Ultimate attainment at the interfaces in second language acquisition
Hopp, H.C.

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7. The Interfaces at L2 Ultimate Attainment: Interpretation

Introduction

In the previous chapter, I considered the syntax-morphology interface at L2 ultimate attainment. Experiments 1 through 3 showed that convergence on syntactic reanalysis signaled by morphological cues in L2 sentence processing obtains for near-native L2 speakers across different L1s. Further, non-convergent performance is modulated by proficiency, and, to a lesser extent, by L1 differences. I discussed how the processing patterns of the advanced groups can be explained by limitations in computational resources and L1 effects in the efficiency of morphological checking. In consequence, I argued that the findings from Experiments 1 to 3 are compatible with the Fundamental Identity Hypothesis.

This chapter ascertains whether the Fundamental Identity Hypothesis can accommodate interface domains of scrambling beyond morphosyntax. In this chapter, I consider the interfaces of syntax with interpretation in the context of scrambling, namely, the interactions of syntax with semantics and information structure. To see whether scrambling is semantically constrained, Experiment 4 tests for the relation between scrambling and definiteness in off-line judgements. To explore the effects of information structure, Experiment 5 considers the relation between scrambling and discourse context in judgements, and Experiment 6 probes whether discourse context affects reanalysis costs for scrambling in on-line reading.

The results suggest at first sight that the interpretive interfaces of syntax pose greater difficulties than the morphosyntax of scrambling. For the semantics of scrambling, no L2 group converges on target judgement patterns. Closer analysis of individual judgement data reveals, however, that the pattern is not robust for the native controls either, so the results need to be treated as preliminary. For the information structure of scrambling, L1 effects on (non-) convergence are observed, in that the L1 Russian and L1 English groups converge, while the L1 Dutch group does not. Focussing on the results for information structure, I argue that L1-specific non-convergence is likely due to learnability. I conclude that the results from Experiments 5 and 6 are compatible with the Fundamental Identity Hypothesis.

This chapter is structured as follows: In Section 7.1, I give an overview of the chapter and the research questions. Section 7.2 presents the subjects, and Section 7.3 describes the allocation to proficiency groups. Section 7.4 presents Experiment 4 on the semantics of scrambling. In Section 7.5, the off-line experiment (Experiment 5) on the information structure of scrambling is reported. Section 7.6 presents a self-paced reading experiment on the information structure of scrambling (Experiment 6). Finally, Section 7.7 relates the findings from Experiments 4-6 to Experiments 1-3 and evaluates them in terms of the Fundamental Identity Hypothesis.
7.1. Overview and research questions

As discussed in Chapters 3 and 4, scrambling is modulated by:

- definiteness restrictions that constrain the interpretation of scrambling at the syntax-semantics interface (see Chapter 3.5),
- information structure that determines the focus structure of scrambling at the syntax-discourse interface (see Chapter 3.8).

In previous studies on endstate L2 acquisition, these interfaces of syntax have been found to pose persistent difficulties in adult L2 acquisition: For syntactic movement, e.g. Belletti et al. (2007), Sorace & Filiaci (2006) and Valenzuela (2006) report that near-native L2 speakers show protracted difficulties restricting syntactic options to the requisite semantico-pragmatic contexts (Chapter 1.3.6.4). For scrambling, Unsworth (2005) shows that even high-proficient English speakers of L2 Dutch fail to obey definiteness restrictions (Chapter 5.3). The present chapter addresses the interpretative interfaces in off-line and on-line experiments. Off-line judgements investigate whether interface conditions modulate the acceptability of scrambling, and an on-line experiment probes whether interface conditions affect reanalysis in the processing of scrambling. The questions addressed in three experiments are, respectively:

(Q1) Do L2 speakers show knowledge of the interaction of scrambling and semantic restrictions in off-line judgements?
(Q2) Do L2 speakers show knowledge of the interaction of scrambling and information structure in off-line judgements?
(Q3) Do L2 speakers show incremental effects of the interaction of information structure and syntax on reanalysis in on-line reading?

Three experiments were conducted with L1 English, L1 Dutch and L1 Russian learners and German natives, so that comparisons between different L1 groups can be made. Further, participants were allocated to two proficiency groups, so that comparisons based on proficiency level can be carried out. Moreover, these groupings allow us to differentiate between effects of proficiency and L1. Table 7.1, adapted from Chapter 6, summarizes the varying L1 properties. The cross-linguistic properties relevant in the context of this chapter are in shaded cells.
The Interfaces at L2 Ultimate Attainment: Interpretation

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<table>
<thead>
<tr>
<th>Syntax of scrambling</th>
<th>Target</th>
<th>GERMAN</th>
<th>ENGLISH</th>
<th>DUTCH</th>
<th>RUSSIAN</th>
</tr>
</thead>
<tbody>
<tr>
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<td>+</td>
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<tr>
<td>Medium scrambling</td>
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<td>-</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Syntax-Morphology (Case)</td>
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<tr>
<td>Syntax-Information Structure</td>
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<td>-</td>
<td>(+)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Syntax-Semantics (Definiteness)</td>
<td>+</td>
<td>-</td>
<td>(+)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Since Dutch has no medium scrambling, IS and definiteness effects only obtain for short scrambling.

Table 7.1. Cross-linguistic differences at the syntactic interfaces for scrambling.

The different L1 properties across groups implicate distinct conditions for L1 transfer. In the absence of scrambling, English also does not instantiate interface interactions of syntactic reordering by scrambling, such as information structure and definiteness. As a consequence, L1 English learners of German cannot make recourse to any L1 properties for convergence on the TL; rather, they need to acquire the relevant interface properties of German from the TL input. Dutch instantiates a similar relationship between scrambling and both definiteness and information structure, at least for scrambling in the complement domain. Crucially, though, Dutch has no (canonical) scrambling across subjects, so that L1 Dutch learners of German cannot directly transfer L1 properties to obtain the same interpretations. Rather, they need to extend L1 interface properties to larger syntactic contexts. In contrast, Russian scrambling is subject to the same information-structural conditions as German scrambling. For these properties, L1 Russian learners can directly refer to L1 properties in L2 German. However, Russian does not encode definiteness grammatically, so that no direct analogue is available for L1 Russian learners in this domain.

If L1 transfer mediates (non-)convergence on interpretive interface properties in advanced to near-native L2 acquisition and processing, the L1 Russian groups, and maybe the L1 Dutch groups, are expected to outperform the L1 English groups. In the context of each experiment, I discuss effects of L1 transfer in more detail.

### 7.2. Experiment 4: Scrambling at the interfaces: Semantics

Experiment 4 investigates the interface of syntax with semantics in off-line knowledge of the effects of definiteness restrictions on scrambling. The aim of this experiment is to establish whether non-natives are sensitive to the semantic restrictions on the scrambling of indefinites.
7.2.1. Overview and research questions

Scrambling in German and Dutch is constrained by interpretive restrictions expressed in definiteness marking of object NPs. As discussed in Chapter 3.5, scrambling induces interpretive changes for indefinites, yet not for definites. Scrambled indefinites bear a strong or quantificational, i.e. specific, generic or partitive, reading, yet are incompatible with an existential interpretation that is available for non-scrambled NPs. For instance, the scrambled NP *eine Katze* (‘a cat’) refers to one specific cat in (1) and cannot refer to just any cat.

(1) Ich weiss, dass eine Katze Peter gerne streichelt. (German)
I know that a cat Peter likes to stroke

‘I know that Peter likes to stroke a cat.’

A technical account of the effects of indefiniteness along the lines of de Hoop (1992) and van Geenhoven (1998) was given in Chapter 3.8.5. Acquisition studies on the interpretive effects of scrambling found that children acquiring their L1 as well as adult and child L2 learners do not robustly associate scrambling with interpretive restrictions in comprehension: L1-acquiring children up to the ages of 12 (Krämer, 2000; Philip, 2003; Unsworth, 2005) as well as L1 English children and adults learning Dutch at different levels of proficiency (Unsworth, 2005) do not consistently disallow existential readings for scrambled indefinite NPs; in other words, they do not robustly differentiate between scrambled and non-scrambled indefinite NPs in semantic terms. On the basis of data from beginning to advanced L2 learners, Unsworth (2005) concludes that target-like performance on interpretive restrictions on scrambling is a function of proficiency. The present experiment seeks to investigate the effects of both proficiency and L1 on semantic restrictions on scrambling.

Experiment 4 is an acceptability judgement task containing definite and indefinite (non-) scrambled NPs presented in contexts that do not support quantificational readings of the object NP. The research questions are:

(Q4.1) Do L2 speakers differentiate between scrambling of definites and scrambling of indefinites?
(Q4.2) Are there proficiency or L1 effects?

As a reference point for studying L1 transfer effects, Table 7.2 summarizes the cross-linguistic morphosyntactic differences relevant in the context of Experiment 4. On the assumption that L1 affects (non-)convergence, the cross-linguistic differences lead one to expect differences in judgement patterns between the L1 Dutch group whose L1
instantiates definiteness restrictions on short scrambling, on the one hand, and the L1 English and L1 Russian groups whose L1s have no definiteness restriction on scrambling (Russian) or no scrambling at all (English), on the other hand.

<table>
<thead>
<tr>
<th>Syntax of scrambling</th>
<th>Target</th>
<th>L1s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GERMAN</td>
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</tr>
<tr>
<td>Short scrambling</td>
<td>+</td>
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</tr>
<tr>
<td>Medium scrambling</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Syntax-Semantics (Definiteness)</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

*Since Dutch has no medium scrambling, definiteness effects only obtain for short scrambling.

**Table 7.2. Cross-linguistic differences relevant in the context of Experiment 4.**

A judgement task was designed that encompassed both grammatical and ungrammatical word orders and case marking. A Magnitude Estimation task was partially based on and adapted from Keller (2000b, Experiment 6). The design is the same as described in Chapter 6 for Experiment 1. It also includes manipulations of information structure that will be discussed as Experiment 5 in this chapter. For convenience, the full design is reported here. The target pattern expected for Experiment 4 is given in (P.4).

(P.4) Target pattern for Experiment 4
Scrambled definite NPs are judged to be significantly more acceptable than scrambled indefinite NPs.

### 7.2.2. Materials

Sentences were constructed that consisted of a matrix clause and an embedded clause containing an animate subject and an inanimate object as well as a transitive verb. A partially factorial design was employed which crossed the factors *Word Order, Context* and *Definiteness*. The factor *Word Order* had two levels: non-scrambled (SOV) and scrambled (OSV) (2).

(2) a. Maria glaubt, dass der Vater den Wagen kauft.
    Maria thinks that the father the car buys

b. Maria glaubt, dass den Wagen der Vater kauft.
    Maria thinks that the car the father buys

The factor *Context* realized effects of information structure (IS) that become relevant for Experiment 5. A *wh*-question designated the constituent corresponding to the *wh*-element in the answer as focus. Correspondingly, all other constituents would be given
information. The factor context had three levels: ALL-Focus (3a), SUBJECT-Focus (3b) and OBJECT-Focus (3c).

(3) a. Was gibt's Neues?
   ‘What's new?’
 b. Wer kauft den Wagen?
   ‘Who buys the car?’
 c. Was kauft der Vater?
   ‘What does the father buy?’

The ALL-Focus context created wide focus by providing a maximally non-specific question. The SUBJECT-Focus context induced narrow focus on the subject by (a) designating the subject as the focus exponent of the answer by targeting it in a wh-question, and (b) establishing the verb and the object NP as given information in the question. The SUBJECT-Focus context thus creates felicitous IS conditions for scrambling (IS-syntax match). The OBJECT-Focus context induced narrow focus on the object by (a) designating the object as the focus exponent of the answer by targeting it in a wh-question, and (b) establishing the verb and the subject NP as given information in the question. Hence, the OBJECT-Focus context gives rise to an IS that is at odds with the IS of scrambling (IS-syntax mismatch).¹

Most relevant for Experiment 4, the factor Definiteness pertained to the object of the embedded clause, and it had two levels: definite and indefinite (4). The scrambled order with indefinite objects is illustrated in (4c).

(4) a. Maria glaubt, dass der Vater den Wagen kauft.
   Maria thinks that the father the car buys
 b. Maria glaubt, dass der Vater einen Wagen kauft.
   Maria thinks that the father a car buys
 c. Maria glaubt, dass einen Wagen der Vater kauft.
   Maria thinks that a car the father buys

Importantly, when sentences (4b) and (4c) are embedded in OBJECT-Focus contexts, the object mentioned in the context wh-question matches the object in the answer (4) in definiteness (e.g. Who bought a car? for (4c)). Note that none of these contexts supports a quantificational interpretation of the indefinite object NP in the answer; hence, scrambled indefinite NPs in (4c) should be judged as infelicitous.

Two further factors were included: ungrammatical embedded Verb-Position Violation (V2) crossed with Word Order, and ungrammatical Case Violation crossed with

¹ Note that the information structure of the context does not support a focus scrambling interpretation of scrambled objects.
Word Order. Since these factors are not relevant for Experiments 4 and 5, I do not report them here (see Chapter 6, Experiment 1, for details).

The design yielded a total of Word Order x Context x Definiteness = 2 x 3 x 2 cells plus V2 x Case Violation x Word Order = 2 x 2 x 3 = 24 cells. Each participant saw one item for each cell. Other materials, assignments to groups and list, procedure and data conversion were as described in Chapter 6, Experiment 1.

7.2.3. Participants

Fifty-three non-natives of the 59 non-natives participated in this experiment. These participants were the same as in Chapter 6, Experiment 1. For comparison, 47 native speakers of German served as a control group.

7.2.4. Analysis and results

Table 7.3 gives the results of the judgement task by listing the normalized and rescaled results (see Chapter 6) across the different conditions relevant for effects of definiteness of the object NP. The first two rows give results for non-scrambled definite (4a) and indefinite (4b) NPs. The last two rows list results for scrambled definite (2b) and indefinite (4c) NPs. The three Context conditions are listed horizontally in each cell (ALL-Focus/SUBJECT-Focus/OBJECT-Focus), i.e. the first number in each cell denotes the level of acceptability in the ALL-Focus context, the second number in each cell the acceptability in the SUBJECT-Focus context, and the third number the acceptability in the OBJECT-Focus context. It was decided to include the factor Context in the statistical comparisons in case definiteness effects are modulated by context.

