A	S	S	A	O	A	S	A	S	O	S	S
N27	S	A	O	S	S	O	A	S	S	O	O	O	S	S	O	S	S	S
N28	A	S	O	A	S	O	O	S	S	O	O	O	A	A	O	O	S	S
N29	A	S	O	S	S	S	S	A	S	S	S	O	A	S	S	O	S	S
N30	S	S	O	S	S	S	S	A	S	O	A	O	S	S	A	O	A	S

Constituent types. S = Subject, O = Object, A = Adverbial, V = Infinite Verb, N = No Response

Note. The numeration of items corresponds to their presentation in Appendix 3.

Appendix 7. Writing prompt

In 50 Jahren werden die Leute mehr über die Pandemie erfahren wollen, welche 2020 die Welt erschüttert hat. Wir können uns vorstellen, dass viele die Wikipedia-Seite zur COVID-19-Pandemie besuchen werden. Du bist gerade dafür verantwortlich, diese Seite zu schreiben. Das Ziel ist, dass du den Lesern detaillierte Informationen zu den Aspekten der Pandemie mitteilst, die du für relevant hältst (zum Beispiel: Ursprung der Krankheit, weltweite Ausbreitung des Virus, klinische Symptome der Infektion, Quarantänemaßnahmen, politische sowie sozioökonomische Auswirkungen, und so weiter). Achte besonders auf die Kohärenz deines Textes. Damit wird gemeint, dass die von dir dargestellten Sachverhalte logisch miteinander verknüpft werden sollen. Du hast 50 Minuten zur Verfügung, um deinen Text zu verfassen. Es gibt keine geforderte Wortanzahl; es wird eher von dir verlangt, so viel wie möglich zu schreiben, bis die vorgegebene Zeit um ist. Versuch also, innerhalb dieser 50 Minuten einen möglichst langen und vollständigen Text zu schreiben. Viel Erfolg!

'In 50 years, people will be curious to know more about the pandemic that turned the world upside down in 2020. We can imagine that many of them will visit the Wikipedia page on the COVID-19 pandemic. Your mission is precisely to write this page. The purpose is to provide your readers with detailed information about the aspects of the pandemic that you consider most relevant (for example, origin of the disease, worldwide spread of the virus, symptoms of the infection, lockdown measures, political as well as socio-economic consequences, etc.). Pay sufficient attention to the coherence of your text. This implies that you should establish logical relationships between the facts you decide to report. You have 50 minutes to compose your text. There is no required text length; however, what we expect from you is to write as much as possible within the time limit. In other words, try your best to write the longest and most complete text possible in the 50 minutes available. Good luck!'

Appendix 8. Indices of syntactic diversity and discourse cohesion: Coding guidelines

1) Indicators of syntactic diversity

Clause type:

Possible values:

- Main clause
- Subordinate clause
- Coordinated clause

Coding guidelines:

- Structures starting with a subordination conjunction, but violating the constraints on verb placement at the end of embedded clauses are still labelled as subordinate clauses.
    - [[Wenn es **war** möglich]$_{\text{Subordinate clause}}$, müssten die Menschen Telearbeit machen]$_{\text{Main clause}}$.
- The label "subordinate clause" covers both finite and infinite structures.
- Coordinated structures also include elliptical structures, in both main and embedded clauses.
    - [Sie dachten, [dass sie sowieso sterben würden]$_{\text{Subordinate clause}}$]$_{\text{Main clause}}$ [und haben in diesem Rahmen entschieden, [ein letztes Mal Krieg zu führen]$_{\text{Subordinate clause}}$]$_{\text{Coordinated clause}}$.
    - [Menschen dürften nicht mehr rausgehen]$_{\text{Main clause}}$, [sich mit Freunden treffen]$_{\text{Coordinated clause}}$, [oder ihre Familie sehen]$_{\text{Coordinated clause}}$.

Subordinate clause type:

Possible values:

- Adverbial clause
- Complement clause
- Relative clause

Coding guidelines:

- Relative clauses are conceptualized here as the whole set of clauses that are embedded within an (or a part of) immediate constituent. This set includes clauses introduced by a relative pronoun, clauses that act as complements of noun phrases or adjectival phrases, and comparative clauses that follow the comparative of an adjective or adverb.
    - Covid-19 ist **ein Virus**, [der sich weltweit entwickelt hat]$_{\text{Relative clause}}$.
    - Die Quarantaine war streng **in diesen Ländern**, [wo die Menschen verpflichtet wurden zu Hause zu bleiben außer für ihre Einkäufe]$_{\text{Relative clause}}$.
    - Donald Trump glaubte, dass der Coronavirus **der Versuch Chinas** war, [die USA zu angreifen]$_{\text{Relative clause}}$.
    - Diese Länder, wie Groß-Brittanien und Schweden, entschieden sich für **eine andere Art und Weise**, [um das Virus zu bekämpfen]$_{\text{Relative clause}}$.

