

Cross-Linguistic Differences at the Syntax-Discourse Interface in Off- and On-line L2 Performance

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1. Introduction

Studies of ultimate attainment in adult second-language (L2) acquisition report a disjunction between success in acquiring the syntax of the target language (TL), on the one hand, and persistent difficulties at the interfaces of syntax with other grammatical modules, e.g. discourse-pragmatics, on the other. However, there continues to be debate as to whether these difficulties arise from deviance in grammatical representations or from computational limitations in the real-time integration of information across linguistic modules. Addressing these issues, this study compares off-line behaviour and on-line performance at the syntax-discourse interface in L2 German.

Word order optionality in German, so-called scrambling, brings together syntactic, morphological and information-structure (IS) information in grammatical licensing and on-line processing. Nineteen L1 English, twenty-two L1 Dutch and twenty L1 Russian advanced to near-native speakers of German were tested on scrambling in an off-line grammaticality judgement task and an on-line self-paced reading task. The results reveal differences among L2 groups according to task (off-line versus on-line) and L1 (English, Dutch, Russian). I argue that the interaction of task and L1 effects calls for a more nuanced conceptualization of non-convergence at the syntactic interfaces at L2 ultimate attainment.

The paper is structured as follows: Section 2 reviews research on the syntax-discourse interface in near-native L2 acquisition. Section 3 presents German scrambling in terms of grammar and processing. In Section 4, Experiments 1 and 2 are presented. Finally, Section 5 discusses the results and concludes.

2. L2 ultimate attainment at the syntax-discourse interface

Recent studies on the syntax-discourse interface at L2 ultimate attainment document protracted difficulty with discourse-interpretive constraints on syntax. Studying the licensing of postverbal subjects in Italian, Belletti, Bennati & Sorace (2006) report results from a series of elicitation experiments and a spontaneous production task with 17 English near-native speakers of Italian. Across tasks, the L2 speakers use postverbal subjects (VS orders), such that they can be considered to have acquired the syntax of VS orders. However, the production of postverbal subjects is not tied to IS as the near-natives do not demonstrate a target-like preference for VS when the subject is in focus or indefinite, i.e. denoting new information. In a truth-value judgement task, Sorace & Filiaci (2006) find that near-native L1 English speakers of Italian allow overt pronouns to corefer to intrasentential topics (subjects) while natives prefer extrasentential non-topical referents. Across several off-line comprehension and production tasks, Valenzuela (2006) reports that L1 English near-native speakers of Spanish acquire the syntax of clitic left dislocation constructions, yet, they fail to associate object topics in clitic left dislocation constructions with an interpretive specificity requirement.

These studies support the generalization that L2 endstate speakers converge on the TL syntax, yet they do not acquire target-like discourse-to-syntax mappings, i.e. they fail to identify both (a) the discourse conditions constraining syntactic movement and (b) its interpretive consequences.

However, the small number of studies on the syntax-discourse interface at the L2 endstate does not yet allow for definitive conclusions about the extent and the cause of these difficulties. First, since there has been no cross-linguistic research, it is unclear to what extent non-convergence is modulated by L1 differences. To explore the cross-linguistic scope of difficulties, this paper tests near-native L2 speakers

across several L1 backgrounds. Second, it is unclear whether protracted problems at the syntax-discourse interface are due to representational impairment in the mapping of discourse information onto syntax or computational limitations on the automaticity of this mapping.

Sorace (2003) hypothesizes that the interface of syntax with discourse interpretation is subject to representational impairment in adult L2 acquisition in that L1 settings are never completely expunged from the Interlanguage grammar. Hence, L1 transfer is argued to lead to indeterminacy or residual optionality as the L1 and the TL settings continue to coexist. However, in light of approaches that argue that processing limitations underlie divergence at other syntactic interfaces in adult L2 acquisition (e.g. Hahne 2001; Prévost & White 2000), it has been suggested that the mapping of discourse information onto syntax may not be impaired, but it may exceed the processing capacities of L2 learners. For instance, Sorace (2006) speculates that such processing limitations may magnify non-convergence at L2 ultimate attainment. In order to differentiate between representational impairment and computational difficulties at the syntax-discourse interface, this paper compares off-line and on-line performance in near-native speakers of different L1s on scrambling in German.

3. Scrambling and the interfaces: Grammar and processing

In addition to sentence-initial topicalization, German, an SOV language (1a), allows for objects to precede subjects in non-sentence-initial positions, so-called scrambling. In (1b), the object-subject (OS) order in the embedded clause is derived by moving the object across the subject (Haider & Rosengren 1998). Morphological case marking on the definite determiners disambiguates syntactic order.

- (1) a. Ich glaube, dass der Vater den Onkel geschlagen hat. (SO)
I think that the_{NOM} father the_{ACC} uncle beaten has
 b. Ich glaube, dass [den Onkel]_i der Vater t_i geschlagen hat. (OS)
'I think that the father hit the uncle.'

