Ultimate attainment at the interfaces in second language acquisition
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5. The Second Language Acquisition of Scrambling

Introduction

Now that I have catalogued the grammar and the psycholinguistics of scrambling in native German, I turn to the L2 acquisition of scrambling. Acquiring word order optionality in a second language encompasses at least three aspects: First, the L2 learner needs to acquire grammatical knowledge of the distributional characteristics, i.e. the syntactic options and restrictions of word order optionality. Second, the L2 learner needs to acquire knowledge of the appropriate conditions of use for optional word orders, i.e. its interface conditions. Third, the L2 learner needs to acquire the requisite processing strategies for comprehending non-canonical word orders. For scrambling, this includes using morphological case and verbal agreement cues to parse OS orders. This chapter reviews previous research on the L2 acquisition of scrambling with a view to answering the following questions:

- Can L2 speakers (of non-scrambling L1 backgrounds) acquire the syntactic options and constraints in regard to scrambling?
- Can L2 speakers acquire the interface constraints on scrambling?
- Do L2 speakers process OS orders derived by scrambling in a target-like manner?
- Is there evidence of L1 transfer of syntactic or interface properties in the L2 acquisition or L2 processing of scrambling?

In order to assess previous research in light of these questions, this chapter is structured as follows: Sections 5.1 and 5.2 review prior studies on the comprehension (Section 5.1) and production (Section 5.2) of the syntax of scrambling. In section 5.3, I review what has been found for interface conditions on L2 scrambling. In Section 5.4, I turn to the L2 processing of scrambling. I summarize the relevant findings in Section 5.5. In Section 5.6, the chapter presents the general research questions for the experimental part of the thesis, and it introduces the general hypothesis for the experiments. Finally, Section 5.7 outlines the predictions of several different approaches to L2 acquisition and L2 processing.

5.1. The L2 comprehension of scrambling: Syntactic options and constraints

Cross-linguistically, the L2 acquisition of scrambling has received limited attention so far, and most of the few studies focus on the question of whether L2 learners manage to acquire knowledge of the distributional options of scrambling.

Studying L2 Dutch, Neeleman & Weerman (1997) administered a grammaticality judgement task consisting of isolated sentences to 14 L1 English adolescents who had
been exposed to Dutch in The Netherlands for between one and eight years. The participants were asked to indicate whether a sentence was correct or incorrect; if participants gave target-like responses 75% or more of the time, they were considered to have acquired a given construction. On scrambled sentences as in (1) where the direct object (*het boek, ‘the book’) has moved in front of the adverb (*langzaam, ‘slowly’), 11 out of the 14 participants gave target-like responses and were hence considered to have acquired scrambling.

(1) Olga heeft het boek langzaam gelezen.  
Olga has the book slowly read  
‘Olga read the book slowly.’  
(from: Neeleman & Weerman, 1997: 168)

In a similar vein, Iwasaki (2003) tested 32 low-to-high proficient L1 English learners of Japanese, who had studied Japanese for at least one year, on a grammaticality judgement task, in which scrambled and non-scrambled sentences were presented accompanied by matching pictures. Like Russian, Japanese allows for scrambling objects across subjects, with postnominal case-markers denoting the syntactic function of NPs (2).

(2) Terebi-o otoko-no-ko-ga mite imasu.  
TV-ACC boy-NOM watch is  
‘A boy is watching TV.’

Irrespective of proficiency level, the participants accepted scrambled sentences at levels above 80%, with the highest-proficiency group accepting scrambling well above 90%. Also studying L2 Japanese, Koda (1993) tested 21 L1 English, 12 L1 Chinese and 13 L1 Korean adult learners enrolled in a first-year Japanese language programme at a US university. The L1s of the participants differ with respect to the availability of scrambling. Neither English nor Chinese allows for scrambling and both have near-canonical SO ordering, while Korean licenses scrambling akin to Japanese. The participants were auditorily presented with (non-)scrambled sentences and subsequently asked to indicate the NP which “took” the action (Koda, 1993). The English and Chinese participants showed better performance on SO compared to OS orders, although correct judgements on OS orders were above chance. By contrast, the L1 Korean participants showed equally high and target-like judgements on either order, which suggests that the analogous L1 instantiation of scrambling transfers to the L2.

In a recent study, Jackson (2005) compared acceptability judgements of non-native L1 English and 21 native speakers of German on scrambled sentences. The non-native group consisted of 18 intermediate and 23 advanced learners of German, who were

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1 See Unsworth (2005: 133-135) for a detailed critique of this study.
all undergraduate students at a US university. Subjects were presented with sentences that differed in word order and in animacy of the subject (3).