To establish potential group differences according to definiteness of the object NP, a Repeated Measures ANOVA with the within-subject factors Order (SO versus OS), Context (ALL-Focus, SUBJECT-Focus, OBJECT-Focus) and Definiteness (definite versus indefinite) was run on the geometric means of judgements. The between-subjects factors were Language (German, English, Russian and Dutch) and Proficiency (native, near-native and advanced).
The results of the Repeated Measures ANOVA show significant main effects of Order (F(1,93) 181.9458, p=0.001) and Context (F(2,93) 6.139, p=0.003), yet no effect of Definiteness (F(1,93) 1.645, p=0.203). The following two-way interactions with the factor Order were recorded for the within-subjects factors: Order and Definiteness (F(1,93) 11.221, p=0.001); Order and Context (F(2,186) 9.522, p<0.001). These interactions attest that both context and the definiteness of the object NP affect judgements on OS orders across groups. However, there is no interaction between the factors Context and Definiteness (F(1,186) 1.193, p=0.306). Effects of definiteness are thus independent of context effects.

For the between-subjects factors, the following interactions were observed: Order and Language (F(1,93) 4.357, p=0.016), and a marginal interaction of Order and Proficiency (F(1,93) 3.067, p=0.083). For the factor Context, the following interactions hold: Context and Language (F(4,93) 2.395, p=0.003) and Context and Proficiency (F(4,93) 2.484, p=0.045). For the factor Definiteness, the interaction with the factor Language just fails to attain marginal significance (F(2,93) 2.341, p=0.102).

The interactions of the factor Order with the within-subjects factors show that both Context and Definiteness have an effect on the acceptability of syntactic reordering. The marginal interaction of Definiteness and Language suggests that there may be group differences regarding the effects of definiteness. In order to explore group differences on definiteness, pairwise comparisons between scrambled definite (2b) and scrambled indefinite (4c) orders were run by language group.

Table 7.3. Experiment 4: Acceptability ratings. Rescaling from geometric means to scale 0-100, (ALL-Focus/SUBJECT-Focus/OBJECT-Focus).
For illustration, Figure 7.1 shows the relative difference the L1 groups make for scrambled orders according to definiteness of the object. The numbers in Figure 7.1 represent the subtraction differences of acceptability ratings for scrambled definite NPs and scrambled indefinite NPs. A positive number indicates that scrambled definite NPs are rated to be more acceptable than scrambled indefinite NPs.

![Figure 7.1. Experiment 4: Subtraction of acceptability means across contexts of indefinite scrambled objects from definite scrambled objects.](image)

**Natives**

For the natives, pairwise comparisons of OS orders containing definite NPs and those containing indefinite NPs indeed attest significant differences across contexts (ALL-Focus: $F_{1}(1,46) = 5.217$, $p<0.001$; $F_{2}(1,7) = 3.763$, $p=0.007$; SUBJECT-Focus: $F_{1}(1,46) = 3.758$, $p<0.001$; $F_{2}(1,7) = 3.231$, $p=0.014$; OBJECT-Focus: $F_{1}(1,46) = 2.858$, $p=0.006$; $F_{2}(1,7) = 1.638$, $p=0.145$). Hence, the natives disallow scrambled indefinite NPs in (2b) independently of context.

**L1 English**

For the L1 English group, pairwise comparisons of OS orders containing definite NPs and those containing indefinite NPs show no differences in any context (ALL-Focus: $F_{1}(1,17) = 0.069$, $p=0.946$; $F_{2}(1,7) = 0.149$, $p=0.885$; SUBJECT-Focus: $F_{1}(1,17) = 0.922$, $p=0.370$; $F_{2}(1,7) = 0.263$, $p=0.800$; OBJECT-Focus: $F_{1}(1,17) = 0.732$, $p=0.474$; $F_{2}(1,7) = 0.217$, $p=0.805$).

**L1 Dutch**

The L1 Dutch group also does not show differences in pairwise comparisons of OS orders containing definite NPs and those containing indefinite NPs in any context (ALL-Focus: $F_{1}(1,17) = 0.407$, $p=0.689$; $F_{2}(1,7) = 0.076$, $p=0.942$; SUBJECT-Focus: $F_{1}(1,17)$
Although the numerical results in Figure 7.1 suggest a target-like tendency, the L1 Russian group does not evince significant differences in pairwise comparisons of OS orders containing definite NPs and those containing indefinite NPs in any context (ALL-Focus: $F_1(1,16)$ 1.0, $p=0.332$; $F_2(1,7)$ 1.345, $p=0.221$; SUBJECT-Focus: $F_1(1,16)$ 0.686, $p=0.502$; $F_2(1,7)$ 0.731, $p=0.489$; OBJECT-Focus: $F_1(1,16)$ -0.008, $p=0.991$; $F_2(1,7)$ 0.698, $p=0.508$).

In sum, Experiment 4 finds that the acceptability of scrambling is modulated by definiteness for the native controls. Further, these effects were shown to be independent of effects of context. In contrast, none of the non-native groups makes a systematic distinction between the acceptability of scrambling relative to the definiteness of the scrambled object NPs.

### 7.2.5. Discussion

Experiment 4 yielded the following results:

- The native group shows sensitivity to definiteness constraints on scrambling in that scrambled orders with definite object NPs are rated to be significantly more acceptable than scrambled indefinite object NPs in question contexts that require existential readings and do not support quantificational interpretations of indefinite object NPs.

- None of the non-native groups demonstrates target-like judgement patterns in that the non-natives make no distinction in the acceptability of scrambling depending on the definiteness of the (scrambled) object NP. This null effect of definiteness is not modulated by proficiency or L1 differences.

In contrast to off-line judgements on the morphosyntax of scrambling (Experiment 1, Chapter 6) where non-convergence was attested for some of the advanced groups, yet not the higher-proficient near-native groups, the off-line judgements on definiteness also yield evidence of non-convergence for the near-native groups. This asymmetry between syntax and interface aspects of word order highlights the protracted difficulties posed by interface constraints on syntax in adult L2 acquisition in general.

Experiment 4 finds no evidence in the pairwise comparisons of the judgement data that any non-native group adheres to the interpretive restrictions on scrambling
expressed in the definiteness constraint. To explore this null effect further, the individual participant data were analysed. A participant was classified as making a distinction according to definiteness if the ratings for scrambled indefinites were lower than for scrambled definites in at least two of the three contexts and the ratings were equal in the remaining context. This classification scheme was chosen to make sure that the effects of definiteness hold across contexts. According to this classification, 28 of the 47 natives (60%) robustly differentiate scrambled definite NPs from scrambled indefinites; yet, of the 53 non-natives in total, only five participants (9%), two from the L1 English group and three from the L1 Russian group, can be categorized as making a robust definiteness distinction. The group data thus do not average out individual differences for the non-natives.

The L2 results resonate with the findings of Unsworth (2005) on definiteness distinctions made by L1 English learners of Dutch in the context of object scrambling across adverbs in the complement domain. In the relevant condition in Unsworth (2005, Task II), participants completing a truth-value judgement task were presented with pictures depicting two identical events performed on two different objects, e.g. two different apes being tickled twice. The non-scrambled order matches the picture, whilst the scrambled order, which evokes a quantificational reading, in this case, a specific reading of the object, does not match the picture (for details, see Chapter 5.3). The native adult controls in Unsworth (2005) scored 95.7% in correctly rejecting scrambled indefinites, and 73% of them made a robust distinction between scrambled definites and indefinites in at least 80% of trials, i.e. they rejected scrambled indefinites and accepted scrambled definites in at least 4 out of 5 trials. In contrast, the highest-proficiency L2 adult learners’ group tested by Unsworth scored 63.6% by correctly rejecting the specific scrambled indefinite NP. Only five out of the 11 L2 adult participants (46%) made a robust distinction.

In comparison to Unsworth’s study that focused on eliciting interpretive distinctions, the general acceptability judgement task employed here did not point participants’ attention to interpretation. This methodological difference might account for the overall lower rates of target-like responses in the present task, among both the non-natives and the natives. Given that only less than two-thirds of the native controls showed the target pattern for definiteness, finding that the L2 groups do not converge on the target pattern needs to be treated as preliminary.

Nevertheless, the present results extend previous findings of problems in the L2 acquisition of definiteness constraints on scrambling (a) to L2 German and (b) to L2 learners at very advanced and near-native levels of proficiency from various L1 backgrounds. The current findings suggest that proficiency differences do not correlate with success on definiteness distinctions, as suggested by Unsworth (2005). Moreover, the fact that Dutch instantiates a similar relation between scrambling and definiteness as German — at least for scrambling in the complement domain — does not confer the L1
Dutch group an advantage over the L1 English and the L1 Russian groups in the judgment task. This finding tentatively suggests that knowledge of interpretive constraints on NP movement in the L2 is not informed by L1 properties. However, more extensive research using a variety of tasks is needed to substantiate these findings.

Previous studies on the L1 and L2 acquisition of interpretive discourse constraints (see, e.g., Avrutin, 1999; Krämer, 2000; Miller & Schmitt, 2004; Unsworth, 2005) attribute non-convergence to incomplete discourse integration. Krämer (2000: 65) defines discourse integration as a two-tiered process that consists of the construction of (a) discourse cohesion, i.e. the use of discourse context in the structural interpretation of linguistic elements, e.g. NPs, and (b) discourse coherence, i.e. the construction of discourse continuity across utterances. As for (a), failure in the construction of discourse cohesion can stem from a variety of representational or computational factors: (i) lack of knowledge of the relevant discourse-interpretation mapping, (ii) insufficient ability to render relevant discourse entities salient enough in context (e.g. Miller & Schmitt, 2004) or (iii) reduced ability to integrate multiple information types (e.g. context, semantics, syntax, etc.) in real-time. The present untimed off-line experiment cannot address these different explanatory approaches; to this end, it would be necessary to carry out a range of off- and on-line experiments that extend beyond the scope of the present thesis. For definiteness, it is not clear whether reading and reaction-time methods are suitable, since the relatively subtle effects of definiteness in reading comprehension are likely to be outweighed by the more robust (structural) processing disadvantage for scrambled OS orders. Potentially additive effects of definiteness will thus be hard to document. Therefore I decided not to run a processing experiment on the effects of definiteness, and I leave this issue for future research.

Nevertheless, the following two experiments in this chapter do address the issue of discourse integration and its processing reflexes in the on-line use of information structure (focus). Its results will be useful to investigate whether the problems with definiteness are due to more general problems with discourse integration in L2 processing.

### 7.3. Experiment 5: Scrambling at the interfaces: Information structure

Experiments 5 and 6 explore the interface of syntax and information structure in off-line knowledge and on-line reading. The purpose of the two experiments is to probe whether non-natives are sensitive to the interplay of syntactic reordering and discourse.

#### 7.3.1. Overview and research questions

Scrambling in German, Dutch and Russian interacts with information structure, i.e. the discourse-functional organization of information by virtue of focus. Descriptively,
scrambling serves to move discursively given constituents out of (sentential) focus to allow for other constituents to bear focus (Haider & Rosengren, 1998). The changes of IS induced by scrambling are illustrated in (5) for German. In the examples, IS is manipulated by question contexts: The wh-word in the question designates the focus in the answer (Höhle, 1982), which is capitalized in the examples. ‘#’ denotes infelicity.

(5) a. Who is reading the book? (German)
   Ich glaube, dass das Buch der JUNGE liest.
   I think that the\text{ACC} book the\text{NOM} boy reads.
   ‘I think that the boy is reading the book.’

b. What is the boy reading?
   #Ich glaube, dass das BUCH der Junge liest.

In (5a), scrambling is felicitous since the scrambled object NP is defocused and the subject NP receives focus. (5b) shows infelicitous scrambling, since the scrambled item bears focus. Chapter 3.8 developed a formal account of the interaction of information structure as expressed by focus and syntactic reordering effected by scrambling. Scrambling was found to be sanctioned by IS to the extent that scrambled OS orders have higher acceptability ratings and lower processing costs if the scrambled item was defocused (IS-syntax match). By contrast, an infelicitous context such as in (5b) induces a mismatch in the IS of the context question and the answer (IS-syntax mismatch).

Experimentally, an off-line judgement study by Keller (2000a) reports that native German acceptability ratings of scrambled orders are systematically affected by differences in IS. In terms of processing effects, reading-time studies by Meng, Bader & Bayer (1999) and Weskott (2003) as well as ERP studies by Bornkessel, Schlesewsky & Friederici (2003a) and Bornkessel & Schlesewsky (2006b) find that IS is manipulated by discourse context modulates reanalysis from the SO order to the OS order (Chapter 4.4). If embedded in a felicitous context (IS-syntax match), reanalysis costs of scrambled OS orders are mitigated compared to null or infelicitous contexts.

Experiments 5 and 6 test for the interaction of IS and word order. Experiment 5 collects off-line acceptability judgements, and Experiment 6 considers IS effects on reanalysis in on-line reading.

Experiment 5 investigates off-line knowledge of the interaction of IS and word order in L2 German. It aims to elicit the following target pattern (P.5).

(P.5) Target pattern for Experiment 5

Scrambled orders are judged to be significantly more acceptable in IS contexts that lead to the defocusing of the scrambled constituent (IS-syntax match:
SUBJECT-Focus context) than in contexts that cause the scrambled constituent to be in focus (IS-syntax mismatch: OBJECT-Focus context).

The research questions are:

(Q5.1) Do L2 speakers show target-like judgements on scrambling in IS contexts manipulating focus marking?
(Q5.2) Are there proficiency or L1 effects?

As a reference point for studying L1 transfer effects, Table 7.4 summarizes the cross-linguistic differences relevant in the context of Experiment 5.

<table>
<thead>
<tr>
<th>Target</th>
<th>L1s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax of scrambling</td>
<td>GERMAN ENGLISH DUTCH RUSSIAN</td>
</tr>
<tr>
<td>Short scrambling</td>
<td>+ - + +</td>
</tr>
<tr>
<td>Medium scrambling</td>
<td>+ - - +</td>
</tr>
<tr>
<td>Syntax-Information</td>
<td>+ - (+) +</td>
</tr>
<tr>
<td>Structure</td>
<td></td>
</tr>
</tbody>
</table>

*Since Dutch has no medium scrambling, IS effects only obtain for short scrambling.