    - In anderen Länder waren die Menschen **frei** [aus ihren Häuser zu gehen auch für shoppen]$_{\text{Relative clause}}$.
    - Da viele Bereiche der Wirtschaft nicht funktionierten, und viele Menschen zu Hause gelockt werden, war die Umwelt **weniger** von Menschen getroffen, [als sie normal ist]$_{\text{Relative clause}}$.
- Complement clauses cover all subordinate clauses that act as arguments (subject or non-subject arguments) of a matrix clause.
    - Eine dieser Nachteile war, [dass es für ärmere Menschen mehr kompliziert war, [online zu arbeiten]$_{\text{Complement clause}}$]$_{\text{Complement clause}}$.
    - Es gibt Leute die sagen [dass er kommt aus China]$_{\text{Complement clause}}$.
- Adverbial constituents that are formed as clauses are labelled as adverbial clauses, irrespective of their function (temporal, causal, modal, etc.).
    - [Wenn der Covid-19 ist in Europa gekommen]$_{\text{Adverbial clause}}$ Italie wurde am erste getroffen.
    - Auf politischerweise hat der Covid-19 eine provisorische Regierung verursacht, [weil Belgien keine Regierung hatte seit ein Jahr]$_{\text{Adverbial clause}}$.
    - [Anstatt Covid-19 zu kämpfen]$_{\text{Adverbial clause}}$, haben die politischen Gruppen aller Welt tatsächlich entschieden, gegeneinander zu kämpfen.

Finiteness:

Possible values:

- Finite
- Non-finite

Coding guidelines:

- Non-finite embedded clauses also include structures with past participles.
    - [Wie vom ersten Minister angekündigt]$_{\text{Non-finite clause}}$ besteht die neue Teststrategie aus kostenlose Schnelltests für alle Bürger.

Voice:

Possible values:

- Active
- Passive

Coding guidelines:

- We consider as markables for voice all passive clauses (processual and stative passives), alternative structures with patient subjects (*sich lassen* + infinitive, *sein* + *zu*-infinitive), and all non-passive structures that can be passivized. Copular structures, intransitive clauses (including clauses with unaccusative verbs), presentational-existential *es gibt*-structures, clauses with locative verbs and other configurations resisting voice alternations are not treated as markables for voice.
    - [Zuerst muss man verstehen, [dass der Präsident Trump sehr gefährlich und dumm war]$_{\text{Non-markable}}$]$_{\text{Markable-Active}}$.
    - [Man kann den Geschmack verlieren]$_{\text{Markable-Active}}$.

- [In Europa, [wo Masken früher nur selten getragen wurden]$_{\text{Markable-Passive}}$, tragt jetzt fast jeder ein Mask]$_{\text{Markable-Active}}$.
- [Er glaubte, [dass das Tragen der Gesichtsmasken sich nicht rechtfertigen lässt]$_{\text{Markable-Passive}}$]$_{\text{Markable-Active}}$.

- Regarding the distinction between stative passives and copular sentences with a past participle employed as a predicative adjective, the decision is made to identify genuine copular structures based on whether the past participle is listed as a separate lexical item in the *Duden Onlinewörterbuch*, with the exception of structures exhibiting an agentive PP-complement pointing to the action of an agent referent. Examples of such past participles acting as predicative adjectives are: *bekannt* ('known'), *verletzt* ('injured'), *beliebt* ('popular'), *geschlossen* ('closed'), *gebraucht* ('used'), *erzogen* ('raised', 'educated'), etc.
    - Asien und China unter anderem ist [bekannt]$_{\text{Predicative adjective}}$ für das Essen von komischen oder lebenden Dingen wie Tiere. → Copular structure
    - Die Leute haben geschwiegen, weil sie gut [erzogen]$_{\text{Predicative adjective}}$ sind. → Copular structure
    - Wir sind <u>von der Regierung</u>$_{\text{Agentive PP-complement}}$ verpflichtet, Masken zu tragen. → Passive
    - Viele Leute sind zunächst in China getroffen. → Passive (interpreted as *vom Virus getroffen*)

Valency:

Values:

- Values are determined based on the selected verbal arguments surfacing in the clause. The identification of valency patterns is carried out using the electronic valency dictionary of German verbs (*Elektronisches Valenzwörterbuch deutscher Verben*).