Syntactic reordering by scrambling is limited to certain discourse contexts, namely, those in which the scrambled NP is defocused and the preverbal subject carries focus (e.g. Lenerz 1977; Haider & Rosengren 1998). Such focus assignment corresponds to an IS where the scrambled NP denotes given information and the subject is new. In all other contexts, scrambling is distinctly marked. This is illustrated in (2&3), where the *wh*-word in the question designates the focussed constituent in the answer. Focus is marked by capitalization and markedness by '#'. In the 'SUBJECT-Focus' context (2), scrambling is felicitous, while the IS of the 'OBJECT-Focus' context (3) is infelicitous for scrambling.

- (2) a. Wer hat den Vater geschlagen? (SUBJECT-Focus)
'Who beat the father?'
 b. Ich glaube, dass den Vater der ONKEL geschlagen hat.
 (3) a. Wen hat der Onkel geschlagen? (OBJECT-Focus)
'Who did the uncle beat?'
 b. #Ich glaube, dass den VATER der Onkel geschlagen hat.

There are cross-linguistic differences in the syntax of scrambling and its association with IS. The morphosyntax and IS of Russian scrambling resembles the relevant properties of German scrambling ((4); see e.g. Bailyn 1995). Dutch has no scrambling across subjects and no case marking on full NPs (5a&b, overleaf); yet, it does show IS-governed scrambling of object NPs across, e.g., adverbs, such as in (5c) where the object scrambles out of focus (see e.g. Zwart 1997).

- (4) a. ... utrom deushk-a udaril DJADJ-u. (Russian)
in the morning grandfather-NOM hit uncle-ACC
 b. ... utrom [djadj-u]_i udaril DEUSHK-a t_i. (OS)

- (5) a. ... dat de man gisteren het BOEK gekocht heeft. (Dutch)
 that the man yesterday the book bought has
 b. ... *dat het boek [de MAN]_i gisteren t_i gekocht heeft. (OS)
 c. ... dat de man [het boek]_i GISTEREN t_i gekocht heeft. (SO_i-ADV-t_i-V)

Finally, English has neither scrambling nor case marking on full NPs. Table 1 summarizes the cross-linguistic differences for the languages under review (for details, see Hopp in prep.).

	German	Russian	Dutch	English
Scrambling across adverbs	+	+	+	-
Scrambling across subjects	+	+	-	-
Syntax-Morphology (Case marking)	+	+	-	-
Syntax-Information Structure	+	+	(+)	-

Table 1. Cross-linguistic differences in scrambling.

3.1. Scrambling and sentence processing

Effects of the syntax and the IS of scrambling also arise in on-line sentence comprehension. Scrambled orders incur additional processing effort compared to canonical SO orders (e.g. Hemforth & Konieczny 2000). This effect is commonly related to universal parsing principles, such as in (6).

- (6) *Minimal Chain Principle* (De Vincenzi, 1991: 13): “Avoid postulating unnecessary chain members at S-structure, but do not delay required chain members.”

In accordance with (6), the parser incrementally constructs the default subject-initial phrase structure in (1a) upon encountering the first embedded NP. Syntactic reanalysis to an OS order (1b) is costly as the OS order contains an extra movement chain compared to the SO default. Measurable garden-path effects, e.g. reading slowdowns, on the non-nominative marked first NP in OS orders (i.e. *den Onkel* – ‘the uncle’ in (1b)) reflect the processing cost of syntactic reanalysis.

Bayer, Bader & Meng (1999) show that the processing costs of German scrambling are modulated by IS in that scrambling evokes reduced processing effort if embedded in a felicitous context (2). Incremental effects of IS on the processing of scrambling have been reported in ERP studies by, e.g., Bornkessel, Schlesewsky & Friederici (2003) and Stolterfoht (2005) where it is further shown that the processing component of IS is neurophysiologically distinct from effects of syntactic reanalysis. Bader & Meng (1999) argue that these effects arise as the consequence of the interaction of two types of reanalysis that are involved in processing scrambling: (a) syntactic reanalysis from SO to OS order as per (6), and (b) IS reanalysis which shifts focus from the object to the subject. In a felicitous IS context such as in (2), the context designates the subject in the answer as bearing (narrow) focus (syntax-IS match), such that only syntactic reanalysis is necessary for OS orders. By contrast, in the infelicitous context in (3), both syntactic and IS reanalysis are required because narrow focus on the object (as induced by the OBJECT-Focus context) needs to be revised to narrow focus on the subject (syntax-IS mismatch). Analogously, in neutral contexts or for out-of-the-blue sentences, syntactic and IS reanalysis are necessary as (default) wide focus must be revised to narrow focus on the subject.

In sum, additional processing effort for scrambling *vis à vis* the canonical SO order is traceable to two distinct, though interacting, reanalysis processes, namely, (a) syntactic reanalysis that is invoked by the expansion of phrase-structure for scrambled orders, and (b) IS reanalysis that is invoked by the adjustment of the IS of the (null) context to fit the IS of scrambling, that is, narrow focus on the preverbal subject. Effects of IS on processing can thus be seen in varying processing costs for scrambled orders depending on whether they are embedded in felicitous or infelicitous IS contexts.