Table 7.4. Cross-linguistic differences relevant in the context of Experiment 5.

If L1 properties affect judgements about the IS of scrambling in the L2, the L1 Russian group can make recourse to identical IS-to-syntax mappings in the L1. The L1 Dutch group could make recourse to IS-to-syntax correspondences for scrambling in the complement domain, where scrambling equally serves the discourse function to move constituents out of focus, but Dutch has no direct analogue to scrambling across the subject. However, recall from Chapter 3 that Dutch instantiates fronting of objects across subjects only for contrastive topics in so-called focus scrambling (Neeleman, 1994) for a restricted set of deictic NPs such as in (6).

(6) … dat ZULke boeken zelfs JAN niet koopt. (Dutch)
   … that such books even John not buys
   ‘that not even John buys such books.’ (from: Neeleman, 1994: 84)

Although the OS order in (6) is distributionally similar to scrambling in German, it is functionally different by forcing contrastive focus on the fronted object. Finally, English does not allow for embedded OS orders in any discourse context, so that recourse to L1 properties is no option for the L1 English group.
7.3.2. Analysis and results

Participants and materials were the same as in Experiment 4. The full set of results is shown in Table 7.3 above. Table 7.5 presents the relevant results for the effects of IS on scrambling. The three Context conditions are listed horizontally in each cell (ALL-Focus/SUBJECT-Focus/OBJECT-Focus), i.e. the first number in each cell denotes the level of acceptability in the ALL-Focus context, the second number in each cell the acceptability in the SUBJECT-Focus context, and the third number the acceptability in the OBJECT-Focus context.

<table>
<thead>
<tr>
<th></th>
<th>ENGLISH Advanced (n=8)</th>
<th>ENGLISH Near-Native (n=10)</th>
<th>DUTCH Advanced (n=8)</th>
<th>DUTCH Near-Native (n=10)</th>
<th>RUSSIAN Advanced (n=9)</th>
<th>RUSSIAN Near-Native (n=8)</th>
<th>GERMAN (n=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4a) SO_{DEF}V</td>
<td>98/91/100</td>
<td>99/98/97</td>
<td>98/100/97</td>
<td>83/95/94</td>
<td>86/82/95</td>
<td>87/85/100</td>
<td>100/99/92</td>
</tr>
<tr>
<td>(2b) O_{DEF}SV</td>
<td>7/9/10</td>
<td>59/67/56</td>
<td>2/13/12</td>
<td>39/47/49</td>
<td>54/75/46</td>
<td>46/63/46</td>
<td>64/68/55</td>
</tr>
</tbody>
</table>

Table 7.5. Experiment 5: Acceptability ratings. Rescaling from geometric means to scale 0-100, (ALL-Focus/SUBJECT-Focus/OBJECT-Focus).

For each group, Figure 7.2 graphs the difference in acceptability between scrambled OS orders (of definite NPs) in the felicitous SUBJECT-Focus context, on the one hand, and the infelicitous OBJECT-Focus context, on the other hand. A positive score means that scrambled orders are rated to be more acceptable in the SUBJECT-Focus context than in the OBJECT-Focus context.

Figure 7.2 shows that the groups differ in making distinctions in the acceptability of scrambling depending on context. To establish the statistical effects of potential group differences, a Repeated Measures ANOVA with the within-subjects factors Order (SO versus OS) and Context (ALL-Focus, SUBJECT-Focus, OBJECT-Focus) was run on the geometric means of judgements. The between-subjects factors were Language (German, English, Russian and Dutch) and Proficiency (native, near-native and advanced).
The results of the Repeated Measures ANOVA show significant main effects of Order (F(1,93) 147.427, p<0.001) but no main effect of Context (F(2,93) 0.989, p=0.374). The interaction of Order and Context becomes significant (F(2,93) 7.672, p=0.001). This interaction attests that context affects specifically OS orders across groups. For the between-subjects factors, the following interactions were observed: Order and Language (F(2,93) 5.442, p=0.006), Order and Proficiency (F(1,93) 4.225, p=0.043). Moreover, there is a significant interaction of Order, Context and Language (F(4,93) 2.632, p=0.036) as well as a marginally significant interaction of Order, Context and Proficiency (F(2,93) 2.521, p=0.083).

The interactions of the factors Order and Context with the factors Language and Proficiency show that there are group differences with respect to the acceptability of OS orders depending on context. For these reasons, it was decided to carry out separate analyses for the natives and the individual language groups by proficiency groups. Pairwise comparisons were run on OS orders in the felicitous SUBJECT-Focus context (3b) versus the matched OS orders in the infelicitous OBJECT-Focus context (3c). The results are summarized in Table 7.6.

The pairwise comparisons for the natives show that they make a robust contrast in acceptability of scrambled orders according to context. Due to the small size of the individual non-native groups, I focus on the results of the within-subjects analysis. The L1 Russian group demonstrates target-like sensitivity to context regardless of proficiency level. The L1 English group demonstrates differential susceptibility to the modulation of scrambling by information structure according to proficiency: The lower-level advanced group does not distinguish scrambling according to context, while the near-natives show target-like differentiations. Finally, the L1 Dutch group does not distinguish the acceptability of scrambling according to context.
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Table 7.6. Experiment 5: Results of pairwise comparisons between scrambled orders in SUBJECT-Focus and OBJECT-Focus context, by group.

<table>
<thead>
<tr>
<th>Group</th>
<th>Results</th>
<th>Context effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 English Advanced (n=8)</td>
<td>$F_{1}(1,7) = 0.093, p=0.929; F_{2}(1,7) = 0.127; p=0.902$</td>
<td>no</td>
</tr>
<tr>
<td>L1 English Near-Native (n=10)</td>
<td>$F_{1}(1,9) = 2.329, p=0.045; F_{2}(1,7) = 0.653, p=0.535$</td>
<td>yes</td>
</tr>
<tr>
<td>L1 Dutch Advanced (n=9)</td>
<td>$F_{1}(1,7) = 0.079, p=0.939; F_{2}(1,7) = 0.054, p=0.958$</td>
<td>no</td>
</tr>
<tr>
<td>L1 Dutch Near-Native (n=8)</td>
<td>$F_{1}(1,9) = -0.196, p=0.849; F_{2}(1,7) = 0.143, p=0.891$</td>
<td>yes</td>
</tr>
<tr>
<td>L1 Russian Advanced (n=8)</td>
<td>$F_{2}(1,8) = 2.338, p=0.048; F_{2}(1,7) = 1.449, p=0.191$</td>
<td>yes</td>
</tr>
<tr>
<td>L1 Russian Near-Native (n=10)</td>
<td>$F_{2}(1,7) = 2.796, p=0.027; F_{2}(1,7) = -1.505, p=0.176$</td>
<td>yes</td>
</tr>
<tr>
<td>German native (n=47)</td>
<td>$F_{2}(1,46) = 2.78, p=0.008; F_{2}(1,7) = 2.880, p=0.024$</td>
<td>yes</td>
</tr>
</tbody>
</table>

7.3.3. Discussion

Experiment 5 yielded the following results:

- IS modulates the acceptability of scrambling in the native controls in that scrambled orders are judged to be significantly more acceptable in the felicitous SUBJECT-Focus context (IS-syntax match) compared to the OBJECT-Focus context (IS-syntax mismatch).
- With respect to the effects of IS on scrambling, the non-native groups show differential judgement patterns:
  - The L1 Dutch group shows no sensitivity to IS effects on scrambling.
  - The L1 English advanced group demonstrates no sensitivity to IS, while the L1 English near-native group shows a target-like judgement pattern.
  - The L1 Russian group shows target-like sensitivity to IS effects on scrambling.

For IS, convergence on target-like judgement patterns turns out to be relative to L1 effects and proficiency level. Finding that L1 Russian learners master the interaction of the syntax of scrambling and the information structure of reordering points to effects of L1 transfer. By contrast, the L1 English learners cannot make recourse to analogous L1 properties, so that their judgements on OS orders show no influence of information structure at advanced proficiency levels. As their proficiency increases, however, they acquire target-like mappings of information structure and syntax as borne out by the target interaction of IS and word order.

These results are partly in line with previous research on discourse-related aspects in endstate adult L2 acquisition (see Chapter 1.3.6.4, and, e.g., Belletti et al., 2007; Hertel, 2003; Lozano, 2006; Valenzuela, 2006). These studies on L2 Romance languages tested L1 English and, in the case of Lozano (2006), L1 Greek speakers, i.e. these studies specifically selected L1-TL mismatches in terms of the discourse properties under...
investigation. They report that adult L2 near-natives demonstrate persistent non-convergence on discourse-related syntax in off-line tasks. Unfortunately, none of these studies compared different L1 groups, so it is not clear whether non-convergence is solely due to L1 effects. The present findings suggest that non-convergence is indeed related to L1 properties as illustrated by the contrast in performance between the L1 English and L1 Russian groups; yet, the convergence by the L1 English near-natives also indicates that protracted difficulties at the syntax-discourse interface can be overcome at the highest levels of proficiency.

In this regard, it is surprising that the L1 Dutch group does not demonstrate any evidence of interactions of word order and information structure. Dutch does not instantiate scrambling of objects across subjects; yet, it does have scrambling in the complement domain that is identically modulated by information-structural constraints (Chapter 3.8). Against this background, 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 the distributionally similar, though functionally different, option in Dutch, so-called focus scrambling (e.g. Neeleman, 1994), as in (6) above. In contrast to pre-subject scrambling in German or Russian that entails the defocusing of the scrambled phrase, focus scrambling applies to contrastive topics and thus incurs (contrastive) focus on the scrambled phrase.

On the assumption that the L1 Dutch group attempts to map the information-structural characteristics of focus scrambling onto pre-subject scrambling in German, they will fail to attain target-like knowledge of scrambling. Bohnacker & Rosén (2006) identify such a mismatch for the information structure of the German ‘Vorfeld’, i.e. the CP region, in terms of theme-rheme structure and topicalization for Swedish adult learners of German at different levels of proficiency. Although Swedish and German share the syntactic options in CP and thus the options for realizing non-subject material in CP, Swedish and German exploit these options differently: According to a small-scale corpus study reported in Bohnacker & Rosén (2006), native Swedish speakers show lower ratios of topicalization and a higher incidence of phonologically light material in CP (see also Vallduvi & Engdahl, 1996) than native Germans do. Bohnacker & Rosén find evidence of the transfer of these information-structural preferences in oral and written production data of Swedish adult learners of German, which results in morphosyntactically well-formed, yet non-native seeming German in terms of information structure. Unfortunately, the present data cannot answer the question as to whether L1 transfer of IS also underlies the null result for the Dutch groups since no contexts were included that would be felicitous for focus scrambling, i.e. by allowing for a contrastive topic interpretation of the object.
In sum, Experiment 5 shows that convergence on the IS of scrambling is possible for L2ers of different L1s. At the same time, it documents a pattern of non-convergence according to proficiency (L1 English group) and L1 transfer (L1 Dutch group). The following processing experiment ascertains whether the patterns of (non-)convergence among the non-natives attested for off-line judgements are replicated in on-line performance.

7.4. Experiment 6: Scrambling at the interfaces: Information structure: Self-paced reading

Experiment 6 tests whether incremental reanalysis is modulated by information structure. In native processing, incremental reanalysis effects for OS orders derived by scrambling are modulated by IS (context) (Chapter 4.4). This modulation reflects multiple and interacting reanalysis processes for OS orders, namely, syntactic reanalysis of phrase structure and IS reanalysis (Bader & Meng, 1999). Both syntactic reanalysis and IS reanalysis are required if the IS created by the context does not match the IS of scrambling (IS-syntax mismatch); only syntactic reanalysis is required if the IS induced by the context matches the IS of scrambling (IS-syntax match). In order to test for the effects of IS on reanalysis, a self-paced reading task was designed that presented sentences embedded in discourse contexts which systematically manipulated IS as expressed in focus assignment. The target pattern to be elicited in Experiment 6 is as follows (P.6).

(P.6) Target pattern for Experiment 6
Effects of incremental reanalysis, i.e. reading slowdowns at the points of morphological disambiguation to the OS order, should be mitigated in IS contexts that match the IS of scrambling (IS-syntax match) compared to IS contexts that do not align with the IS of scrambling (IS-syntax mismatch).

Hence, the research questions for Experiment 6 are:

(Q6.1) Does IS (context) affect incremental reanalysis on the regions of disambiguation in L2 processing?
(Q6.2) Are there L1 differences in the L2 processing of scrambled OS orders in context?
(Q6.3) Are there proficiency differences in the L2 processing of scrambled OS orders in context?
7.4.1. Participants

For Experiment 6, 20 advanced to near-native L1 English speakers (10 female), 22 L1 Russian speakers (19 female), 21 L1 Dutch speakers (14 female) and 16 native German controls (9 female) were recruited (for additional information, see Appendix A, Table A.2). Their ages ranged from 22-62 years (see Table 7.7). Participant selection criteria and recruitment procedures were as described in Chapter 6. Some participants who had taken part in the experiments reported in Chapter 6 also participated in the following experiment. These participants had not been debriefed after the first experimental session. For each of these subjects, there was a time lag of minimally six months between the two experimental sessions.

7.4.2. Proficiency measure and allocation to proficiency groups

The same rationale in participant selection and grouping was used as for the experiments reported in Chapter 6. Two tasks on comprehension and production skills in the target language were administered: a C-test and a picture-description task eliciting spontaneous speech (for details, see Chapter 6).

7.4.3. C-test

Participants were subdivided into two proficiency groups according to group median scores on the C-test. Table 7.7 shows that the non-natives scored between 43% and 81%. A one-way ANOVA with proficiency score as the dependent variable and group (advanced English, near-native English, advanced Dutch, etc.) as the independent variable yields a significant effect of group (F(5,55) 27.170, p<0.001). Post-hoc pairwise t-tests for independent samples (Bonferroni adjustment) on the proficiency scores demonstrate that there are no statistically significant differences between any of the three advanced groups (p>0.05), or between any of the near-native groups. However, there are statistically significant differences between the advanced groups, on the one hand, and the near-native groups, on the other (p<0.001). For proficiency groups collapsed across L1s, the near-natives are significantly different from the advanced group (F(1,59) 9.882, p<0.001). These comparisons underline the differences in proficiency between the advanced and the near-native groups. Detailed participant information is given in Table 7.7.
7.4.4. Picture-description task

To supplement the C-test as a proficiency measure, the elicited speech data from the picture-description task were analysed in terms of an index of errors and in terms of native speaker ratings, as described in Chapter 6.