Coding guidelines:

- One and the same verb can be attributed two different valency patterns depending on the different meanings of the verb in question.
    - [Wirtschaftsspezialisten]$_{\text{Subject}}$ haben in Fachzeitschriften [die Auswirkungen der Pandemie auf die Gesundheitskosten]$_{\text{Accusative object}}$ <u>diskutiert</u>. → Diskutieren: Sich mit etwas auseinandersetzen: SUBJ + ACC
    - [Die Bürger]$_{\text{Subject}}$ konnten [mit dem Minister]$_{\text{Prepositional complement}}$ [über das Risiko für ihre Gesundheit]$_{\text{Prepositional complement}}$ <u>diskutieren</u>. → Diskutieren: Mit jemandem etwas erörtern: SUBJ + PRP + PRP
- The annotation of verb valency in passive clauses is based on the valency pattern of the corresponding verb in active structures.
    - Alle Schulen, Hochschulen und Universitäten wurden geschlossen. → Schließen: Den Betrieb von etwas einstellen: SUBJ + ACC
    - Am Anfang wurde das Virus "Corona" Virus gennant. → Nennen: Etwas einen solchen Namen geben: SUBJ + ACC + PRD (Object predicative)

- Am Ende kann das Coronavirus mit der spanischen Grippe von 1917 verglichen werden. → Vergleichen: Etwas betrachten und in Relation setzen zu etwas anderem: SUBJ + ACC + PRP

- Valency patterns include facultative arguments. These arguments are only labelled as part of the verb valency in case of overt realization.
    - Covid-19 ist eine Pandämie, die am Ende des Jahres 2019 in der Stadt Wuhan (China) zum ersten Mal entstanden ist. → Entstehen: Etwas fängt an, irgendwo irgendwann zu sein und entwickelt sich: SUBJ + (ADV(Ort)) + (ADV(Zeit))
- With respect to infinite clauses, subjects are added to the reported valency pattern.
    - [Die Lösungen, [die viele Länder gefunden haben], ist [zu Hause zu bleiben]$_{\text{Non-finite clause}}$ und [weniger Menschen zu sehen]$_{\text{Non-finite coordinated clause}}$].
        - ➔ zu Hause zu bleiben → Bleiben: Sich von irgendwo nicht entfernen: SUBJ + ADV
        - ➔ weniger Menschen zu sehen → Sehen: Jemanden treffen: SUBJ + ACC
- Similarly, the omitted arguments in elliptical structures are also included in the valency pattern.
    - Einige Leute waren nicht mit den Hygienemaßnahmen einverstanden und [sind auf die Straßen gegangen]$_{\text{Elliptical clause}}$.
        - ➔ Gehen: Sich in einer bestimmten Absicht irgendwohin begeben: SUBJ + ADV

Number of adjuncts:

Possible values:

- The attributed values are numbers that correspond to the identified number of adjuncts, i.e. immediate constituents that are not listed as part of the valency pattern of the verb, in a given clause. The minimal value is equal to zero and there is in principle no limit as to the number of adjuncts that can be accommodated in a clause.
    - 0: Wir dachten, dass es gefährlich wäre.
    - 1: Deswegen**1** stierben diese Tieren.
    - 2: Sie blieben lieber**1** zu Hause, um sich ein Film anzuschauen**2**.
    - 3: Tatsächlich**1** hat die Arbeitslosigkeit sehr schnell**2** zugenommen in fast alle Ländern**3**.
    - 4: In Europa**1** sorgte man zunächst**2** zu wenig**3** über die Pandemie, weil China sehr weit weg war**4**.

Coding guidelines:

- In copular clauses, spatial-temporal constituents positioned at the left of subjects or predicatives are not treated as adjuncts. Their function is to further specify subject or predicative, which is why they are not treated as immediate constituents, but rather as dependents of an argument.
    - 2020 war [der Beginn der Pandemie in unseren westlichen Ländern]$_{\text{Predicative}}$. → Number of adjuncts = 0

- In general, constituents that can be interpreted as specifying dependents of larger constituents that immediately precede them are not labelled as adjuncts.
    - Dies hat [für eine Revolution [in bezug auf Onlinekaufen]$_{\text{Dependent}}$]$_{\text{Prepositional object}}$ gesorgt. → Number of adjuncts = 0

BUT: [In bezug auf Onlinekaufen]$_{\text{Thematic PP/Adjunct}}$ hat dies für eine Revolution gesorgt. → Number of adjuncts = 1

- Dependents that are not adjacent to their licensing constituent must not be confused with adjuncts.
    - Über die Vor- und Nachteile der Impfung gegen den Coronavirus$_{\text{Dependent}}$ haben die meisten Leute keine vernünftige Meinung$_{\text{Licensing constituent}}$. → Number of adjuncts = 0

Type of clause-initial constituents (= prefields) in V2 declaratives:

Possible values:

- Constituent types are operationalized in terms of syntactic functions. Eight values are defined:
    - Subject (including expletives)
        - [Viele Unternehmen]$_{\text{Subject}}$ mussten$_{\text{V2}}$ nämlich für längere Zeit geschlossen bleiben.
    - Accusative object
        - [Diese Quarantäne]$_{\text{Accusative object}}$ wollten$_{\text{V2}}$ viele Länder nicht.
    - Dative object
        - [Diesen alten Patienten]$_{\text{Dative object}}$ konnten$_{\text{V2}}$ die Krankenhäuser keine Behandlung mehr geben.
    - Prepositional object
        - [Mit dieser Pandemie]$_{\text{Prepositional object}}$ hatte$_{\text{V2}}$ kein Land in Europa wirklich gerechnet.
    - Adverbial
        - [Am Anfang der Pandemie]$_{\text{Adverbial}}$ hatten$_{\text{V2}}$ Menschen Angst, dass ihre Haustieren das Virus tragen.
    - Predicative
        - [Der wichtigste Punkt]$_{\text{Predicative}}$ war$_{\text{V2}}$ der Kontrolle von der Verbreitung des Virus.
    - Dependent
        - [Zu den Informationen über die Ursprung der Krankheit]$_{\text{Dependent}}$ haben$_{\text{V2}}$ die internationalen Wissenschaftlicher den Zugang nicht bekommen können.
    - Ellipsis
        - Die Chinesiche Leute haben aber diese zwei Tieren gegessen und [Elliptical Subject]$_{\text{Ellipsis}}$ sind$_{\text{V2}}$ davon gestorben.

2) Indicators of discourse cohesion

Segmentation:

- Indicators of discourse givenness are annotated per clause, but with reference to antecedents whose identification is based on a segmentation of learner texts in T-units.

T-units are in other words used as basic information units in discourse with reference to which referential givenness as well as bridging strategies can be located.

- In Januar 2020, hat die Corona-pandemie begonnen aber [das war nur in China]$_{\text{T-unit-1}}$. [[[Dieses Land]$_{\text{Givenness}}$ hat sehr grosse Teile eingeschlossen wegen der Pandemie]$_{\text{Clause-0}}$]$_{\text{T-unit-0}}$.

- Immediate constituents are either attributed one of five values of discourse givenness - given, pronoun, given-displaced, bridging, bridging-contained – or left unlabelled. Aside from referential givenness, we also tag occurrences of discourse connectors. Finally, elliptical clauses are added to the repertoire of cohesive devices.

Referential givenness:

Possible values:

- Given
- Pronoun
- Given-displaced
- Bridging
- Bridging-contained

Given:

- Given referents are defined as referential expressions (corresponding to immediate constituents) with an antecedent occurring in either the same T-unit or in the previous T-unit. Givenness can operate through repetition of the same expression or by means of a paraphrase. In the second case, the co-reference relationship is inferred.
    - Die Symptomen von Covid-19 sind nicht die Ähnliche für jede Person. Man kann [das Covid-19]$_{\text{Given}}$ haben und gar nicht krank sein.
    - Der Coronavirus resultiert aus der Mischung von zwei Tiere die nicht zusammen passen. Aber die chinesische Population hat [diese zwei Tieren]$_{\text{Given}}$ gegessen.
    - Um das Virus zu blockieren sollen die Leute zu Hause bleiben und weniger soziale Kontakte haben. Das Problem ist jedoch, dass die Leute [solche Lösung]$_{\text{Given}}$ nicht respektieren wollen.

Pronoun:

- Anaphoric expressions in pronominal form (with an antecedent in T-unit-0 or T-unit-1) are labelled as pronouns. Generic pronouns (*wir*, *man*, *jeder*, *jemand*, etc.) do not count as markables for the category "pronoun". However, pronominal expressions that refer to generic NPs are treated as markables.
    - Viele Leute in der Welt sind vom Coronavirus gestorben. Nachdem [es]$_{\text{Pronoun}}$ in China war, war [es]$_{\text{Pronoun}}$ in Asien.
    - Erstens hat die Covid-Pandemie in Asien geherrscht. Da die anderen Kontinenten keine Maßnahmen genommen haben um [die Pandemie]$_{\text{Given}}$ zu blockieren, hat [sie]$_{\text{Pronoun}}$ sich zweitens in der ganzen Welt ausgebreitet.
    - Da die Leute mussten zu Hause bleiben, war es schwierig, um ihre Geistesgesundheit zu schützen. [Sie]$_{\text{Pronoun}}$ brauchten Psychiater oder Psychologen, die also ihre Arbeit nicht verloren haben.