(3) a. Ich glaube, dass die Oma den Enkel beschreibt. (SO, animate)
   I think that the grandmother describes the grandson

b. Ich glaube, dass den Enkel die Oma beschreibt. (OS, animate)

c. Ich glaube, dass der Brief den Enkel beschreibt. (SO, inanimate)
   I think that the letter describes the grandson

d. Ich glaube, dass den Enkel der Brief beschreibt. (OS, inanimate)

Participants judged these sentences on a four-point scale ranging from ‘natural’ to ‘impossible’. The results show an interaction of word order and animacy for the natives. Natives had a general SO preference but judged OS orders to be better if an animate object preceded an inanimate subject (3d). Non-native behaviour differed from native patterns in terms of both absolute levels of judgements and relative distinctions they made. Overall, judgement levels were lower. The non-natives demonstrated a trend towards accepting SO orders more than OS orders, yet, they did not distinguish the acceptability of either order according to animacy. Across conditions and proficiency levels, however, the non-natives recognized the acceptability of OS orders by assigning them judgements in the positive, i.e. ‘acceptable’, range.

In sum, these studies demonstrate that, at least when asked to make categorical judgements of sentences presented in isolation in untimed tasks, L2 learners are capable of identifying scrambling as grammatically correct. This finding for L2 scrambling aligns with the successful adult L2 acquisition of the syntax of other derived OS orders, like topicalization (e.g. Hulk, 1991; Jordens, 2006). It is worth noting, though, that finding that L2 learners accept scrambling does not allow for conclusions about the grammatical nature of L2 knowledge of scrambling, since the distributional option of scrambling in Dutch, German and Japanese is inducible from surface properties of the input.

In order to identify whether L2 knowledge of scrambling conforms to native-language constraints on grammatical representations, Schreiber & Sprouse (1998) and Hopp (2002; 2005) tested a range of licit and illicit scrambling and topicalization constructions in L2 German. German allows for multiple movements of phrases in that a phrase from which an element has been extracted can move across this element. This so-called ‘remnant movement’ is illustrated in (4), where the NP den Wagen (‘the car’) first scrambles out of the larger phrase (marked α); subsequently, this larger phrase (the remnant) topicalizes across the scrambled NP.

(4) [a\(t_1\) Zu reparieren\(t_2\)] hat Peter [dp\(t_1\) den Wagen\(t_1\)] schon \(t_2\) versucht. (German)
   To repair has Peter the car already tried

   ‘Peter already tried to repair the car.’
While sentences like (4) are rare, yet grammatical, in German, the same linearization is starkly ungrammatical in embedded clauses (5).

(5) *Ich glaube, dass [\(\alpha_t\) zu reparieren]_2 Peter [\(\delta_P\) den Wagen], schon \(t_2\) 
    I think that to repair Peter the car already 
    versucht hat. 
    tried has 

The difference between (4) and (5) is that in (4), the remnant topicalizes after scrambling has occurred, while in (5), the remnant scrambles across a previously scrambled phrase. According to a putatively universal constraint on syntactic derivations (Müller, 1996; Takano, 2000), remnant movement is illicit if the two movements are of the same type, e.g., scrambling in (5), whereas remnant movement is allowed if the two movements are of different types, e.g., scrambling and topicalization in (4). In absence of scrambling, English does not afford evidence of the grammaticality contrast in remnant movement constructions. Moreover, the target-language input underdetermines the differences in grammaticality between (4) and (5), since the grammatical (4) is all but as infrequent as the ungrammatical (5) (for details, see Hopp, 2005). Hence, finding evidence of English learners of German establishing a contrast between (4) and (5) would demonstrate subtle grammatical knowledge of the syntax of scrambling that could not have come from the L1 or been induced from the input.

Testing 33 intermediate English learners of German, Schreiber & Sprouse (1998) report inconclusive results from an acceptability judgement task: There is partial evidence of L2 learners making relative contrasts between (4) and (5), yet the learners (a) show low absolute levels of acceptance for scrambling and (b) overgeneralize word order options derived by scrambling. Hopp (2002) argues that the unclear findings might be due to the low proficiency of learners and the fact that the sentences were presented in isolation thereby being distinctly marked. Building on Schreiber & Sprouse (1998), Hopp (2002; 2005) investigated several types of scrambling and remnant movement (out of VP as in (4) and (5) and out of NP (6)) with sentences that were embedded in discourse contexts and presented both visually and auditorily to increase their naturalness (for details, see Hopp, 2005).