7.4.4.1. Index of errors

Table 7.8 presents the results of the index of errors. The details on coding and analysis are discussed in Chapter 6.3.2.1. Briefly, the index of errors was calculated as the number of errors that the participants in each group made per minute. For classification of the type of errors, errors were coded in the areas of (a) syntax, (b) case marking, (c) gender marking and (d) lexical errors (e.g. wrong choice of word or phrase, choice of non-existing words, choice of non-German words). Table 7.8 presents the results broken down by group. The first row of data presents the total time of all speech samples for a given group. In the lower rows, the numbers are errors per minute; the actual number of errors is given in parentheses. The two rightmost columns present collapsed indices of errors for the advanced and near-native groups, respectively; these were obtained by adding the speech samples from each language group at the same proficiency level and then dividing them by the total number of errors in each category.
For each language group, the near-natives had a lower or equal error ratio compared to the advanced speakers. In sum, the analysis of the rate of errors of the subjects in L2 production underscores the findings of the C-test in that the production data suggest that the proficiency differences obtained in the C-test reflect accuracy in L2 production.

7.4.4.2. Rating

All speech samples were rated by three native speakers of German on five dimensions: (a) fluency, (b) choice of vocabulary, (c) expression, (d) mistakes and (e) accent or pronunciation. The raters scored each sample on the five dimensions using a ten-point rating scale. 10 was defined as the score for comprehensive native-likeness, and 0 was the score for most perceptible non-native-likeness (see Appendix B for details). The native speaker group scored 8.5 points or higher on each of the dimensions. The raters were the same as for the experiments reported in the preceding chapter. For the speech samples in Table 7.9, interrater reliability was high, as indexed by a Cronbach’s α of 0.784. Table 7.9 summarizes the results.

The differences between proficiency groups and between L1s parallel those of the participants in the experiments reported in Chapter 6. In order to establish the relation between the picture-description task and the C-test, a correlational analysis was run on the z-scores of total scores of each participant in each test. There is a moderate correlation r=0.449 (p<0.01) between the scores of the C-test and the rating of the speech samples.
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<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>total score</td>
<td>6.1</td>
<td>7.7</td>
<td>8.0</td>
<td>8.7</td>
<td>7.2</td>
<td>8.1</td>
<td>7.2</td>
<td>8.2</td>
</tr>
<tr>
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<td>8.5</td>
<td>9.2</td>
<td>7.5</td>
<td>8.1</td>
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<td>8.3</td>
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<td>6.9</td>
<td>7.6</td>
<td>8.4</td>
<td>6.7</td>
<td>7.7</td>
<td>6.6</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Table 7.9. Ratings of speech samples.

7.4.5. Materials

Eighteen quadruplets of experimental sentences were constructed. Half of the quadruplets were 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. In order to ensure that the NPs within and across conditions would be of similar length, NPs that were between 7 and 9 characters long were chosen; the verbs were also between 7 and 9 characters in length. The NPs were further matched for gender, number and animacy. Examples of both orders in one quadruplet of the experimental items are given in (7) and (8).

(7) 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

(8) Ich glaube, dass den Arbeiter am Montag der Lehrling abgelenkt hat. (OS)

Further, triplets of contexts were designed for each quadruplet of sentences. The 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 orders in (7) and (8) are given in (9).

(9) ALL-Focus: ‘In the factory, the machines ground to a standstill last Monday. What had happened?’

SUBJECT-Focus: ‘In the factory, the worker was distracted by someone last Monday. Who distracted the worker?’
OBJECT-Focus: ‘In the factory, the apprentice distracted someone last Monday. Who did the apprentice distract?’

The ALL-Focus context induced wide focus for the experimental item by providing (a) no information about the events expressed in the experimental item or their participants and (b) a maximally non-specific question. The SUBJECT-Focus context induced 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 focus exponent of the answer by targetting it in the wh-question. Hence, the SUBJECT-Focus gave rise to felicitous IS conditions for scrambling (IS-syntax match). Conversely, the OBJECT-Focus context induced 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 focus exponent of the answer by targetting it in the wh-question. The IS of the OBJECT-Focus context thus conflicted with the IS structure required for felicitous scrambling (IS-syntax mismatch). The contexts were constructed such that a focus scrambling reading of the object (as in (6)) in the experimental item is not supported.

Note that the different contexts create differential demands for the comprehension of subsequent sentences (see Table 7.10) in terms of the predictability of syntactic function assignment. 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 subsequent sentences, the syntactic function of arguments must be identified by case marking (involving morphological checking, see Chapter 6); for OS orders, the default SO phrase-structure assumption must be revised to the OS order and the default wide focus structure needs to be revised to fit the information structure of scrambling with narrow focus on the subject.

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 context specifies 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); in addition, the wh-question again designates the syntactic function of the NP targeted by the wh-phrase (i.e. the subject in the SUBJECT-Focus context and the object in the OBJECT-Focus context). Since the contexts thus disambiguate the syntactic functions of the verb’s arguments in the subsequent sentence, these conditions tap the interaction of word order and information structure in the experimental item independently of the processing of case. The SUBJECT-Focus and OBJECT-Focus contexts differ from each other in that the SUBJECT-Focus context creates an information structure that fits the focus structure of OS orders (i.e. narrow focus on the subject; IS-syntax match), while the OBJECT-Focus context gives rise to an information structure that is in conflict with OS
orders (IS-syntax mismatch), so that the information structure of the answer needs to be revised to accommodate the OS order. Table 7.10 summarizes the task demands in each of the contexts.²

<table>
<thead>
<tr>
<th>ALL-Focus</th>
<th>SUBJECT-Focus</th>
<th>OBJECT-Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphological checking</td>
<td>Syntactic reanalysis</td>
<td>Syntactic reanalysis</td>
</tr>
<tr>
<td>Syntactic reanalysis</td>
<td>IS reanalysis</td>
<td>IS reanalysis</td>
</tr>
</tbody>
</table>

Table 7.10. Task demands for processing OS orders in the different contexts.

7.4.6. Comprehension questions

In order to ensure that participants read the sentences properly and in order to check their comprehension of the sentences, each item was followed by a comprehension statement. For the experimental items, this statement was a main clause in SO order that contained both NPs and the verb of the preceding experimental item. An example of a comprehension sentence in response to (7) or (8) is given in (10).

(10) Der Lehrling hat den Arbeiter abgelenkt.  
The apprentice has the worker distracted

For half of the experimental items, the comprehension statement was a correct rendering of the experimental item; for the other half, the comprehension sentence was an incorrect rendering of the experimental item.

7.4.7. Plausibility and reversibility

The items were constructed with attention to the plausibility and the semantico-pragmatic reversibility of the predicates: A sentence with NP1 for the subject and NP2 for the object was to be as plausible as the sentence with NP2 for the subject and NP1 for the subject. The reversibility of sentences was tested in an off-line rating study as described for Experiments 2 in Chapter 6. The complete set of experimental materials is given in Appendix H.

² Note that Table 7.10 does not make a difference between the ALL-Focus context and the OBJECT-Focus context in terms of information structure reanalysis for scrambling, even though the actual reanalysis processes differ: For the ALL-Focus context, wide focus (i.e. no IS specification) must be revised to narrow focus on the subject; for the OBJECT-Focus context, narrow focus on the object (i.e. a specific IS) must be revised to narrow focus on the subject. At present, it is unclear whether IS reanalysis from a maximally unbiased intersentential discourse relation (ALL-Focus context) needs to be treated differently compared to the information structure reanalysis from a strongly biased intersentential discourse relation in the OBJECT-Focus context.
7.4.8. Assignment to groups and lists

The 18 quadruplets of the experimental items were divided into three item groups of six sets each. On the basis of these three item groups, four subject lists were created, using a Latin Square design as in Experiment 2 in the previous chapter.

In order to ensure that all relatively infrequent, implausible or irreversible items would not appear in one condition on a list, the item groups were matched on (a) mean plausibility and reversibility scores and (b) logarithmic frequency of NPs and the verb (CELEX database; Baayen et al., 1995). Subjects were pseudorandomly assigned to lists such that each list was read by a similar number of subjects.

7.4.9. Fillers

In addition to the 36 experimental items, the task included 24 fillers, thus yielding a total of 60 items. The fillers were the same for each list and encompassed constructions different from the ones of the experimental items. Each filler comprised a context and a comprehension statement; for half the fillers, the comprehension statements were correct, for the other half, they were incorrect. The comprehension statements of the fillers referred to the first or second sentence of the context to ensure that participants read the contexts carefully throughout the experiment.

7.4.10. Order of presentation

The order of the experimental items and the fillers was randomized. The order of sentences was randomized automatically for each participant.

7.4.11. Procedure

The paradigm was a non-cumulative Moving Windows task (Just et al., 1982) and was run using E-Prime software (Schneider et al., 2002). Subjects were tested individually. They sat in front of a laptop computer with a 15-inch TFT screen. The keyboard was covered with a blind that left only the spacebar and two keys visible. The spacebar was the ‘Go’ key. The two other keys were slightly offset from the rest of the keyboard on the bottom right. The left key was marked with a green sticker (the ‘yes’ key) and the right key was marked with a red sticker (the ‘no’ key).

A trial was initiated by pressing the ‘Go’ key. Each trial sentence was preceded by a fixation star at the left edge in the vertical centre of the screen. When the participants pressed the ‘Go’ key, the background sentence appeared in full starting at the left edge in the middle of the screen. At the following push of the key, the *wh*-question appeared in full, starting at the left edge in the vertical centre of the screen. At the subsequent push of
the key, the first segment of the experimental item appeared. At the next push of the key, the first segment disappeared and the next segment appeared to the right of the now-gone segment, etc. All sentences fit on one line. The presentation of the sentences included punctuation. Spelling and punctuation were according to the reformed spelling conventions (Duden, 1996). The end of a sentence was signaled by a full stop following the last word in the final segment. The experimental items were divided into seven segments (11).

(11) Matrix COMP NP1 adverbial NP2 V-part V-fin
Ich glaube | dass | der Lehrling | am Montag | den Arbeiter | abgelenkt | hat.

All text was presented in Courier New Font, font size 14, in white letters against a black background. Once the last word of the final segment had been read, the comprehension statement, e.g. (10), was presented in its entirety. The comprehension statement was presented in Courier New Font, font size 14, in yellow letters against a black background in the centre of the screen. The participant now had to decide whether the comprehension statement matched the content of the experimental sentence by pressing the ‘yes’ key or the ‘no’ key. Once the response had been given, the screen changed to display the fixation star, and the following trial could be initiated by pressing the space bar.

The participants were told that the experiment was about reading comprehension in a (second) language and were instructed to read for comprehension. They were asked to read at their normal reading speed. The presentation of the actual items was preceded by a page of instructions and six practice items. Feedback to the participants’ responses in the practice items was given by the experimenter. Once the participants had understood the procedure and could operate the buttons, the actual experiment was started. The participants did not receive any feedback during the experimental session. Most participants completed the task within 14 minutes.

7.4.12. Analysis and data removal

Reading times faster than 100ms or slower than 5000ms were treated as missing data. In addition, individual reading times for a segment above or below two standard deviations of the group mean for that segment were trimmed to the group mean of the segment plus or minus two standard deviations, respectively. This affected less than 3% of the trials in each group. The analyses of reading times were run for both raw reading times and residual reading times. Residual reading times abstract away from individual differences by factoring out differences in overall reading speed. Residual reading times were calculated as described in Chapter 6.6.8.

Note that the SUBJECT- and OBJECT-Focus contexts (i.e. the background sentence and the question) mention different NPs that appear in the experimental item,
i.e. the SUBJECT-Focus context mentions the object NP of the experimental item and the OBJECT-Focus context mentions the subject NP. In order to make sure that priming effects of reading these items again in the experimental item do not affect the analysis of context effects on reanalysis, a larger region of analysis was defined. For studying the incremental effects of IS on reanalysis, the relevant region of analysis was defined as the sum of segments 3 to 5, i.e. the first NP, the adverbial and the second NP. This region, henceforth termed Segment 3-5, was chosen in order to make comparisons across contexts possible, because this region comprises one given NP, i.e. mentioned in the background sentence and the question, and one new NP, i.e. the focus exponent, for both the SUBJECT-Focus and OBJECT-Focus contexts. In addition, reading times were analysed for the remaining segments in order to catch potentially delayed or spill-over effects, especially among the non-native groups.

Mixed three-way Repeated Measures ANOVAs with Order and Context as within-subjects factors and with Language (German, English, Dutch, Russian) and Proficiency (native, advanced L2 and near-native L2) as between-subjects factors were performed for the segments separately on both raw and residual reading times. Finding interactions with the factor Language would indicate that (some) non-native processing is different from native processing or differs among the L2 groups; finding interactions with the factor Proficiency would indicate that processing differs according to proficiency level. Post-hoc two-way analyses were computed to investigate the cause of interactions of the within-subjects factors and Language or Proficiency. Results are reported as significant if the p-value is less than .05, although effects with a p-value close to or less than .1 are reported if they are of interest. For the post-hoc analyses, the significance level was adjusted using Bonferroni-adjusted alpha levels of .025 per test.

Analyses of reading times were run on all items and on only those items for which participants gave correct comprehension responses in order to see whether reading patterns differ according to correct comprehension. There were no major differences between these analyses. The few differences are indicated in Table 7.14 and will be reported in the text if relevant for the discussion. In the following, analyses are reported for all items regardless of comprehension accuracy (see Chapter 6 for argumentation).

### 7.4.13. Results

#### 7.4.13.1. Comprehension questions

Table 7.11 lists the accuracy scores for each sentence type by group. In addition to reading times, the comprehension accuracy of sentences gives insight into global processing behaviour: Typically, a sentence that elicits processing difficulty in reading
leads to both lower accuracy and slower response times in the comprehension questions. By comparison to the embedded SO questions, embedded OS orders yield lower comprehension accuracies. OS orders thus give rise to stronger comprehension difficulty after disambiguation than their SO counterparts.