- *Da*-compounds which are formed by pre-fixing *da/dar* to the beginning of a preposition are also attributed the label “pronoun”. *Da*-compounds replace combinations made up of a preposition and an anaphoric expression realized in the form of a pronoun.
    - Ein gefährlicher Virus hatte ein groβes Teil der chinesischen Population nämlich getroffen. Manche Menschen sind [daran]$_{\text{Pronoun}}$ gestorben oder sind sehr krank geworden.

Given-displaced:

- The label given-displaced is reserved for instances of givenness with minimum one T-unit between anaphor and antecedent. In other words, the antecedent of the anaphoric expression occurs earlier than T-unit-1.
    - [Am Anfang war das Virus "Corona" Virus genannt]$_{\text{T-unit-8}}$ [und nur Leuten in China waren krank von diesen Virus]$_{\text{T-unit-7}}$, [denn es war [in China]$_{\text{Given}}$ geboren]$_{\text{T-unit-6}}$. [Die Spezialisten des Virus dachten, dass der Virus ab November erstanden ist]$_{\text{T-unit-5}}$, [aber viele andere Leuten sagten dass der Virus schon im October da war]$_{\text{T-unit-4}}$. [Der Virus kommt schnell]$_{\text{T-unit-3}}$, [er ist sehr steckig]$_{\text{T-unit-2}}$, [also man kann es sehr schnell haben und sehr schnell geben]$_{\text{T-unit-1}}$. [[**China**]$_{\text{Given-displaced}}$ war sehr schnell krank]$_{\text{T-unit-0}}$, [und dann waren es die andere Ländern]$_{\text{T-unit+1}}$.

Bridging-contained:

- This label is attributed to non-coreferring immediate constituents in which a discourse-given (or given-displaced) expression is embedded, serving as an anchor to the preceding discourse context. The anchoring expression is embedded in either phrasal material or within a complement clause.
    - Ein Mann hatte Ende 2019 ein fremdes Tier gegessen aber wusste nicht, dass dieser sehr giftig sein konnte. [Das Einschlucken von diesem Tier]$_{\text{Bridging-contained}}$ hat sehr gefährliche Konsequenzen geschafft weltweit.
    - Vielen Musiker haben während dieses Lockdown Musik gespielt, um die Ruhe zu brechen und um ein bisschen "Leben" [an ihren Nachbarn]$_{\text{Bridging-contained}}$ anzubieten.
    - Manche Unternehmen und Organisationen sahen [ihre Märkte]$_{\text{Bridging-contained}}$ durchfallen.
    - Der Virus Covid-19 begann Ende 2019 in einer kleine Provinz in China. […]. Nach einigen Monaten beendete [die chinesische Regierung]$_{\text{Bridging-contained}}$ die Krise.
    - Am Anfang war das Virus "Corona" Virus gennant und nur Leuten in China waren [krank von diesen Virus]$_{\text{Bridging-contained}}$.
    - Der Covid-19 ist ein Virus, das auch Corona-virus oder einfach Covid genannt wird. Es stammt aus China im spät 2019 und hat sich in wenig Zeit überall in der Welt verbreitet. Der Virus wurde zu uns Menschen gebracht [durch Fliegermäuse, die [in China]$_{\text{Given}}$ gegessen werden]$_{\text{Bridging-contained}}$.

➔ Important: In the situation where the anchoring expression is embedded within a complement clause (e.g. a relative clause), the co-referring anchor is labelled a first time as "bridging-contained" at the level of the main clause, and a second time as "given" (or "given-displaced") at the level of the subordinate clause.

Bridging:

- This label is attributed to three types of non-coreferring expressions: (i) expressions whose interpretation is dependent on a referent in the preceding discourse context; (ii) (definite or indefinite) expressions that form a common semantic superset with an expression in the immediately preceding context (T-unit-0/T-unit-1); (iii) expressions containing an attributive adjective that establishes an ideational continuity with the preceding discourse. The label "bridging" is assigned to immediate constituents. When bridging expressions are embedded in larger phrasal material or in complement clauses, they are coded as bridging-contained elements.
    - Folglich hat die italienische Population mehr und mehr Covid-Fälle aufgenommen und [die Situation]$_{\text{Bridging}}$ läufte langsam ins Chaos. → Interpreted as *Die Situation in Italien*
    - Wir wissen alles, dass China viel lügt und viele wichtige Information versteckt. Und [die anderen Länder]$_{\text{Bridging}}$ wussten nicht, dass dieses Virus gefährlich war. → *Die anderen Länder als China*
    - Im Allgemein war die Pandemie auch eine Katastrophe im Event Sector, weil Sänger zum Beispiel nicht mehr Spektakel vorstellen können. [Die Mehrheit]$_{\text{Bridging}}$ hatten also kein Geld genug, um korrekt zu leben, zu essen, sich anzukleiden, usw. → *Die Mehrheit der Sänger*
    - Manche Unternehmen und Organisationen sahen ihre Märkte durchfallen, und [Konzerne wie Amazon und FedEx]$_{\text{Bridging}}$ waren die erste Verletzte.