4. Experiments

The two experiments reported in this paper test whether near-native L2 speakers are sensitive to the discourse-relatedness of German scrambling in off-line acceptability judgements and on-line sentence processing. The following predictions can be put forward.

If the mapping between syntax and discourse is subject to *representational impairment*, near-native L2 speakers are predicted not to demonstrate target-like sensitivity to IS effects on scrambling in either off-line and on-line tasks. On Sorace's (2003) assumptions, the L1 should determine convergence: The match in L1-TL properties should entail convergence for the L1 Russian group, whereas mismatching L1-TL combinations should lead to indeterminacy for the L1 English and L1 Dutch groups across tasks.

If the mapping between syntax and discourse is subject to *computational difficulty*, we expect to find differences between off-line and on-line performance. Specifically, if computational capacity limitations constrain the mapping between syntax and discourse at L2 ultimate attainment, the degree of target-like performance should correlate with task demands.

4.1 Subjects

Groups of L1 Russian, L1 English and L1 Dutch highly proficient speakers of German and native German controls took part in the experiments. The subject groups were not identical in Experiment 1 and 2 (Table 2), although there was a sizeable overlap in subjects. All L2ers had started learning German after age 11 and were residents in Germany at the time of testing. They all completed a timed web-based C-test (Grotjahn 1996) to estimate their proficiency in German and were then allocated to two groups according to their scores, i.e. advanced (ADV, <67%) and near-native (N-N, ≥67%); the cut-off point was the median score in each group. Subject information is listed in Table 2.

		ADV R	N-N R	ADV E	N-N E	ADV D	N-N D	GER
N (Exp.1/Exp.2)		8/11	8/10	8/9	8/11	6/11	10/10	47/16
C test (timed) (%)	range	43-65%	69-81%	43-63%	66-77%	46-65%	66-77%	76-92%
	aver.	57%	74%	53%	70%	57%	71%	82%
Length of exposure (years)	range	6-31	10-30	11-43	12-46	10-33	13-41	
	aver.	15.4	14.0	26.0	24.9	20.6	28.0	
Length of residence (years)	range	2-15	5-15	6-31	3-32	5-16	6-36	
	aver.	7.9	11.6	18.1	15.8	11.3	18.5	
Age	aver.	30.1	29.8	52.0	40.9	37.0	41.8	50.1

Table 2. Subject information by group (E=English; R=Russian; D=Dutch, GER=German; ADV=advanced; N-N=near-native)

4.2 Experiment 1: Acceptability Judgements

To test knowledge of scrambling and its interaction with IS, a web-based judgement experiment (Magnitude Estimation; Bard et al. 1996) was run using the software package *WebExp* (Keller, Corley, Corley, Konieczny & Todirascu 1998) and adapting materials from Keller (2000). Subjects judged the acceptability of the sentences embedded in contexts relative to an open-ended scale of their choosing. The factors in the materials relevant for present purposes were *Context* and *Word Order*.

The factor *Context* manipulated IS, and it had three levels: the neutral ALL-Focus context inducing wide focus (7a), the SUBJECT-Focus context that makes the object given information and induces narrow focus on the subject (7b), and, finally, the OBJECT-Focus context that renders the subject given and induces narrow focus on the object (7c). The IS of the SUBJECT-Focus context is felicitous for scrambling (syntax-IS match), while the OBJECT-Focus context is not (syntax-IS mismatch).

- (7)
- a. ALL-Focus: What happened?
 - b. SUBJECT-Focus: Who bought the car?
 - c. OBJECT-Focus: What did the father buy?

The factor *Word Order* also had three levels: the canonical SO order (8a), the scrambled OS order (8b), and an ungrammatical SO order that comprised two nominative-marked NPs (8c).

- (8) a. Thomas denkt, dass der Vater den Wagen kauft. (SO)
Thomas thinks that the_{NOM} father the_{ACC} car buys
 b. Thomas denkt, dass den Wagen der Vater kauft. (OS)
 c. Thomas denkt, dass der Vater der Wagen kauft. (S_NO_N)

In (8), the subject was animate, and the object inanimate. Due to individual variability in judgement scales, the geometric means of judgements were rescaled to a scale from 0 to 100 for comparability. Tables 3 and 4 present the results for the advanced and the near-native groups, respectively.¹ The results for the contexts are listed horizontally in each cell (ALL-Focus / SUBJECT-Focus / OBJECT-Focus).