<table>
<thead>
<tr>
<th></th>
<th>ALL-Focus</th>
<th>SUBJET-Focus</th>
<th>OBJECT-Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>German</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=16)</td>
<td>76% (73/96)</td>
<td>61% (57/94)</td>
<td>85% (82/96)</td>
</tr>
<tr>
<td><strong>E ADV</strong></td>
<td>76% (41/54)</td>
<td>51% (26/51)</td>
<td>83% (45/54)</td>
</tr>
<tr>
<td>(n=9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E NN</strong></td>
<td>80% (48/60)</td>
<td>78% (47/60)</td>
<td>90% (54/60)</td>
</tr>
<tr>
<td>(n=10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D ADV</strong></td>
<td>92% (54/59)</td>
<td>32% (19/59)</td>
<td>80% (48/60)</td>
</tr>
<tr>
<td>(n=10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D NN</strong></td>
<td>91% (48/59)</td>
<td>53% (32/60)</td>
<td>83% (50/60)</td>
</tr>
<tr>
<td>(n=10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R ADV</strong></td>
<td>83% (60/72)</td>
<td>40% (29/72)</td>
<td>86% (60/70)</td>
</tr>
<tr>
<td>(n=12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R NN</strong></td>
<td>88% (53/60)</td>
<td>76% (44/58)</td>
<td>93% (55/59)</td>
</tr>
<tr>
<td>(n=10)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7.11. Experiment 6: Comprehension accuracy in percent. Numbers in parentheses denote absolute numbers.

A Repeated Measures ANOVA with the factors Order and Context as within-subjects factors and Proficiency and Language as between-subjects factors unearths significant main effects of Order (F(1,70) 77.053, p<0.001) and Context (F(2,140) 18.048, p<0.001) and an interaction of Order and Context (F(2,140) 4.014, p=0.020). The interaction of Order and Context reflects the proportionally increased accuracy on OS orders in the felicitous SUBJECT-Focus context compared to OS orders in other contexts. There were also interactions of the factor Order with the between-subjects factors Language (F(2,70) 4.310, p=0.017) as well as Proficiency (F(1,71) 18.014, p<0.001). These interactions arguably reflect the lower accuracy rates for OS orders of the advanced L2 groups.

Table 7.12 records the relative difference between the SO order and the OS order for each context in order to illustrate the size of the relative contrast in comprehension accuracy between SO and OS orders. Since comprehension accuracy for SO orders varies across contexts, the relative difference between SO and OS orders illustrates the comparative difficulty of comprehending OS orders *vis à vis* their SO counterparts in the respective contexts.
Germanw (n=16)w 15%w 9%w 17%
E ADV (n=9)w 25%w 23%w 34%
E NN (n=10)w 1%w 7%w 7%
D ADV (n=10)w 60%w 37%w 61%
D NN (n=10)w 28%w 13%w 23%
R ADV (n=12)w 43%w 22%w 30%
R NN (n=10)w 12%w 10%w 15%

Table 7.12. Experiment 6: Relative difference in comprehension accuracy between SO and OS order in percent.

Table 7.12 illustrates the difference in relative contrasts between the SO and OS orders for the ALL-Focus context, the SUBJECT-Focus context and the OBJECT-Focus context: The difference in comprehension accuracy is consistently smallest for the felicitous SUBJECT-Focus context. At the global level of post-reading comprehension, then, context affects the accuracy of reading scrambled sentences for all groups.

7.4.13.2. Response times to comprehension questions

The response times were analysed for items that were answered correctly. Typically, sentences that prove hard to understand also elicit longer response times, such that the analysis of response times can add to the analysis of comprehension accuracy. A Repeated Measures ANOVA with the same factors as above was carried out. Since some participants did not correctly answer any questions for some sentence types, all their data were excluded, leaving 67 participants whose data were analysed. Table 7.13 shows the mean reaction times for each sentence type by group.
Table 7.13. Experiment 6: Response Times (in milliseconds) to comprehension questions.

<table>
<thead>
<tr>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>German (n=16)</td>
<td>2366 ms</td>
<td>2751 ms</td>
<td>2463 ms</td>
<td>2336 ms</td>
<td>2394 ms</td>
<td>2612 ms</td>
</tr>
<tr>
<td>E ADV (n=9)</td>
<td>3145 ms</td>
<td>3426 ms</td>
<td>3063 ms</td>
<td>2981 ms</td>
<td>2875 ms</td>
<td>3218 ms</td>
</tr>
<tr>
<td>E NN (n=10)</td>
<td>2562 ms</td>
<td>3190 ms</td>
<td>2500 ms</td>
<td>2556 ms</td>
<td>2638 ms</td>
<td>2866 ms</td>
</tr>
<tr>
<td>D ADV (n=10)</td>
<td>2555 ms</td>
<td>2630 ms</td>
<td>2842 ms</td>
<td>3462 ms</td>
<td>2564 ms</td>
<td>2891 ms</td>
</tr>
<tr>
<td>D NN (n=10)</td>
<td>2476 ms</td>
<td>2620 ms</td>
<td>2942 ms</td>
<td>2668 ms</td>
<td>2635 ms</td>
<td>2539 ms</td>
</tr>
<tr>
<td>R ADV (n=12)</td>
<td>3188 ms</td>
<td>3725 ms</td>
<td>3009 ms</td>
<td>3047 ms</td>
<td>2878 ms</td>
<td>3206 ms</td>
</tr>
<tr>
<td>R NN (n=10)</td>
<td>2869 ms</td>
<td>2644 ms</td>
<td>2927 ms</td>
<td>2690 ms</td>
<td>2518 ms</td>
<td>2912 ms</td>
</tr>
</tbody>
</table>

The between-groups ANOVA yields a main effect of *Order* (F(1,60) 5.936, p=0.018). There is no main effect of *Context* (F(2,120) 1.621, p=0.202), yet there is an interaction of the factor *Context* with the factor *Language* (F(4,120) 5.041, p<0.001) as well as a three-way interaction with the factors *Language* and *Proficiency* (F(4,120) 3.233, p=0.015). Further, there is a three-way interaction of *Context, Order* and *Language* (F(4,120) 4.377, p=0.002) as well as a four-way interaction between the factors *Context, Order, Language* and *Proficiency* (F(4,120) 3.108, p=0.018). These interactions most likely reflect the L1 Dutch performance, in particular of the advanced group, which shows a slowdown for OS orders in the SUBJECT-Focus context compared to the other contexts. All other groups show equal or faster response times to the comprehension questions for OS orders in the SUBJECT-Focus context compared to the other contexts. These findings thus add to the results on comprehension accuracy that context facilitates the comprehension of scrambled orders.

7.4.13.3. Reading times

In order to explore incremental effects of IS on the processing of scrambling, the reading times were analysed for each segment in the self-paced reading task. For individual segments and total sentences, mixed three-way Repeated Measures ANOVAs with *Order* and *Context* as within-subjects factors and with *Language* (German, English, Dutch, Russian) and *Proficiency* (native, advanced L2 and near-native L2) as between-subjects factors were performed. Table 7.14 charts the significant effects for raw and residual
reading times and notes differences between the analyses for all items and the analyses for only those items for which comprehension questions were answered correctly. The reading times for all segments are given in Appendix I.

The analysis of the reading times for the total sentence yields main effects of **Context** (F(2,140) 103.217, p<0.001) and **Order** (F(1,70) 142.066, p<0.001). Further, there is an interaction of **Context** and **Order** (F(2,140) 5.745, p=0.004). This interaction reflects the differential effects of context on reading times of OS orders. As for between-subjects factors, there is a marginal interaction of **Context** with the factor **Proficiency** (F(2,140) 2.382, p=0.098). In addition, there are (marginal) three-way interactions of the factors **Context** and **Order** with the factors **Language** (F(4,140) 2.191, p=0.073) as well as **Proficiency** (F(2,140) 3.142, p=0.046).

As for individual segments, there were no significant effects on segments 1 or 2. On Segment 3-5, 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). This interaction signals that context affects scrambled OS orders differently from SO orders. 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 context does not affect reading times in the same way across groups. Further, there are three-way interactions of the factors **Context**, **Order** and **Language** (F(4,140) 2.511, p=0.045) and the factors **Context**, **Order** and **Proficiency** (F(2,140) 3.561, p=0.031). These interactions suggest that the specificity of context effects to the OS orders does not hold across language and proficiency groups.
<table>
<thead>
<tr>
<th>Segment</th>
<th>Effect</th>
<th>Raw RTs</th>
<th>Residual RTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3-5</td>
<td>Context</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Context x Language x Proficiency</td>
<td>&lt;.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>n.s.</td>
</tr>
<tr>
<td>Order</td>
<td>***</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Order x Language x Proficiency</td>
<td>&lt;.1&lt;sup&gt;c&lt;/sup&gt;</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Context x Order</td>
<td>***</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Context x Order x Language</td>
<td>*&lt;sup&gt;b&lt;/sup&gt;</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Context x Order x Proficiency</td>
<td>*</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>Context</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Context x Language</td>
<td>&lt;.1&lt;sup&gt;c&lt;/sup&gt;</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Context x Proficiency</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Order</td>
<td>***</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Context x Order</td>
<td>&lt;.1&lt;sup&gt;c&lt;/sup&gt;</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Context x Order x Language</td>
<td>***</td>
<td>***&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>Context</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Order</td>
<td>***</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Context</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Context x Language</td>
<td>&lt;.1&lt;sup&gt;c&lt;/sup&gt;</td>
<td>&lt;.1&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Context x Proficiency</td>
<td>&lt;.1&lt;sup&gt;c&lt;/sup&gt;</td>
<td>&lt;.1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Order</td>
<td>***</td>
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<td></td>
</tr>
<tr>
<td>Order x Language x Proficiency</td>
<td>*&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>Context x Order</td>
<td>**</td>
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<tr>
<td>Context x Order x Language</td>
<td>*&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Context x Order x Proficiency</td>
<td>*&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;.1</td>
<td></td>
</tr>
</tbody>
</table>

Note: <sup>a</sup> indicates that the effect did not reach significance in the analysis of only correct items.  
<sup>b</sup> indicates that the effect reached only marginal significance in the analysis of only correct items.  
<sup>c</sup> indicates the effect reached significance only for correct items. ***: p<.001; **: p<.01; *: p<.05.

**Table 7.14.** Experiment 6: Significant effects for raw and residual reading times.
The effects from Segment 3-5 spill over to segment 6. On segment 6, there are significant main effects of the factors Context (F(2,140) 112.444, p<0.001) and Order (F(1,70) 55.414, p<0.001) as well as a marginally significant interaction of Context and Order (F(2,140) 2.654, p=0.074). As for between-subjects factors, the interaction of Context with the factor Language becomes marginally significant (F(4,140) 2.247, p=0.067), and the interaction of Context and Proficiency is significant (F(2,140) 7.810, p=0.001). In addition there is a three-way interaction of the factors Context, Order and Language (F(4,140) 5.455, p<0.001). Finally, on segment 7, there are main effects of Context (F(2,140) 36.600, p<0.001) and Order (F(1,70) 53.794, p<0.001).

In sum, the ANOVAs show clear effects of the influence of context on the processing of OS orders. These effects are visible globally in total sentence reading times. Thus, comprehenders use context in understanding sentences; a felicitous context engenders faster reading of scrambled sentences. In addition, contexts effects are visible incrementally in the reading times of the pre-verbal segments encompassing the two NPs. Hence, sensitivity to contextual manipulation occurs incrementally in the course of sentence processing, even before verbal information is encountered. Comprehenders thus use context immediately when reading NPs; in other words, discourse context affects the efficacy of syntactic function assignment of NPs. Finally, interactions of the factor Context and the interaction of Context and Order with the between-subjects factors Language and Proficiency suggest that there are group differences in the effects of context on the processing of OS orders.

Given the interactions with the factors Language and Proficiency, I analyse the reading times per segment separately, first, by language group, and, second, by proficiency group. Planned pairwise comparisons between the SO and OS orders were run for each context in order to establish whether there are differences in reading times between the SO and OS orders. I concentrate on the SUBJECT-Focus and OBJECT-Focus contexts, since the ALL-Focus context differs from these in terms of intersentential predictions (see Section 7.6.1). In addition, a pairwise comparison between the OS order in the SUBJECT-Focus and the OBJECT-Focus context was run in order to gauge whether there are differences in reading times of the OS orders depending on context. I focus on the analysis for Segment 3-5, yet I include segment 6 in case some (L2) groups show delayed effects. In addition, total sentence reading times are analysed.

Natives

For Segment 3-5, pairwise comparisons of the SO versus OS orders show significant differences in the ALL-Focus context (F1(1,15) -3.893, p=0.001; F2(1,23) -2.791, p=0.010) and in the OBJECT-Focus context (F1(1,15) -4.571, p<0.001; F2(1,23) -5.127, p<0.001); by contrast, there is no significant difference between the orders in the
SUBJECT-Focus context \((F_{1}(1,15) = -1.938, p=0.072; F_{2}(1,23) = -1.179, p=0.250)\). This finding shows that the felicitous SUBJECT-Focus context leads to the mitigation of the difference in reading times between the SO and OS orders. In addition, a pairwise comparison of the OS orders in the SUBJECT-Focus and OBJECT-Focus contexts yields a significant difference in the analysis by subjects and a marginally significant difference in the analysis by items \((F_{1}(1,15) = -3.306, p=0.005; F_{2}(1,23) = -2.188, p=0.039)\). This finding further underlines differences in reading times of OS orders depending on context. Figure 7.3 charts the reading times for the natives on Segment 3-5 and indicates significant differences in the pairwise comparisons.

**Figure 7.3.** Experiment 6: Reading times (in ms) for Segment 3-5 for native-speaker group by context (significant differences indicated).