Discourse connector:

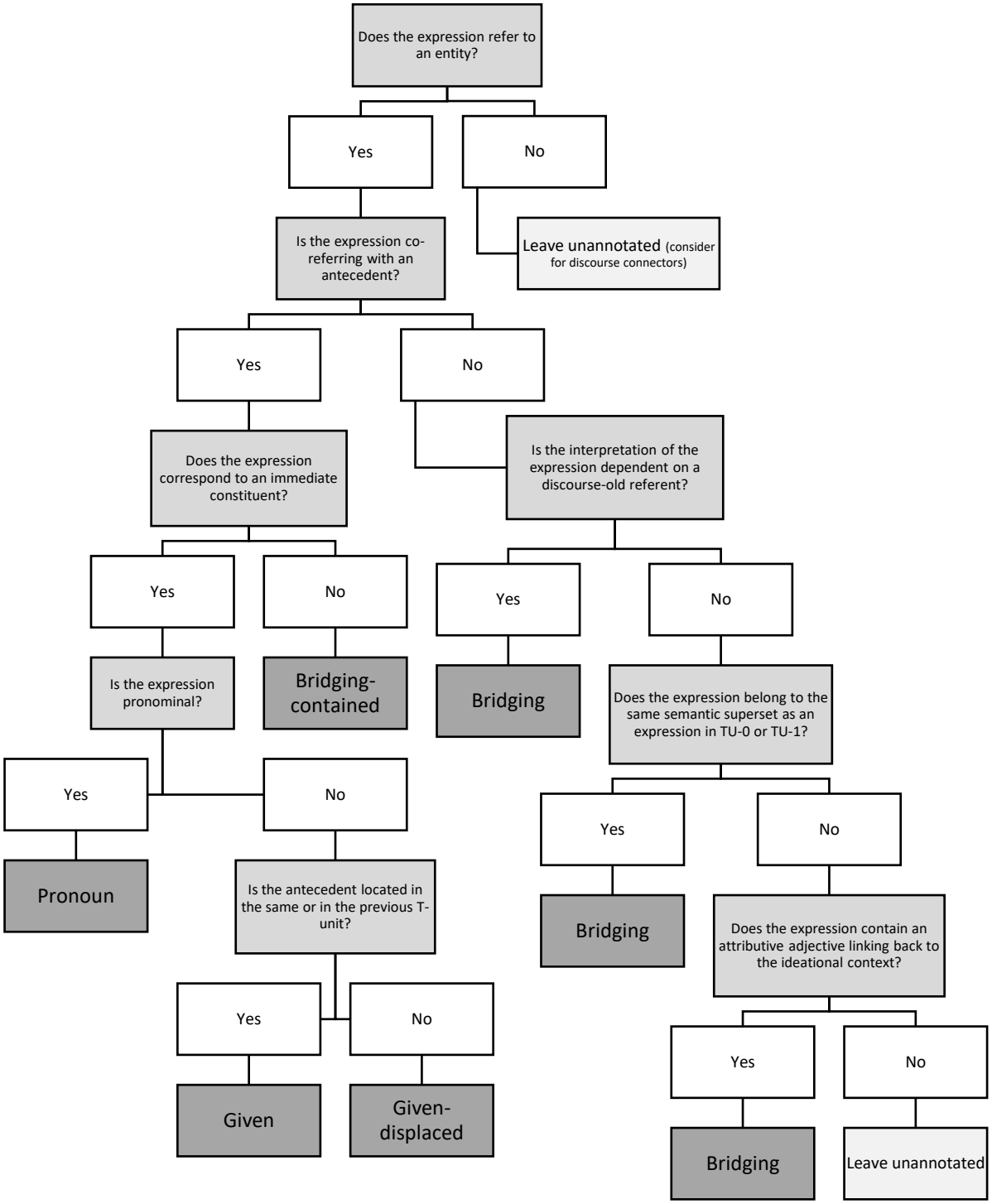
- Expressions that do not refer to entities are identified as discourse connectors based on whether they are part of the following list of adverbial connectors which was established within the framework of a discourse annotation project at the University of Potsdam (Stede, M. (Ed.) (2016), *Handbuch Textannotation*. Potsdam: Universitätsverlag Potsdam):
    - *aber, allein, allenfalls, allerdings, also, andererseits, anderenfalls, ansonsten, anstelle dessen, auch, aufgrund dessen, außer, außerdem, beispielsweise, bzw., da, dabei, dadurch, dafür, dagegen, daher, danach, dann, darauf, daraufhin, darüber hinaus, darum, demgegenüber, denn, dennoch, des Weiteren, desgleichen, deshalb, dessen ungeachtet, deswegen, doch, ebenfalls, ebensowenig, ergo, erstens, ferner, folglich, gleichwohl, hierauf, hierdurch, hiernach, hingegen, infolge dessen, insofern, insofern als, inwiefern, inwieweit, inzwischen, jedoch, mithin, nämlich, nebenher, nichtsdestoweniger, nichtsdestotrotz, ob, obendrein, ohnedies, ohnehin, seitdem, seither, so, sodann, somit, sonst, soweit, später, statt, tatsächlich, trotzdem, überdies, unterdessen, vielmehr, vorher, währenddessen, warum, weiterhin, wie, zudem, zugleich, zum Beispiel, zumal, zunächst, zusätzlich, zuvor, zwar, zweitens*.