	German (n=47)	Russian advanced (n=8)	English advanced (n=8)	Dutch advanced (n=6)
(8a) SO	100/99/93	89/79/97	98/91/100	87/76/84
(8b) OS	54/ 67/51	62/ 79/50	8/9/10	1/12/11
(8c) *S _N O _N	9/4/0	13/19/28	72/71/49	65/70/60

Table 3. Results: Advanced groups (ALL-Focus/SUBJECT-Focus/OBJECT-Focus)

	German (n=47)	Russian Near-N (n=8)	English Near-N (n=10)	Dutch Near-N (n=10)
(8a) SO	100/99/93	85/83/100	99/97/94	80/92/91
(8b) OS	54/ 67/51	45/ 62/46	58/ 66/55	38/46/47
(8c) *S _N O _N	9/4/0	20/20/11	12/15/16	15/4/4

Table 4. Results: Near-Native groups (ALL-Focus/SUBJECT-Focus/OBJECT-Focus)

Let us first consider the target native patterns of judgements. With respect to morphosyntax, the natives make a distinction between the canonical SO order (8a) that is judged the highest across all contexts and the scrambled OS order (8b) that receives lower ratings reflecting its markedness. However, the scrambled OS order is rated significantly better than SO orders containing case violations (8c). In sum, then, the scrambled order is marked, though acceptable, in German. With respect to the effects of IS, the natives show a significant difference in the judgements of the OS order between the felicitous SUBJECT-Focus context and the infelicitous OBJECT-Focus context ($F(1,46) 2.78, p=0.008$). The relevant significant differences are shown in boldface in Tables 3 and 4.

The non-natives' judgements differ according to proficiency and L1. The L1 Russian groups make target-like distinctions on the morphosyntax of scrambling. They are also sensitive to the effects of IS on scrambling since they make a distinction for OS sentences between the SUBJECT-Focus and the OBJECT-Focus context ($F(1,16) -2.693, p=0.016$). By contrast, the L1 English and L1 Dutch advanced groups show divergence on both the morphosyntax and the IS of scrambling. As for morphosyntax, these groups rule out the scrambled OS order (8b) and they are not sensitive to case violations (8c). Their judgement patterns thus suggest that they use linear order and/or animacy to determine the syntactic function of NPs, but not case marking. As for IS effects, these groups do not make a difference for OS orders depending on context ($p>0.9$). By contrast, the near-native L1 English and L1 Dutch groups converge on the morphosyntax of scrambling ((8b) versus (8c)). L1 differences emerge in that

¹ Note that the numbers in Tables 3 & 4 reflect the relative degree of acceptability and not accuracy of judgements.

the L1 English group demonstrates a target-like effect of IS on scrambling ($F(1,9) 2.329, p=0.045$), whereas the L1 Dutch group makes no distinction for OS orders between the SUBJECT-Focus and the OBJECT-Focus context ($F(1,9) -0.196, p=0.849$).

In sum, Experiment 1 finds a clear L1 effect in that both L1 Russian groups converge on the morphosyntax and the IS of scrambling in German. Problems in mapping discourse interpretation onto syntax thus do not affect L2 learners in general; rather, they correlate with asymmetries in the L1-TL realization of IS-to-syntax mappings.

Despite the fact that neither English nor Dutch exhibit German-style scrambling and its associated IS conditions, the behaviour of these groups differs. The L1 English speakers display target-like sensitivity to the effects of IS on scrambling once they have acquired the morphosyntax of scrambling. However, the results from the L1 Dutch group show that the acquisition of the morphosyntax of scrambling and IS effects is dissociated. This finding bears out the asymmetry between target-like acquisition of syntax and continued divergence at the interface with discourse.

The null effect of context for the L1 Dutch group could mean either that the group identifies no relation between syntactic reordering by scrambling and IS or that the group applies a non-target-like IS-to-syntax mapping to scrambling. Although a null finding does not allow for any firm conclusions, let us consider the latter option. It may be the case that the L1 Dutch group associates German scrambling with a distributionally similar, though functionally different, option in Dutch, so-called focus scrambling (e.g. Neeleman 1994). Focus scrambling denotes a narrowly restricted and highly marked option for OS reordering which describes the fronting of a contrastively stressed topic (mostly deictic NPs) across the subject or clause-boundaries as in (9).

- (9) ... dat zulke boeken zelfs Jan niet koopt
 that such books even John not buys
 ‘... that not even John buys such books.’ (from: Neeleman 1994: 84)

By analogy to (9), the L1 Dutch group might impose a contrastive topic reading on scrambled NPs in German. The null effect of context for the L1 Dutch group could thus reflect effects of L1 transfer of a different IS mapping to scrambling. While this option cannot be ruled out, it cannot be substantiated either, because the materials in Experiment 1 neither afford a deictic nor a contrastive topic reading of the scrambled NPs. Hence, one would expect the L1 Dutch group to rule out the scrambling sentences altogether, rather than to judge them at levels comparable to the other groups who converge on target-like discourse interpretation of scrambling.

In sum, Experiment 1 reveals L1 effects in the mapping of IS onto syntax, yet it also attests that even learners with an L1 that does not instantiate syntactic or IS analogues of scrambling can attain target-like mappings between syntax and discourse. In other words, convergence at the syntax-discourse interface at L2 ultimate attainment is not *per se* constrained by the L1.

4.3 Experiment 2: Self-Paced Reading

Experiment 2 asks whether L2 speakers use IS information in on-line processing in a self-paced reading task. The rationale of this task is that locally increased processing efforts of syntactic and IS reanalysis (see Section 3.1) can be detected in higher reading times on a given segment compared to the same segment in a control condition. More specifically, Experiment 2 investigates whether the increased processing costs of scrambling are mitigated if scrambling is embedded in a felicitous IS context, and, conversely, whether an infelicitous context leads to higher processing costs.