On segment 6, pairwise comparisons of SO versus OS orders in each context show a difference approaching marginal significance in the ALL-Focus context \((F_{1}(1,15) = -2.108, p=0.052; F_{2}(1,23) = -1.746, p=0.094)\), no difference in the SUBJECT-Focus context \((F_{1}(1,15) = -1.035, p=0.317; F_{2}(1,23) = -1.088, p=0.288)\) and a significant difference in the OBJECT-Focus context \((F_{1}(1,15) = -2.920, p=0.011; F_{2}(1,23) = -2.932, p=0.007)\). These effects can be considered spill-overs from Segment 3-5 that underline the differences for OS orders between the SUBJECT-Focus and OBJECT-Focus contexts.

For total sentence reading times, pairwise comparisons of SO versus OS orders in each context show a significant difference in the ALL-Focus context \((F_{1}(1,15) = -3.555, p=0.003; F_{2}(1,23) = -4.224, p<0.001)\), no difference in the SUBJECT-Focus context \((F_{1}(1,15) = -2.025, p=0.061; F_{2}(1,23) = 1.770, p=0.090)\) and a significant difference in the OBJECT-Focus context \((F_{1}(1,15) = -3.628, p=0.002; F_{2}(1,23) = -4.630, p<0.001)\). Moreover, a comparison of the OS orders in the SUBJECT-Focus and OBJECT-Focus contexts

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3 Recall from Section 7.4.12 that the significance level for post-hoc comparisons is set to \(p<.025\).
reveals a significant difference, at least in the analysis by subjects (F₁(1,15) -3.559, p=0.003; F₂(1,23) -2.034, p=0.054).

In sum, the natives show clear effects of context on the processing of OS orders; these effects emerge in global sentence reading times as well as in local reading times on Segment 3-5. For Segment 3-5, these incremental effects take two forms: First, the slowdown for OS orders compared to SO orders attested in the ALL-Focus and OBJECT-Focus contexts is mitigated or even disappears in the felicitous SUBJECT-Focus context. Second, OS orders are read significantly faster in the felicitous SUBJECT-Focus context than in the OBJECT-Focus context.

In the following sections, the results of the statistical comparisons for each L1 and each proficiency group are summarized at the beginning of each section and subsequently reported in detail. They are given for incremental effects, i.e. Segment 3-5 and segment 6, and for total reading times.

L1 English advanced

The L1 English advanced group shows no slowdowns for OS orders in the ALL-Focus or SUBJECT-Focus contexts; however, slowdowns occur for the OS order compared to the SO order in the OBJECT-Focus context, both incrementally on the pre-verbal segments (Segment 3-5) as well as globally in total sentence reading times. This asymmetry reflects a specific effect of context on the processing of OS orders in that the mismatching OBJECT-Focus context incurs slower reading of OS orders. This context effect is replicated in the comparisons for OS orders between the OBJECT-Focus and SUBJECT-Focus contexts.

On Segment 3-5, pairwise comparisons between the SO and OS orders yield a marginally significant difference in the ALL-Focus context (F₁(1,8) -2.347, p=0.047; F₂(1,23) -0.760, p=0.455) in the analysis by subjects and no difference in the SUBJECT-Focus context (F₁(1,8) -0.139, p=0.893; F₂(1,23) -0.003, p=0.997); however, there is a significant difference in the OBJECT-Focus context (F₁(1,8) -3.341, p=0.010; F₂(1,23) -2.298, p=0.031). For the comparison of the OS orders between the SUBJECT-Focus and OBJECT-Focus contexts, a significant difference holds in the analysis by subjects (F₁(1,8) -2.951, p=0.018; F₂(1,23) -1.816, p=0.082). Similar effects hold for the following segment 6, arguably spilling over from Segment 3-5. For segment 6, SO and OS orders are not significantly different from each other in the ALL-Focus context (F₁(1,8) -0.435, p=0.675; F₂(1,23) -0.198, p=0.845) or the SUBJECT-Focus context (F₁(1,8) 1.810, p=0.108; F₂(1,23) 1.401, p=0.175); by contrast, there is a marginally significant difference in the OBJECT-Focus context (F₁(1,8) -2.523, p=0.036; F₂(1,23) -2.400, p=0.025). There is no significant difference for OS orders between the SUBJECT-Focus and OBJECT-Focus contexts (F₁(1,8) -2.281, p=0.052; F₂(1,23) -1.770, p=0.090).
The Interfaces at L2 Ultimate Attainment: Interpretation

**Figure 7.4.** Experiment 6: Reading times (in ms) for Segment 3-5 for L1 English advanced group by context (significant differences indicated).

In the total sentence reading times, the difference between SO and OS orders does not attain significance in the ALL-Focus context ($F_{1}(1,8) = 2.132$, $p=0.066$; $F_{2}(1,23) = 0.421$, $p=0.677$) or in the SUBJECT-Focus context ($F_{1}(1,8) = 0.167$, $p=0.871$; $F_{2}(1,23) = 0.433$, $p=0.669$); yet, the difference is significant in the OBJECT-Focus context ($F_{1}(1,8) = 3.177$, $p=0.013$; $F_{2}(1,23) = 2.477$, $p=0.021$).

**L1 English near-natives**

The L1 English near-natives evince specific slowdowns for OS orders in the ALL-Focus and OBJECT-Focus contexts that are absent in the SUBJECT-Focus context, both incrementally on Segment 3-5 and on the sentence-final segment. These effects reflect the modulation of reanalysis to the OS order by context. Total reading times replicate the local effects of context. In contrast, the comparison of OS orders between the SUBJECT-Focus and OBJECT-Focus contexts shows no differences.

On Segment 3-5, pairwise comparisons between the SO and the OS orders yield marginally significant differences in the ALL-Focus context ($F_{1}(1,9) = 2.141$, $p=0.027$; $F_{2}(1,23) = 1.608$, $p=0.121$) and a significant difference in the OBJECT-Focus context ($F_{1}(1,9) = 7.962$, $p<0.001$; $F_{2}(1,23) = 3.697$, $p=0.001$); however, there is no significant difference in the SUBJECT-Focus context ($F_{1}(1,9) = 2.258$, $p=0.050$; $F_{2}(1,23) = 2.056$, $p=0.051$).

For the comparison of the OS orders between the SUBJECT-Focus and OBJECT-Focus contexts, no significant difference obtains ($F_{1}(1,9) = 0.249$, $p=0.809$; $F_{2}(1,23) = 0.300$, $p=0.767$).
For segment 6, SO and OS orders are not significantly different from each other in the SUBJECT-Focus context (F(1,9) -0.488, p=0.637; F(2,123) -0.610, p=0.548) or the ALL-Focus context (F(1,9) -2.142, p=0.061; F(2,123) -1.392, p=0.177). There is a significant difference in the OBJECT-Focus context (F(1,9) -3.104, p=0.013; F(2,123) -2.299, p=0.031), which is marginal in the analysis by items.

In the total sentence reading times, the difference between SO and OS orders attains significance in the ALL-Focus context (F(1,9) -3.555, p=0.006; F(2,123) -2.436, p=0.023) and in the OBJECT-Focus context (F(1,9) -6.430, p<0.001; F(2,123) -3.625, p=0.001); yet, the difference is not significant in the SUBJECT-Focus context (F(1,9) -1.796, p=0.106; F(2,123) -1.967, p=0.061).

**L1 Dutch advanced**

The L1 Dutch advanced group does not show target differences in reading times of OS orders according to context, since the processing disadvantage for OS orders seems to be levelled in the infelicitous OBJECT-Focus context, yet not in the felicitous SUBJECT-Focus context. This reverse effect of context holds for incremental reading times on the segments of disambiguation as well as for total reading times.

On Segment 3-5, the L1 Dutch advanced group demonstrates significant differences between SO and OS orders in both the ALL-Focus context (F(1,9) -3.658, p=0.005; F(2,123) -1.072, p=0.295) and the SUBJECT-Focus context (F(1,9) -3.231, p=0.010; F(2,123) -1.229, p=0.231) in the analysis by subjects. No significant difference arises in the OBJECT-Focus context (F(1,9) -2.175, p=0.058; F(2,123) -0.612, p=0.546). Moreover, the difference for OS orders between the SUBJECT-Focus context and the OBJECT-Focus context is not significant (F(1,9) -0.377, p=0.715; F(2,123) 0.224,
p=0.825). On segment 6, there are no significant differences between SO and OS orders in any context.

![Diagram](image)

**Figure 7.6.** Experiment 6: Reading times (in ms) for Segment 3-5 for L1 Dutch advanced group by context (significant differences indicated).

For total reading times, significant differences obtain in the analysis by subjects for the ALL-Focus context ($F_1(1,9)$ -2.743, $p=0.023$; $F_2(1,23)$ -1.479, $p=0.153$), for the SUBJECT-Focus context ($F_1(1,9)$ -3.250, $p=0.010$; $F_2(1,23)$ -1.416, $p=0.170$) and marginally also for OBJECT-Focus context ($F_1(1,9)$ -2.516, $p=0.033$; $F_2(1,23)$ -1.884, $p=0.072$).

**L1 Dutch Near-Native**

The L1 Dutch near-natives do not show systematic differences in local or global reading times for OS orders according to context; rather, OS orders incur longer reading times than SO orders in all contexts.

For Segment 3-5, the Dutch near-natives demonstrate significant differences between SO and OS orders in all contexts (ALL-Focus: $F_1(1,9)$ -3.243, $p=0.010$; $F_2(1,23)$ -3.790, $p=0.001$; SUBJECT-Focus: $F_1(1,9)$ -4.424, $p=0.002$; $F_2(1,23)$ -4.056, $p<0.001$; OBJECT-Focus: $F_1(1,9)$ -3.321, $p=0.009$; $F_2(1,23)$ -3.057, $p=0.006$). In addition, the difference for OS orders between the SUBJECT-Focus context and the OBJECT-Focus context is not significant ($F_1(1,9)$ -0.425, $p=0.681$; $F_2(1,23)$ -0.225, $p=0.824$). On segment 6, there is a significant difference only for the OBJECT-Focus context ($F_1(1,9)$ -3.222, $p=0.010$; $F_2(1,23)$ -2.903, $p=0.008$).

In total sentence reading times, significant differences between SO and OS orders are attested across contexts (ALL-Focus: $F_1(1,9)$ -3.078, $p=0.013$ $F_2(1,23)$ -3.666, $p=0.001$; SUBJECT-Focus: $F_1(1,9)$ -3.668, $p=0.005$; $F_2(1,23)$ -3.554, $p=0.002$; OBJECT-Focus: $F_1(1,9)$ -3.812, $p=0.004$; $F_2(1,23)$ -3.980, $p=0.001$).
**Figure 7.7.** Experiment 6: Reading times (in ms) for Segment 3-5 for L1 Dutch near-native group by context (significant differences indicated).

**L1 Russian advanced group**

The L1 Russian advanced group does not demonstrate slowdowns for OS orders in the ALL-Focus or SUBJECT-Focus contexts; however, it does show local slowdowns for the OS order compared to the SO order in the OBJECT-Focus context on Segments 3-5. This asymmetry points to effects of context. In addition, the comparison of OS orders between the SUBJECT-Focus and OBJECT-Focus contexts is marginally significant.

**Figure 7.8.** Experiment 6: Reading times (in ms) for Segment 3-5 for L1 Russian advanced group by context (significant differences indicated).

For Segment 3-5, pairwise comparisons between the SO and OS orders yield no significant differences in the ALL-Focus (F1(1,11) =-1.336, p=0.209; F2(1,23) =-1.325, p=0.198) and only a marginally significant difference in the analysis of subjects for the SUBJECT-Focus context (F1(1,11) =-2.238, p=0.047; F2(1,23) =-1.244, p=0.226); however,
there is a strongly significant difference in the OBJECT-Focus context ($F_{1}(1,11) -5.080$, $p<0.001$; $F_{2}(1,23) -8.261$, $p<0.001$). For the comparison of the OS orders between the SUBJECT-Focus and OBJECT-Focus contexts, a marginally significant difference obtains ($F_{1}(1,11) -2.405$, $p=0.035$; $F_{2}(1,23) -1.878$, $p=0.073$).

For segment 6, SO and OS orders are not significantly different from each other in the ALL-Focus context ($F_{1}(1,11) -0.384$, $p=0.708$; $F_{2}(1,23) -0.687$, $p=0.499$), yet they are in the SUBJECT-Focus context ($F_{1}(1,11) -3.242$, $p=0.008$; $F_{2}(1,23) -2.582$, $0.017$) and in the OBJECT-Focus context ($F_{1}(1,11) -5.113$, $p=0.001$ $F_{2}(1,23) -2.664$, $p=0.014$).

In the total sentence reading times, the difference between SO and OS orders does not attain significance in the ALL-Focus context ($F_{1}(1,11) -1.175$, $p=0.265$; $F_{2}(1,23) -0.886$, $p=0.385$); yet, the difference is significant in the SUBJECT-Focus context in the analysis by subjects ($F_{1}(1,8) -4.000$, $p=0.002$; $F_{2}(1,23) -1.492$, $p=0.149$) and in the OBJECT-Focus context ($F_{1}(1,11) -6.446$, $p<0.001$; $F_{2}(1,23) -6.868$, $p<0.001$).

**L1 Russian Near-Native**

The L1 Russian near-natives show locally specific slowdowns on Segment 3-5 in line with the target pattern. Further, the comparison of OS orders between the SUBJECT-Focus and OBJECT-Focus contexts yields significant differences. However, the context effects do not extend to global reading times, where OS orders are read more slowly than SO orders, irrespective of context. The incremental effects, however, do show that context affects on-line comprehension in a target-like way.

**Figure 7.9.** Experiment 6: Reading times (in ms) for Segment 3-5 for L1 Russian near-native group by context (significant differences indicated).

On Segment 3-5, pairwise comparisons between the SO and the OS orders yield significant differences in the ALL-Focus context ($F_{1}(1,9) -4.620$, $p=0.001$; $F_{2}(1,23)$
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-2.182, p=0.040) and the OBJECT-Focus context (F(1,9) -1.969, p=0.061), at least in the analyses by subjects; however, there is no significant difference in the SUBJECT-Focus context (F(1,9) -1.822, p=0.102; F(2,1,23) -0.884, p=0.386). For the comparison of the OS orders between the SUBJECT-Focus and OBJECT-Focus contexts, there is also a significant difference (F(1,9) -0.804, p=0.021; F(2,1,23) -2.440, p=0.023).