- [Deshalb]$_{\text{Discourse connector}}$ ist es sehr einfach für solche asymptomatische Leute, die andere zu infektieren, ohne es zu wissen.
- Die Symptome der Krankheit Covid-19 sind [außerdem]$_{\text{Discourse connector}}$ sehr ähnlich zu den Symptomen der Grippe.
- Die Regierung hatte [nämlich]$_{\text{Discourse connector}}$ wieder eine wichtige Platz genommen.
- Das ist [auch]$_{\text{Discourse connector}}$ wahrscheinlich der Grund dafür, dass der Coronavirus eine Pandemie heisst.

Ellipsis:

- Ellipses consist in omissions of sub-clausal material (e.g. verbs, verb phrases, nouns, noun phrases, etc.) that refers to textual antecedent.
- The most frequent type of ellipsis involves omission of the subject in coordinated clauses.
    - Im Vergleich zu den anderen Krankheiten, wie zum Beispiel der Spanish Flu wahrend dem zweiten Weltkrieg, AIDs in den 21. Jahrhundert sowie Ebola in den vergangenen Jahren, ist der Coronavirus viel schneller verbreitet [und [Elliptical Subject] hat fast alle Ecken der Welt erreicht].
    - Studenten mussten noch lernen [und [Elliptical Subject] hatten dann online Kursen].
- However, omissions can extend beyond the subject and include finite verbs as well as objects.
    - Man kann es sehr schnell haben [und [Ellipsis of Subject+Finite verb+Object] sehr schnell geben].
    - Man kann zum Beispiel den Geschmack verlieren [oder [Ellipsis of Subject+Finite verb] Kopfschmerzen und andere Schmerzen haben].
- Ellipses can also affect the whole verbal bracket (and parts of immediate constituents).
    - Viele Patienten haben Symptome [aber die anderen [Ellipsis of the NP-Subject head+Ellipsis of finite verb] keine [Nominal Ellipsis within the NP-Object]].

Decision tree for referential givenness:



Example annotation of discourse cohesion cues:

Clause 1	Die Corona-virus Pandemie hat im Jahr 2020 begonnen.
Clause 2	[Im Januar]$_{\text{Bridging}}$ hat das Welt über einer grossen Krankheit hören sprechen.
Clause 3	[Viele Zeitschriften dieser Zeit]$_{\text{Bridging-contained}}$ sagten, dass jemand ein Tier namens "Pangolin" in China gegessen hatte.
Clause 4	dass jemand ein Tier namens "Pangolin" in China gegessen hatte
Clause 5	In Europa sorgte man [zunächst]$_{\text{Discourse connector}}$ zu wenig [über die Pandemie]$_{\text{Given-displaced}}$, weil China sehr weit weg war.
Clause 6	weil [China]$_{\text{Given}}$ sehr weit weg war
Clause 7	und man dachte nicht, dass Corona eine zu gefährliche Krankheit war.
Clause 8	dass [der Corona-virus]$_{\text{Given-displaced}}$ eine zu gefährliche Krankheit war
Clause 9	[Dann]$_{\text{Discourse connector}}$ kam [dieses Virus]$_{\text{Given}}$ [bis zu Europa, Amerika und so weiter]$_{\text{Bridging-contained}}$.
Clause 10	[Dann]$_{\text{Discourse connector}}$ haben sich die Menschen mehr [an dieser Krankheit]$_{\text{Given}}$ interessiert.