4.3.1 Materials and procedure

Eighteen quadruplets of experimental sentences were constructed. Half of the quadruplets was in SO order, the other half was in OS order (Factor *Order*). Within each quadruple set, two versions of each sentence were constructed by reversing the position of the nouns (i.e. N1-N2 and N2-N1), so that any potential effect of lexical semantics or pragmatics of the SO and OS manipulation would be completely matched. All sentences were initiated by a matrix clause. Sentences were disambiguated by

case, i.e. they contained two NPs, one unambiguously marked for nominative, the other unambiguously marked for accusative. The NPs were further matched for length, gender, number and animacy. Plausibility was controlled for on the basis of an independent judgement pretest. Examples of the two orders in one quadruplet of the experimental items are given in (10).

- (10)a. Ich glaube, dass der Lehrling am Montag den Arbeiter abgelenkt hat. (SO)
I think that the_{NOM} apprentice on Monday the_{ACC} worker distracted has
- b. Ich glaube, dass den Arbeiter am Montag der Lehrling abgelenkt hat. (OS)

Further, triplets of contexts were designed for each quadruplet of sentences. Each triplet consisted of an ALL-Focus context, a SUBJECT-Focus context and an OBJECT-Focus context (Factor *Context*). The context comprised a background sentence to set the scene and a *wh*-question to designate the focus structure of the experimental item. Examples of the contexts for the sentences in (10) are given in (11).

- (11)a. ALL-Focus: “In the factory, the machines ground to a standstill last Monday.
 What had happened?”
- b. SUBJECT-Focus: “In the factory, the worker was distracted by someone last Monday.
 Who distracted the worker?”
- c. OBJECT-Focus: “In the factory, the apprentice distracted someone last Monday.
 Who did the apprentice distract?”

The ALL-Focus context induces wide focus for the experimental item. The SUBJECT-Focus context induces narrow focus on the subject by (a) establishing the verb and the object NP as given information in the background sentence and (b) designating the subject as the focussed constituent in the answer by targetting it in the *wh*-question. The SUBJECT-Focus context is a felicitous context for scrambling. Conversely, the infelicitous OBJECT-Focus context induces narrow focus on the object by (a) establishing the verb and the subject NP as given information in the background sentence and (b) designating the object as the focussed constituent in the answer by targetting it in the *wh*-question.

Note that the different contexts create differential task demands for the comprehension of subsequent sentences in terms of the predictability of syntactic function assignment (Table 5). Being the least specific, the ALL-Focus context does not give rise to any intersentential predictions; it thus closely resembles out-of-the-blue sentences. Hence, for the answers in (10), the syntactic function of arguments must be identified by case marking (case checking). By contrast, the SUBJECT-Focus and the OBJECT-Focus contexts create several intersentential predictions: (a) The contexts introduce the verb of the subsequent sentence, (b) the contexts introduce one NP argument of the verb and (c) the contexts specify the syntactic function of the NP argument mentioned in the context (i.e. the object in the SUBJECT-Focus context and the subject in the OBJECT-Focus context) by virtue of a variety of morphosyntactic cues (word order, case etc.). In addition, the *wh*-question again designates the syntactic function of the NP targetted by the *wh*-word (i.e. the subject in the SUBJECT-Focus context and the object in the OBJECT-Focus context). Since the contexts thus prime the syntactic functions of the verb’s arguments in the answer, these conditions tap the interaction of word order and IS independently of case marking. As noted above, the SUBJECT-Focus and the OBJECT-Focus contexts differ from each other in that the SUBJECT-Focus context creates an IS that fits scrambled orders (i.e. narrow focus on the subject; IS-syntax match). The OBJECT-Focus context, in contrast, gives rise to an IS that is in conflict with scrambled orders (IS-syntax mismatch), such that IS reanalysis is necessary to accommodate the OS order. Table 5 summarizes the task demands in each of the contexts.

ALL-Focus Context	SUBJECT-Focus Context	OBJECT-Focus Context
Case checking		
Syntactic reanalysis	Syntactic reanalysis	Syntactic reanalysis
Information structure reanalysis		Information structure reanalysis

Table 5. Task demands for processing scrambled OS orders in the different contexts

The 18 quadruplets of the experimental sentences were divided into three groups of six sets each for each context. On the basis of these three groups, four subject lists were created. Each subject saw 36 items (plus 24 fillers), i.e. six per condition. The paradigm was a non-cumulative Moving Windows task (Just, Carpenter & Woolley, 1982). The context sentence and the question were presented *in toto*, whereas the experimental sentences were presented in seven segments (S1-S7; see (12)).

- (12) Matrix/S1 COMP/S2 NP1/S3 adv./S4 NP2/S5 V/S6 V-fin/S7
 Ich glaube | dass | den Arbeiter | am Montag | der Lehrling | abgelenkt | hat.