On segment 6, SO and OS orders are significantly different from each other in the SUBJECT-Focus context (F(1,9) -3.115, p=0.012; F(2,1,23) -2.517, p=0.019); no other comparisons reach significance.

In total sentence reading times, the difference between SO and OS orders attains significance across all contexts (p<0.05).

To summarize the results, Tables 7.15 and 7.16 list comparisons for Segment 3-5 for the natives and the advanced (Table 7.15) and near-native (Table 7.16) L2 groups. Statistically significant effects of the comparisons between SO and OS orders are listed for each context (ALL-Focus, SUBJECT-Focus, OBJECT-Focus). In addition, the tables show effects of the comparison for OS orders between the SUBJECT-Focus and the OBJECT-Focus context.

<table>
<thead>
<tr>
<th>ALL-Focus Focus</th>
<th>German</th>
<th>English advanced</th>
<th>Dutch advanced</th>
<th>Russian advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO</td>
<td>2005</td>
<td>2946</td>
<td>2729</td>
<td>3108</td>
</tr>
<tr>
<td>OS</td>
<td>2285</td>
<td>3196</td>
<td>2960</td>
<td>3191</td>
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<td>SUBJECT-Focus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO</td>
<td>1832</td>
<td>2611</td>
<td>2352</td>
<td>2694</td>
</tr>
<tr>
<td>OS</td>
<td>1948</td>
<td>2625</td>
<td>2576</td>
<td>2956</td>
</tr>
<tr>
<td>OBJECT-Focus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO</td>
<td>1782</td>
<td>2496</td>
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</tr>
<tr>
<td>OS</td>
<td>2227</td>
<td>2968</td>
<td>2640</td>
<td>3233</td>
</tr>
</tbody>
</table>

Table 7.15. Experiment 6: Reading times (in milliseconds) for Segment 3-5 (NP1-ADV-NP2): Advanced groups.

<table>
<thead>
<tr>
<th>ALL-Focus Focus</th>
<th>German</th>
<th>English N.-N.</th>
<th>Dutch N.-N.</th>
<th>Russian N.-N.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO</td>
<td>2005</td>
<td>2700</td>
<td>2545</td>
<td>3181</td>
</tr>
<tr>
<td>OS</td>
<td>2285</td>
<td>2994</td>
<td>2849</td>
<td>3557</td>
</tr>
<tr>
<td>SUBJECT-Focus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO</td>
<td>1832</td>
<td>2405</td>
<td>2180</td>
<td>2579</td>
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<tr>
<td>OS</td>
<td>1948</td>
<td>2680</td>
<td>2556</td>
<td>2778</td>
</tr>
<tr>
<td>OBJECT-Focus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO</td>
<td>1782</td>
<td>2265</td>
<td>2305</td>
<td>2732</td>
</tr>
<tr>
<td>OS</td>
<td>2227</td>
<td>2720</td>
<td>2569</td>
<td>3043</td>
</tr>
</tbody>
</table>

Table 7.16. Experiment 6: Reading times (in milliseconds) for Segment 3-5 (NP1-ADV-NP2): Near-Native groups.

Both the L1 Russian and L1 English groups show target-like distinctions in incremental reading slowdowns on Segment 3-5 between the SUBJECT-Focus and OBJECT-Focus
contexts. In contrast, the L1 Dutch groups do not show target-like differences according to context. For all L2 groups, the same effects hold across proficiency levels.

7.4.14. Discussion

In Experiment 6, the following results were found:

- In comprehension accuracy, all groups show smaller contrasts in comprehension accuracy between the SO and OS orders in the SUBJECT-Focus context compared to the ALL-Focus and OBJECT-Focus contexts.
- Response times for the comprehension questions are shorter for OS orders in the SUBJECT-Focus context than for SO orders in the same context and for OS orders in the ALL-Focus and OBJECT-Focus contexts. These effects hold across groups with the exception of the L1 Dutch advanced group.
- Total reading times show an interaction of Context and Order, which indicates that global reading times of OS orders are modulated by context. The interactions with the factors Proficiency and Language demonstrate that there are group differences with respect to context effects.
- Incremental reading times show context-specific differences on Segment 3-5 for OS orders as shown by the interaction of Context and Order. This finding bears out that the processing of OS orders is incrementally modulated by context in that slowdowns for OS orders are reduced in the felicitous SUBJECT-Focus context. There are also interactions with the factors Language and Proficiency, indicating that the groups behave differently according to proficiency level and L1.
  - For the ALL-Focus context, Experiment 6 replicates the findings from Experiment 2 for sentences presented in isolation in that the advanced groups do not show robust incremental slowdowns indicative of reanalysis to OS orders. By contrast, the near-natives evince local slowdowns for OS orders.
  - In the SUBJECT-Focus and OBJECT-Focus contexts, the natives and the L1 English and the L1 Russian groups demonstrate differential effects in that incremental slowdowns for OS orders obtain in the OBJECT-Focus context, yet not in the SUBJECT-Focus context for Segment 3-5. In addition, the natives, the L1 English advanced group and the L1 Russian groups also show differences in reading times for the OS orders between the SUBJECT-Focus and OBJECT-Focus contexts. The L1 Dutch group does not show any differences between the contexts.

For the natives, Experiment 6 yields clear evidence that IS modulates the processing of scrambled orders incrementally. This modulation is expressed in reading time differences
on the sentence-final segment and the total sentence reading times: Both show an asymmetry between the SUBJECT-Focus and OBJECT-Focus contexts. In addition, incremental modulations are observed on Segment 3-5. The native-speaker results thus extend empirical evidence of incremental effects of IS information on syntactic processing. They go beyond the findings of context effects by Meng, Bader & Bayer (1999) that recorded only end-of-sentence effects of context in reading-time experiments. In addition, the result that contexts inducing the canonical defocusing of fronted objects in OS structures leads to the levelling of processing effort between SO and OS orders adds to the findings of incremental IS effects in the processing of OS orders by Bornkessel, Schlesewsky & Friederici (2003a) and Bornkessel & Schlesewsky (2006b). The following discussion focuses on these incremental reanalysis effects and the implications for non-native processing.

Before discussing the effects of IS among the L2 groups, let us briefly consider the ALL-Focus context. For the non-natives, reading times on Segment 3-5 in the ALL-Focus context replicate the proficiency effect shown in Experiment 2 in that the advanced groups do not evince slowdowns for OS orders whereas the near-natives do. 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 (see Chapter 4). Hence, Experiment 6 replicates the results of Experiment 2.

Let us now turn to effects of context. The ALL-Focus context implicates reanalysis according to case morphology, whereas in the SUBJECT-Focus and OBJECT-Focus contexts, the syntactic function of the NPs is established by the context, i.e. morphological checking is not necessary for syntactic function assignment. It would therefore be illegitimate to make direct comparisons between the ALL-Focus context, on the one hand, and the SUBJECT-Focus and OBJECT-Focus contexts, on the other. I thus only consider the SUBJECT-Focus and OBJECT-Focus contexts in comparison. This way, I abstract away from the difficulties with case at the syntax-morphology interface in L2 processing, so that the interaction of syntax with IS can be isolated.

For the processing of SO and OS orders in context, L1 effects, yet no proficiency effects, emerge. The L1 Russian group demonstrates target-like patterns, the L1 English group shows differences between SO and OS orders across contexts, and the L1 Dutch

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4 Note, however, that these latter studies using ERPs did not find levelling of processing cost for given, i.e. unfocused scrambled NPs as does Experiment 6; rather, ERP studies report facilitation for the processing of OS orders for fronted objects denoting contrastive (Bornkessel et al., 2003a) and corrective (Bornkessel & Schlesewsky, 2006b) foci. More research is needed to unravel the reasons of the discrepant findings as to the type of IS that mitigates processing costs for scrambling. It seems that these difference may be due to method in that reading-time methods are more sensitive to these effects than ERPs. Like Experiment 6, a self-paced reading study and an eye-tracking study reported for Finnish discourse-driven OVS orders (Kaiser & Trueswell, 2004) elicits incremental effects of givenness on non-canonical orders.

5 Note that the L1 Dutch advanced group does in fact show a significant slowdown for OS orders in the ALL-Focus context. This is due to the larger region of analysis in Experiment 6. When considering only the segment of the first NP, i.e. segment 3, as in Experiment 2, there is no significant difference.
group does not make any differences in the processing of OS orders across contexts. Consider the L1 Dutch group first. For comprehension accuracy, the L1 Dutch groups appear to make a difference according to context, yet these differences do not translate into response times to comprehension questions or into sentence reading times. The online reading times strengthen the observation that there is no target-like interplay of syntactic reordering by scrambling and information structure for the L1 Dutch group in Experiment 5. There is no evidence of IS interactions of syntax even under experimental conditions that abstract away from case marking and manage to unearth target-like online reflexes of IS-to-syntax mappings for the L1 English advanced group.

Since the experiment did not include a condition that induces contrastive focus on the scrambled object akin to focus-scrambling in Dutch, it is unclear whether the null finding across contexts for the L1 Dutch group marks (a) divergence in IS-to-syntax correspondences because marginally available L1 mappings, i.e. focus scrambling, persevere in the L2 (see Section 7.5.4) or (b) simply incompleteness in the sense that the L1 Dutch groups do not identify any contingency 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. I will discuss the potential sources of the non-convergence of the L1 Dutch speakers in greater detail in the general discussion in Chapter 9.

In contrast, the L1 Russian groups demonstrate significant differences between the SO and OS orders in the OBJECT-Focus context, yet not in the SUBJECT-Focus context, as well as showing a difference in reading times of the OS orders in the SUBJECT-Focus and OBJECT-Focus contexts on Segment 3-5. The L1 English group only shows differential effects in the comparison of the SO and OS orders, yet no statistically significant differences between OS orders across contexts. In other words, the L1 Russian groups show facilitatory effects of the IS-syntax match in the SUBJECT-Focus context vis à vis the ALL-Focus context as well as disruptive effects of the IS-syntax mismatch in the OBJECT-Focus context. By contrast, the L1 English group is solely sensitive to the IS-syntax mismatch in the OBJECT-Focus context in that an infelicitous context leads to processing slowdowns. In this sense, the context effect attested for the L1 English group can be considered to be somewhat weaker than for the native and the L1 Russian groups. This difference may be related to facilitatory effects of analogous L1 properties for the L1 Russian group.

Notwithstanding these differences, Experiment 6 attests that L1 English and L1 Russian speakers construct intersentential IS-to-syntax mappings and apply these rapidly and incrementally in L2 sentence processing. More specifically, the interaction of information structure and syntax is borne out in that the congruency of the information structure of the context with the information structure of scrambled OS orders engenders less effortful processing of scrambled orders (SUBJECT-Focus versus ALL-Focus contexts); conversely, an incongruent information structure gives rise to strong reanalysis
effects (OBJECT-Focus context). Cast in terms of the approach adopted by Bader & Meng (1999) of the interaction of two reanalysis processes, i.e. syntactic reanalysis and IS reanalysis (see also Bader, 1998), the findings suggest that when the information structure of the context matches the IS of scrambled OS orders, scrambled OS orders are processed as efficiently as SO orders since solely the default SO syntax needs to be reanalysed to OS. In the cases of the ALL-Focus and OBJECT-Focus contexts, both IS and syntactic reanalysis to the OS order need to be executed which results in measurable reanalysis effects. Bader & Meng’s model of cumulative revisions of canonical syntactic ordering and information structure can thus be recruited to explain how syntax and IS interact in determining reanalysis processes in both native and non-native processing.

7.5. Comparison of off-line behaviour and on-line performance (Experiment 5 versus Experiment 6)

The on-line results resemble the off-line findings only partially in terms of information-structural effects on OS orders: The L1 Dutch learners’ insensitivity to contextual manipulation on-line matches the null effect of context in the off-line judgements in Experiment 6; conversely, the L1 Russian group and the L1 English near-natives are sensitive to information-structural differences in both off-line and on-line tasks. By contrast, the L1 English advanced group does not show effects of context on the acceptability of OS orders, yet it does evince processing differences according to context in Experiment 6. These differences between tasks are unlikely to result from differences in participants across tasks since the majority of participants was the same in the off-line experiment 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.

Assuming that the asymmetry between off-line judgements and on-line reading is real, I suggest that it may reflect differences in task demands between off-line judgements and on-line reading. For sentences embedded in contexts as in Experiments 5 and 6, making an acceptability judgement necessitates additional processes compared to reading sentences for comprehension. Making an acceptability judgement for a sentence presented in context requires, amongst other things, (a) establishing the morphosyntactic well-formedness of the sentence, (b) establishing an information structure for the sentence and (c) matching the information structure of the sentence with the context in order to gauge its contextual fit. For reading in context, morphological checking is not necessary, since reading does not involve evaluations of well-formedness. Rather, reading proceeds on the assumption that the sentences to be read are well-formed to start with.
Table 7.17 lists the differential demands for acceptability judgements and reading comprehension.

<table>
<thead>
<tr>
<th>Acceptability Judgements</th>
<th>Reading comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any context</td>
<td>SUBJECT-Focus</td>
</tr>
<tr>
<td></td>
<td>OBJECT-Focus</td>
</tr>
<tr>
<td>Morphological checking</td>
<td>Syntactic reanalysis</td>
</tr>
<tr>
<td>Syntactic reanalysis</td>
<td>Syntactic reanalysis</td>
</tr>
<tr>
<td>IS reanalysis</td>
<td>IS reanalysis</td>
</tr>
</tbody>
</table>

**Table 7.17. Task demands for OS orders in the different contexts.**

Table 7.17 shows that making acceptability judgements of scrambling, like reading OS orders in isolation or a neutral (ALL-Focus) context implicates more processes than reading OS orders in context. Crucially, even for sentences presented in discourse contexts, making an acceptability judgement requires morphological checking, since it is essential to first establish whether a sentence is morphosyntactically well-formed before this sentence can be related to the context.

Hence, the difficulties with morphological feature checking arguably prevent effects of information structure to surface in the off-line judgements. When the demands of morphological checking are removed as in Experiment 6, evidence of phrase-structural revision by information-structural cues emerges. The observed disjunction between off-line and on-line performance indicates that computational problems at the syntax-morphology interface mask convergence at other interfaces, e.g. the syntax-discourse interface. In addition, the comparison of Experiments 5 and 6 shows that effects not attested in off-line judgements may surface in on-line comprehension. Since acceptability judgements involve the global evaluation of sentences across several grammatical and extragrammatical dimensions of well-formedness (e.g. Birdsong, 1989; Schütze, 1996), off-line acceptability judgements may thus systematically underestimate the degree of convergence at the interfaces.