Acknowledgements

At the very beginning of my PhD project, a former professor of mine told me that I should consider the PhD as a marathon, and that I should be careful not to exhaust all my mental and physical resources too early in the process. Although endurance races were one of my strengths in high school, a 5000 meters race is nothing compared to a marathon, the longest Olympic distance to which only the bravest runners measure themselves. You may well think to reassure yourself that you are not the first that the perspective of a marathon puts off, it does not alter the fact that this long journey ahead of you will not feel like a serene holiday by the sea. Now that I am looking back at these past four years, I must confess that the marathon metaphor was the right one. I experienced the moments of blank despair where you are running short of breath, where there is no oasis at the horizon, where everything seems to indicate that you will never cross the finish line. I felt these moments where I thought I may have started a race that was simply too hard for my legs. But next to these moments, there were other ones, fortunately much more numerous, where I could get my second wind, lengthen my stride, and gain some precious confidence in my ability to persevere and achieve my objectives. You may wonder what gives you the strength to run long distances to the best of your potential and to recover from the tougher times that you inevitably encounter. As for me, a big part of the answer is to be found in the people who surrounded me, those who coached me, for they ran the PhD marathon before me and equipped me with the necessary knowledge resources, and those who cheered me up along the way, family and friends, without whose support I would not be able to say: “Wow, I made it to the end”.

I do not want these acknowledgments to take the form of a name dropping exercise, for the main reason that I want to avoid the affront of forgetting people who made in one way or another this PhD journey one worth experiencing. As a result, I will reserve the few lines below to express my gratitude to a small number of essential persons, the ones without whom bringing

my doctoral research to a successful conclusion would have been impossible. The first of these key people that come to my mind are my two PhD supervisors, Liesbeth Degand and Ferran Suñer. Before the start of my doctoral research, I had already a few years behind me in the department of modern languages, as a bachelor and master student. And still, even in this small world, my paths did not cross Liesbeth's and Ferran's prior to the PhD. To the question whether I could have dreamt of better supervisors, the answer is no. I am fully aware that I am probably not the easiest PhD candidate to work with. I can be particularly stubborn, pessimistic, and inconstant at times (also arrogant, at least that is what my wife would say), and despite this, Liesbeth and Ferran found the right way to keep me focused on achieving my goals. More importantly, they quickly allowed me to take initiatives in defining my research objectives and planning the necessary methodological steps. I sincerely appreciated these signs of trust which helped me grow in my scientific practice and forced me to develop a strong sense of ownership towards my project. Supervisors are there to give confidence and provide the necessary logistic support when needed, but the main difference they make is through their constant ability to inspire. I must confess that I did not know much about statistics after my master studies. Fortunately, I could count on Ferran to help me understand the key concepts and figure out which models are relevant to answer specific research questions. My long discussions with Liesbeth revolved less around statistical analyses, but her endless knowledge of the grammar-discourse interface and her precious expertise with regard to the annotation of corpus data were also of significant value for the realization of the studies presented in this dissertation.

Supervisors are on the front line to provide support and guidance to PhD candidates. However, they are not the only resource persons on whom we can rely to solve the practical and methodological problems that necessarily occur. Next to my supervisors, there were fantastic people in the second line who also deserve a big thank you. I think particularly of the members of my "comité d'accompagnement", Carlee Arnett and Fanny Meunier. Although we

did not meet that often, their enthusiasm and accessibility made a lasting impression on me. And last but not least, I would like to thank Nathalie Lefèvre for the statistical consulting. Nathalie works in the shadow of countless research projects, but her contribution is nonetheless vital.

A PhD is often considered as a solitary job. Well, to be frank, it involves a lot of long private moments where you are left alone in your office, surrounded by nothing else but your computer and a couple of interesting books. The positive side of it is that you learn so much throughout the day that you have a lot the tell to your beloved ones when dinner time comes. This is the perfect occasion to thank my wife Chushu for having been my most loyal audience over these past four years. Chushu, I admire you for the patience you showed when listening to my countless rehearsals before conference presentations. Don't worry, I don't blame you for having told me how ridiculous I was when I took a bottle of wine in the kitchen and made an unfortunate attempt to illustrate the bottleneck hypothesis. And before I forget, I know you were waiting for it for more than three years, so I promise you this: I will tidy up my desk at home!

Next to my wife, my parents also deserve a warm hug for having been there in both good times and hard times. I want to thank them for listening to my doubts and for always helping me put things in the right perspective.

Finally, a few words for two friends, Marie-Laure and Guillaume, whose continued encouragement did me a lot of good. My regular chats with them over a coffee allowed me take a step back from my work at the moments when I needed it the most.

To all those I did not mention by their name here, colleagues, researchers, family and friends, with whom I had the opportunity to connect, exchange ideas, or simply have a good belly laugh, thank you from the bottom of my heart!