Each item was followed by a comprehension sentence to check if subjects accurately understood the items. The subjects had to judge whether the comprehension sentence expressed the same meaning as the experimental item. For half of the experimental stimuli and the fillers, the comprehension sentence expressed the same meaning as the experimental item. The comprehension questions for the filler items targetted properties of the context to ensure that subjects read the contexts attentively. Instructions and practice items preceded the task. All stimuli were presented in Courier New Font, font size 14, in white letters against a black background on a 15-inch TFT screen.

4.3.2 Analysis and results

For the analysis of reading times, the sum of segments 3,4 and 5 was defined as a region of interest (Segment 3-5). Considering this region allows us to see whether there are incremental processing effects at the point where syntactic order is disambiguated. By choosing a collapsed segment that includes both NP arguments, it was ensured that no differences in IS status or previous mention of NPs obtain between the SUBJECT-Focus and the OBJECT-Focus context: In either context, Segment 3-5 contains one given and one new NP. Reading times were analyzed for the segments of all items.

A mixed three-way Repeated Measures ANOVA with *Order* and *Context* as within-subjects factors and with, respectively, *Language* (German, English, Dutch, Russian) and *Proficiency* (native, advanced L2 and near-native L2) as between-subjects factors was performed. Note that the between-subjects factors are not fully factorial. Finding interactions with the factor *Language* would indicate that there are differences in processing according to L1; finding interactions with the factor *Proficiency* would indicate differences according to proficiency level. Planned post-hoc two-way analyses were computed to investigate the cause of potential interactions of the within-subject factors and *Language* or *Proficiency*. For the post-hoc analyses, the significance level was adjusted to α -levels of 0.025 per test.

The between-subjects analysis for Segment 3-5 shows that there are main effects of *Context* ($F(2,140) 78.714, p<0.001$) and *Order* ($F(1,70) 132.229, p<0.001$). There is also a significant interaction of *Context* and *Order* ($F(2,140) 10.244, p<0.001$). As for interactions with the between-subjects factors, there is a marginal three-way interaction of the factors *Context*, *Language* and *Proficiency* ($F(4,140) 2.225, p=0.069$), which suggests that IS does not affect reading times in the same way across groups. Further, there is a three-way interaction of the factors *Context*, *Order* and *Language* ($F(4,140) 2.511, p=0.045$) as well as an interaction of the factors *Context*, *Order* and *Proficiency* ($F(2,140) 3.561, p=0.031$). These interactions suggest that the context effects for the OS order do not generalize across language and proficiency groups. In consequence, reading times for Segment 3-5 were analyzed separately for each proficiency and L1 group.

Reading times for Segment 3-5 for the advanced groups and the near-natives are given in Tables 6 and 7 (overleaf), respectively. Tables 6 and 7 also list results of the pairwise comparisons. Planned comparisons were run between SO and OS orders in each context to see whether context affects slowdowns for OS orders compared to SO orders, i.e. to see whether incremental slowdowns for OS orders obtain in each context. In addition, OS orders were compared between the SUBJECT-Focus and the OBJECT-Focus context to see whether IS specifically affects the processing of scrambled orders.

For the natives, Experiment 2 yields clear evidence that IS modulates the processing of scrambled orders incrementally. This modulation is expressed (a) in the cancellation of slowdowns for OS orders *vis à vis* the SO order in the felicitous SUBJECT-Focus context compared to the OBJECT-Focus context and (b) in the significant difference in reading times for OS orders between the SUBJECT-Focus and the OBJECT-Focus context on Segment 3-5. Hence, when there is an IS-syntax match

(SUBJECT-Focus), OS orders do not incur processing difficulty compared to canonical SO orders. In contrast, an IS-syntax mismatch (OBJECT-Focus) evinces significantly longer reading times for OS orders compared to SO orders. Moreover, OS orders are read significantly faster when IS and syntax match (SUBJECT-Focus) than when there is a mismatch (OBJECT-Focus).

		German		Russian advanced		English advanced		Dutch advanced	
A-Foc	SO	2005	*	3108	ns	2946	ns	2729	*
	OS	2285		3291		3196		2960	
S-Foc	SO	1832	ns	2694	ns	2611	ns	2352	*
	OS	1948		2956		2625		2576	
O-Foc	SO	1782	* *	2527	* *	2496	* *	2406	ns ns
	OS	2227		3323		2968		2640	

Table 6. Reading times (in milliseconds) for Segment 3-5 (NP1-ADV-NP2): Advanced groups

		German		Russian Near-N		English Near-N		Dutch Near-N	
A-Foc	SO	2005	*	3181	*	2700	*	2545	*
	OS	2285		3557		2994		2849	
S-Foc	SO	1832	ns	2579	ns	2405	ns	2180	*
	OS	1948		2778		2680		2556	
O-Foc	SO	1782	* *	2732	* *	2265	* ns	2305	* ns
	OS	2227		3043		2720		2569	

Table 7. Reading times (in milliseconds) for Segment 3-5 (NP1-ADV-NP2): Near-Native groups

Before discussing the effects of IS among the L2 groups, let us briefly consider the ALL-Focus context. For the non-natives, the reading times on Segment 3-5 in the ALL-Focus context replicate the proficiency effect shown in Hopp (2006ab) in that the advanced groups across L1s do not evince incremental slowdowns for OS orders, whereas the near-natives do.² This asymmetry in performance was related to difficulties of the advanced L2 groups in accessing and checking morphological case information for syntactic reanalysis in real time (Hopp 2006ab).