### 7.6. **Discourse context in L2 processing**

The present experiment finds that L2 speakers use context in L2 sentence processing incrementally. This finding is in line with previous studies reporting that contextual information as expressed in pragmatic plausibility influences the incremental on-line resolution of filler-gap dependencies (e.g. Felser & Roberts, 2007; Hoover & Dwivedi, 1998; Juffs, 2004; Williams, 2006; Williams et al., 2001). Yet, since these studies all deal with intrasentential semantico-pragmatic plausibility biases of nouns to act as direct objects in wh-filler-gap structures (e.g. *Which machine did the mechanic fix ...* versus *Which friend did the mechanic fix ...*, Williams, 2006; Williams et al., 2001), they do not
speak to intersentential effects of discourse context on processing, i.e. discourse integration.

In terms of intersentential discourse integration, the L1 Russian group demonstrates effortless discourse integration of OS orders in a felicitous context and disruption effects of the severing of discourse coherence when faced with incongruent syntax-to-discourse correspondences in on-line sentence processing. Equally, the L1 English group attests sensitivity to the rupturing of discourse coherence in the infelicitous OBJECT-Focus context. In sum, Experiment 6 finds evidence of target-like processing of discourse information that is incrementally matched against a discourse model structured in terms of IS.

This finding also has implications for the interpretation of the results regarding definiteness restrictions on scrambled indefinites reported in Experiment 4. In line with Krämer (2000) and Unsworth (2005), I speculated in Section 7.4.5 that processing limitations may be the cause of difficulties with the discourse integration of scrambling. More specifically, it was hypothesized that even advanced L2 speakers do not disallow scrambled indefinite NPs bearing an existential reading because they do not rapidly effect discourse integration of scrambled NPs due to taxing processing demands. At this level of generality, the results from Experiment 6 prove this conjecture to be false, since L2 speakers are demonstrably sensitive to the discourse relatedness of NPs in on-line processing of IS.

In light of the present findings, it seems that problems with discourse integration in the L2 are more narrowly circumscribed to the acquisition and perhaps the processing of indefinite NPs in discourse. They might have a variety of sources: First, the low salience of indefinite articles might reduce the cue strength of indefiniteness (Hurewitz, Brown-Schmidt, Thorpe, Gleitman & Trueswell, 2000). Since for German, the morphological forms of indefinite determiners vary from the monosyllabic *ein* (NOM/ACC, neuter) to the more salient *einen* (ACC, masculine) or *einem* (DAT, masculine), an account in terms of salience would predict differences in accuracy according to the morphological realizations of indefiniteness.

Second, a processing disadvantage for (scrambled) indefinites might arise in terms of their presuppositional behaviour (e.g. Crain & Steedman, 1985; for L2 acquisition, see Ionin, Ko & Wexler, 2006). Since a scrambled indefinite acts as a presupposition trigger (van Geenhoven 1998) due to its quantificational reading, additional processing costs might obtain compared to existential indefinites. For instance, Warren (2003) reports that quantified NPs incur greater processing costs than referential NPs and relates these differences to their presuppositional status.

Finally, Krämer (2000) suggests that discourse integration is not a monolithic process; rather its difficulty is contingent on input, context, IS and morphological marking of NPs, such that acquisition may vary across different types of discourse-related phenomena, different types of NPs and even different types of indefinites (Krämer,
The Interfaces at L2 Ultimate Attainment: Interpretation

2000). Exploring these potential sources is beyond the scope of this thesis, and much further research is needed.

In sum, Experiments 5 and 6 find that L2 learners use IS in judgments on scrambling and that L2 learners establish incremental syntax-to-discourse mappings in reading comprehension. Hence, advanced to near-natives L2 speakers rapidly integrate NPs into discourse and, conversely, discourse integration facilitates processing of non-canonical orders. Sensitivity to the observed interaction of scrambling and IS varies according to L1, both off-line and on-line. Differences in convergence across L1 groups cannot be directly linked to L1 transfer, because convergent IS-to-syntax mappings can be acquired even if the L1 has no isomorphic correspondences (English); rather, asymmetries between the L1 and L2 mappings of IS and syntax (Dutch) appear to prevent convergence in judgements or on-line reading. At least in the present experiments, such non-convergence does not abate as proficiency increases.

7.7. General discussion of Experiments 4-6

The three experiments in this chapter probed the interaction of the syntax of scrambling with two interface domains, namely, the syntax-semantics interface with respect to definiteness restrictions and the syntax-information structure interface with respect to focus. Native off-line judgements and on-line processing have been shown to be susceptible to interface constraints as summarized in (12).

(12) Interactions of the syntax of scrambling with interfaces in native speakers

- Definiteness: Scrambling of indefinite NPs is semantically restricted to NPs receiving a quantificational interpretation, whereas scrambling of definite NPs is semantically neutral. Experiment 5 yielded (some) evidence of this difference in different acceptability ratings of scrambled definites and indefinites.

- Information structure: Scrambling is contextually modulated in that, e.g., defocused object NPs scramble felicitously across focused subject NPs. This modulation is expressed in off-line acceptability judgements in Experiment 5 as well as in differential incremental reading times in processing (Experiment 6).

In relation to the L2 groups, the three experiments probed (a) the extent to which non-native judgements and non-native processing replicate target patterns of judgements and reading comprehension and (b) the extent to which L1 differences and proficiency level affect L2 performance. The results show (a) differences in performance between off-line and on-line tasks, (b) differences in performance of the groups between proficiency levels
and (c) differences in performance of the groups according to L1. Table 7.18 gives a schematic overview of the results for each group.

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<td>Information structure</td>
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<tr>
<td>On-line</td>
<td>Information structure</td>
<td>6</td>
<td>+</td>
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**Table 7.18.** Overview of the results from Experiment 4-6. ‘+’ denotes convergence and ‘-’ denotes non-convergence.

With reference to the native processing pattern summarized in (12), no L2 group converges in off-line judgements on definiteness restrictions on scrambling. On the other tasks, only the L1 Russian groups and the L1 English near-natives converge on native patterns.

**Off-versus on-line performance**

The three experiments reveal a disjunction between off-line judgements and on-line performance in the interaction of subject-object reordering and information structure for the L1 advanced English group. This difference has been related to varying task demands between off-line judgements and on-line reading in context. For the other groups, on-line performance reflects off-line behaviour.

**Proficiency effects**

Effects of proficiency level are attested in the judgement task on information structure for the L1 English group, yet, as discussed above, this difference arguably reflects the different task demands of Experiments 5 and 6.

**L1 effects**

L1 effects account for the major part of between-group variation in the three experiments. For information structure, L1 differences arise in that the L1 English and L1 Russian groups show on-line and off-line reflexes of IS effects, whereas the L1 Dutch group evinces no evidence of the interaction of syntactic reordering and information structure. It
was argued that the failure of the L1 Dutch group to converge on the target relations of IS and word order is due to asymmetries in the IS-to-syntax mappings for scrambling between Dutch and German.

In sum, the experiments reported in this chapter bear out that interfaces pose difficulty in endstate L2 acquisition. Compared to the processing of morphosyntax explored in Chapter 6, the experiments on interface aspects do not attest uniform convergence on the target language at near-native levels.

For definiteness, the global finding of non-convergence may be related to the insensitivity of the judgement task to comparatively subtle interpretive constraints. After all, only 60% of the natives show a judgement pattern reflecting the target distinctions; against this background, it is not clear whether the consistent non-target judgement patterns by the L2 groups point to non-convergence. Further research is necessary to establish whether semantic restrictions encoded in the definiteness constraint are truly subject to persistent divergence in L2 acquisition.

For information structure, we find that convergence at the syntax-discourse interface is possible for L2 learners, irrespective of whether the L1 encodes similar IS-to-syntax mappings (Russian) or not (English). The findings from both Experiments 5 and 6 run counter to earlier research on the syntax-discourse interface at L2 ultimate attainment, where L1 English near-native speakers of Italian (Belletti et al., 2007; Sorace & Filiaci, 2006) and Spanish (Valenzuela, 2006) failed to evince target-like performance. In opposition to these studies, Experiment 6 attests that it is possible for L2 speakers to go beyond the discourse relations of syntax realized in their L1. In fact, in Experiment 6, even L2 speakers below near-native proficiency levels show convergence at the syntax-discourse interface. The present cross-linguistic findings are thus not compatible with accounts assuming representational impairment at the syntax-discourse interface (Sorace, 2003). Instead, the cross-linguistic comparisons in Experiments 5 and 6 (i.e. the L1 English versus the L1 Dutch groups) suggest that convergence at the syntax-discourse interface may be constrained by asymmetries in L1-TL realization of IS mappings onto syntax.

Further, the across-experiment comparisons suggest that difficulties at the syntax-discourse interface are partially due to interacting effects across interfaces. Specifically, problems with morphological checking at the syntax-morphology interface affect performance on the discourse-relatedness of scrambling for the L1 English advanced group (Experiment 5). Once these problems are circumvented in Experiment 6, which abstracts away from morphological checking, the L1 English advanced groups show target-like effects of IS on scrambling. This interaction between IS and morphological checking may be specific to discourse-related word orders that are marked by inflectional (case) morphology like scrambling. However, such linkages across interfaces suggest that
problems at the syntax-discourse interface can at least in part be caused by the grammatical complexity of discourse-related word orders.

Discourse-related word orders involve two kinds of complexity: First, by definition, they require the mapping of discourse and syntactic information and are thus more complex than word orders that are not restricted to particular sets of discourse contexts. Once the relevant characteristics have been extracted from a discourse context, it is necessary to establish a correspondence between these discourse characteristics and the syntax. As shown in Kilborn (1992), discussed in Chapter 2.4.2.2, the integration of different types of grammatical information is subject to greater difficulty in L2 processing than it is in monolingual processing.

Second, discourse-related word orders are typically non-canonical word orders, since canonical word orders constitute the unmarked syntactic option. For instance, SO orders are contextually neutral in German, while derived OS orders are contextually restricted to given objects. For Italian, SV orders with unergative verbs are unmarked, while derived VS orders are contextually restricted to information-structurally new subjects (Belletti et al., 2007). Computing derived syntax, e.g. for German OS and Italian VS orders, is associated with increased processing effort. As shown in Experiments 1-3 for derived OS orders in German, advanced L2 speakers (unlike near-natives) fail to compute the syntax of these orders by instead applying a general Agent-Patient template to the stimuli (see Chapter 6). Given that these L2ers do not or only incompletely compute the syntax of OS orders, they fail to evince appropriate discourse mappings associated with these orders as a consequence. Once the processing effort for computing non-canonical orders is reduced, as in Experiment 6, L2ers do show discourse mappings of these orders.

In this way, the additional processing costs of derived orders may entail non-convergence on their discourse-relatedness. For instance, Sorace & Filiaci (2006) argue that L1 English near-native speakers of Italian fail to converge on the discourse requirements of overt pronouns because of the greater processing demands of overt pronouns in terms of discourse antecedence. As a result, Sorace and Filiaci speculate, near-natives rely on universal processing strategies such as the Active Filler Strategy (Frazier, 1987) that minimize the processing effort of overt pronouns, yet lead to non-convergent interpretations. Similarly, processing derived scrambling orders contravenes the Minimal Chain Principle (DeVincenzi, 1991) and the preference for agent-patient ordering in ‘good enough’ processing (Ferreira, 2003). Deriving scrambled orders may thus tax computational resources in the L2 to the extent that it exhausts the computational resources, at least in non-near-native L2ers. In consequence, interface mappings, e.g. information structure or interpretive constraints, may not be (fully) computed. On this account, L2 problems at the interfaces would be due to economy strategies that minimize processing resources rather than to problems specific to interfaces per se. Of course, both the computational requirements of integrating information types across interfaces and the
increased computational effort needed for deriving the syntax of discourse-related word orders may show interactive or additive effects, such that both of these computational demands are likely to limit the application of convergent grammatical knowledge in L2 processing.

Experiments 5 and 6 can only begin to address the question to what extent computational difficulties are the basis of protracted problems at the interfaces. However, the finding that sensitivity to IS not attested in off-line judgements surfaces in on-line reading suggests that the different task demands on L2ers affect convergence. These results thus add to prior findings that non-convergence even in off-line judgements is related to computational difficulties in using extant grammatical knowledge (McDonald, 2000, 2006; Sorace & Filiaci, 2006). Further, they highlight the point that task demands cannot just be conceptualized in terms of speed (as in Experiment 3, Chapter 6), but also need to be defined by the (number of) grammatical information types that have to be integrated in a given task. In Chapter 9, I attempt to relate effects of computational limitations observed in Experiments 5 and 6 to those attested in Experiments 1 to 3 in the previous chapter as well as those to be reported in the following chapter.

7.8. Summary

Experiments 4 to 6 support findings in previous research that the syntactic interfaces with interpretive modules are prone to persistent difficulty in adult L2 acquisition. However, results on the syntax-semantics interface in terms of definiteness restrictions remain inconclusive, given the heterogeneous performance of the native controls. For the syntax-discourse interface, the results are clearer and show protracted non-convergence even at near-native levels for L1 Dutch L2ers of German. However, the results from the L1 English group show, first, that convergence is not representationally delimited by L1-TL identity in discourse-to-syntax mappings, and, second, that (non-)convergence systematically correlates with task demands. Since these findings do not point to qualitative differences between non-natives and natives, I conclude that the Fundamental Identity Hypothesis, repeated in (13), can be extended to the syntax-discourse interface.

(13) Fundamental Identity Hypothesis
There are no fundamental differences between non-native and native grammatical representation or processing architecture forced by a critical period. Differences, if found, relate to factors characterizing L2 acquisition independently of a critical period, e.g. L1 transfer or performance factors, such as computational limitations, etc.

In the final experiment, reported in Chapter 8, we turn to the interface of syntax with the lexicon to see whether the results for the interaction of syntax and argument structure at L2 ultimate attainment are also compatible with the Fundamental Identity Hypothesis.