Now consider the effects of IS among the L2 groups. For the sentences in the SUBJECT-Focus and the OBJECT-Focus contexts, the syntactic function of the NPs is established by the context, i.e. case checking is not required for syntactic function assignment. The SUBJECT-Focus and OBJECT-Focus conditions hence isolate the interaction of syntax with IS.

For the processing of SO and OS orders in the SUBJECT-Focus and the OBJECT-Focus contexts, the groups' performance does not differ according to proficiency; rather, it differs according to L1. Unlike the L1 English and the L1 Russian groups, the L1 Dutch group does not make target-like IS distinctions in the processing of OS orders. It is uncertain whether the null finding across contexts for the L1 Dutch group marks (a) divergence in IS-to-syntax correspondences because marginally available L1 mappings (focus scrambling; Neeleman 1994) persevere in the L2 also in processing or (b) simply incompleteness in the sense that the L1 Dutch groups do not identify any relation between IS and syntax for scrambling. To test between these options, future experiments should include a condition that induces contrastive focus on the scrambled object akin to focus scrambling in Dutch.

In contrast to the L1 Dutch group, the L1 Russian and the L1 English groups demonstrate target-like patterns in the SUBJECT-Focus and OBJECT-Focus contexts. Both L1 groups evince significant differences between the SO and the OS order in the OBJECT-Focus context, yet not in the SUBJECT-

² In Hopp (2006ab), more local regions of disambiguation, i.e. segments 3 and 4 are considered, and none of the advanced groups evinces significant differences between SO and OS orders ($p > 0.05$). The present finding that the L1 Dutch advanced group shows significant differences between the SO and the OS order in the ALL-Focus context is thus most likely due to the larger region of analysis. The present findings are hence in line with the interpretation in Hopp (2006ab) that the lower-proficient advanced groups do not effect incremental reanalysis at the point of disambiguation; rather, revision from the default SO assumption to the OS order occurs globally across and at the end of sentences.

Focus context, coupled with longer reading times of the OS orders in the OBJECT-Focus context than in the SUBJECT-Focus context. This pattern means that the congruency of the IS of the context with scrambled orders engenders less effortful processing of OS orders (SUBJECT-Focus); conversely, an incongruent IS-syntax relation gives rise to strong reanalysis effects (OBJECT-Focus). In total, Experiment 2 attests that L1 English and L1 Russian advanced and near-native speakers construct target-like intersentential IS-to-syntax mappings and apply these rapidly and incrementally in L2 sentence processing.

4.4 Comparison of off-line and on-line results (Experiment 1 versus Experiment 2)

The on-line results resemble the off-line findings only partially in terms of IS effects on OS orders: The L1 English advanced group does not show target-like behaviour on the morphosyntax and IS of scrambling in Experiment 1, yet it does evoke target-like on-line effects of IS in Experiment 2.³ This asymmetry goes against the robust tendency observed for advanced to near-native L2 acquisition that syntax is acquirable while associated discourse conditions are prone to difficulty (Section 2). Moreover, the result from the advanced L1 English group constitutes an apparent paradox of target-like acquisition of IS-to-syntax mappings for scrambling while the syntax of scrambling itself has not been acquired.

I suggest that this asymmetry reflects differences in task demands between off-line judgements in Experiment 1 and on-line reading in Experiment 2. Making an acceptability judgement for a scrambled sentence presented in context as in Experiment 1 requires (a) establishing the morphosyntactic well-formedness of the sentence, and (b) matching the IS of the sentence with the context in order to gauge the contextual appropriateness of the sentence. Crucially, arriving at a correct well-formedness judgement requires target-like knowledge of case marking in order to identify scrambled orders. Both in Experiment 1 and in Experiment 2, the L1 English advanced group does not show evidence of the use of case marking. Moreover, the experiments reported in Hopp (2006ab) reveal that proficiency-matched L1 English and L1 Dutch advanced groups are not robustly sensitive to case morphology as a means of marking syntactic function, because (a) they do not evince local reanalysis effects indicative of the incremental use of case in processing and (b) the use of case marking breaks down completely for these L2 speakers in speeded grammaticality judgements. Instead of employing inflectional case morphology, these L2 speakers predominantly employ linear order or animacy cues to determine the syntactic function of NPs. In the context of Experiment 1, then, the L1 English advanced group does not appear to derive the scrambled OS order by case marking, and it fails to identify the IS of scrambling as a consequence. In other words, difficulties with inflectional case marking prevent effects of IS from surfacing in off-line judgements.

In contrast, Experiment 2 abstracts away from case marking by disambiguating the syntactic function of NPs in the context; in addition, Experiment 2 does not require subjects to make well-formedness judgements. By isolating IS effects in sentence reading, Experiment 2 yields evidence of target-like interactions of IS and word order that are not attested in off-line judgement tasks. Since acceptability judgements involve the global evaluation of sentences across several grammatical and extragrammatical dimensions of well-formedness (e.g. Schütze 1996), off-line acceptability judgements may thus systematically underestimate the degree of convergence at the interfaces.

More generally, the observed disjunction between off-line and on-line performance indicates that problems at the syntax-morphology interface may mask convergence at other interfaces such as the syntax-discourse interface. In a similar vein, Sorace (2005) suggests that the overproduction of overt subjects in pro-drop languages by near-native L2 speakers (Belletti et al. 2006; Sorace & Filiaci 2006) might be a default processing strategy resulting from poorly automatized morphological knowledge in L2 acquisition. Systematic off- and on-line comparisons are thus necessary in order to isolate particular interface mappings and to locate the sources of difficulties at L2 ultimate attainment.

³ These differences between tasks are unlikely to result from differences in subjects across tasks since the majority of subjects was the same in the off-line and the on-line experiment; in fact, limiting the data analysis to the subset of subjects who completed both tasks yields the same result. Furthermore, it is unlikely that the lack of an effect for the L1 English groups in the off-line task is due to some methodological factor in the design of the Magnitude Estimation task, since other groups of the same proficiency level and the same L1 do show effects.

5. Discussion and conclusion

Two experiments probed the syntax-discourse interface in advanced to near-native L2 German in order to explore L1 effects and in order to locate the causes of non-convergence at L2 ultimate attainment. This cross-linguistic study finds L1 effects on convergence. However, target-like IS-to-syntax mappings are not only attested for the L1 Russian speakers who can resort to analogous L1 interactions of IS and word order. Despite having no analogue of scrambling in the L1, L1 English learners also converge on IS-to-syntax mappings in German. These results show that convergence at the syntax-discourse interface is possible even for L2 speakers who do not access TL settings via the L1.

With respect to the causes of non-convergence, the present cross-linguistic findings are thus not compatible with accounts assuming representational impairment at the syntax-discourse interface (e.g. Sorace 2003), because L1 English near-natives are sensitive to the interaction of IS and word order in off-line and on-line tasks. Moreover, since convergence is possible for L1 English speakers, it is unlikely that the non-convergence of the L1 Dutch group is due to representational impairment; instead, the protracted divergence found for the L1 Dutch group appears to be due to learnability. Specifically, the marginal option in Dutch for contrastive topics to appear in the scrambled OS order might transfer to the L2. Accordingly, the cross-linguistic comparisons in Experiments 1 and 2 suggest that convergence may be constrained by *asymmetries* in L1-TL realization of IS mappings onto syntax. On the assumption that the initial state of L2 acquisition is equivalent to the full L1 grammar (e.g. Schwartz & Sprouse 1996), the association of scrambled OS orders with a contrastive topic IS might persevere in L2 acquisition. In fact, focus scrambling is also a marginal option in German (Haider & Rosengren 1998), such that the ambiguity of the TL input might prevent restructuring to the canonical IS association with scrambling. At this point, this suggestion must remain tentative, since there is no positive evidence showing that the L1 Dutch group imposes a contrastive topic interpretation on German scrambling.

Finding that the sensitivity to IS effects on scrambling varies between the off-line and the on-line task suggests that mappings at the syntax-discourse interface are partially modulated by computational factors. I argued that difficulties in using case marking for syntactic reordering obscure target-like use of IS mappings onto word order in off-line judgements. In the conditions of the on-line task that abstract away from case marking and thus reduce processing demands of scrambled sentences, effects of IS are attested also for groups that do not show any evidence of IS off-line.

In the context of German scrambling, processing factors could affect performance at the interfaces in two ways. First, interface phenomena by definition involve the integration of multiple types of information (e.g. syntactic, morphological and IS), and such integration might strain or exceed the processing capacities of L2 speakers. Second, economy or default strategies in (L2) processing might favour a more parsimonious structural option compared to a more complex, derived structure that is associated with interface mappings (e.g. SO versus OS in German, or SV versus VS in Italian; see Belletti et al. 2006). Failure of L2 speakers to show interface knowledge might thus result from economy considerations that minimize processing resources rather than from problems specific to interfaces (see also Sorace 2005). Provided resource limitations underlie non-convergent L2 performance, one can predict that these limitations also surface for native speakers under increased processing load; alternatively, the performance patterns of L2 speakers should be replicated in the same tasks in native speakers with low working memory resources.

Future research will have to establish whether the findings that interface properties are subject to protracted difficulty in L2 acquisition can indeed be explained by the increased computational complexity inherent in mappings between grammatical modules. The results from this study suggest that non-convergence at L2 ultimate attainment is at least partially attributable to processing limitations.

In sum, this cross-linguistic study in L2 endstate speakers accrues evidence that convergence on the syntax-discourse interface is not *a priori* constrained by L1 properties. Off-line and on-line comparisons further suggest that non-convergence on discourse-related aspects of syntax is partially due to increased computational demands in integrating information across grammatical modules. When IS-to-syntax mappings are isolated experimentally, clear evidence of convergence emerges. In fact, under such experimental conditions, even L2 speakers below near-native proficiency levels show convergence at the syntax-discourse interface.

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