(6) a. [Einen Film \(t_1\)]_2 denke ich, hat Martin [über Frankreich]_1 gestern \(t_2\) gesehen. 
    A film think I has Martin about France yesterday watched 
    ‘I think that Martin watched a film about France yesterday.’

b. *Ich denke, dass [einen Film \(t_1\)]_2 Martin [über Frankreich]_1 gestern \(t_2\) gesehen hat. 
    I think that a film Martin about France yesterday watched has
In this study, 26 advanced L1 English and 13 advanced L1 Japanese speakers of German were tested in an acceptability judgement task. Japanese scrambling provides overt evidence of the constraints on remnant movement (Koizumi, 1995), whereas English does not. The results show that both L1 groups make robust relative contrasts between grammatical scrambling and remnant movement, on the one hand, and ungrammatical remnant movements, on the other. These contrasts are made across superficially dissimilar construction types ((4) and (6)) by both groups. Irrespective of whether the L1 instantiates scrambling, L2 learners can thus acquire knowledge of scrambling in the TL in so far as they know about the syntactic options and restrictions on scrambling and that they distinguish scrambling from other optional movement types, e.g. topicalization. Summarizing, L2 knowledge of scrambling extends beyond distributional surface regularities and is systematically constrained even for L2 speakers of non-scrambling L1s.

5.2. The L2 production of scrambling: Syntax

Although there have been numerous studies analysing spontaneous production data of L2 learners acquiring German and Dutch (e.g. Clahsen, 1988; Clahsen, Meisel, & Pienemann, 1983; Clahsen & Muysken, 1986, 1989; DuPlessis, Solin, Travis, & White, 1987; Jordens, 1988; Schwartz & Tomaselli, 1990), studies on the L2 production of scrambling are few and far between. Using data from L1 Italian, Portuguese and Spanish learners of German from the ZISA corpus (Clahsen et al., 1983), Clahsen (1988) studies the development of negation in adult L2 acquisition (see also Meisel, 1997). He identifies three stages: At first, learners, irrespective of L1 word order, show SVO word orders with canonically pre-verbal negation. In a second stage, negation is exclusively expressed by placement of the negator in immediately postverbal position, i.e. preceding the object (7).

(7) wenn ich glaube, ich kann nich eine Sache machen (German)
  ‘If I believe I cannot do a thing.’ (from: Clahsen, 1988: 139)

Note that the negation in (7) is not target-like, since the object needs to appear in front of negation, i.e. the object needs to scramble across the negator. Such target-like patterns are attested only at a later stage in the data, illustrated in (8).

(8) ich versteh Michael wirklich nich (German)
    ‘I really do not understand Michael.’ (from: Clahsen, 1988: 140)
This three-stage sequence of acquisition found in the longitudinal data suggests that a non-scrambling stage precedes the emergence of scrambling (for further discussion, see Unsworth, 2005).

In a comparative experimental study of adult and child L2 acquisition, Unsworth (2005) studied the comprehension and production of scrambling and its associated interpretive effects by English learners of Dutch (see Section 5.3). Following earlier research on the L1 acquisition of Dutch scrambling by Schaeffer (2000), Unsworth employed an elicited production task to test for scrambling in the context of negation. Child L1, child L2 and adult L2 acquirers of three different proficiency levels (classified as low, mid and high) were presented with a short picture story context in which a character contemplates manipulating an object, but then decides not to. The target sentence of the elicitation task requires the use of negation; in cases where the object is definite, the target necessitates scrambling of the object across negation (9) to express sentential, rather than constituent, negation.

(9) Ernie gaat de giraffe niet natekenen.
Ernie goes the giraffe not copy
‘Ernie is not going to copy the giraffe.’ (from: Unsworth, 2005: 236)

The results show a division of performance according to proficiency. For both child L2 and adult L2 acquirers, the low proficient group fails to scramble the definite object across the adverb around 80% of the time, whereas the mid- and high-proficient L2 participants correctly scramble the object at levels at and above 80%. Similar results obtain for scrambling indefinite NPs across negation. A further breakdown of the participants’ performance suggests that some low-proficient subjects also show non-target-like verb placement, i.e. SVO (10) instead of SOV (9).

(10) Ernie gaat niet natekenen de giraffe.
Ernie goes not copy the giraffe (from: Unsworth, 2005: 236)

Putting these observations together, Unsworth suggests that the L2 acquisition of the production of Dutch scrambling conforms to a three-stage sequential development. Initially, transfer of the English SVO order occurs. In the second stage, learners adopt the target-like SOV word order, yet do not scramble the object. In a third stage, L2 learners adopt the target-like configuration of SOV order with scrambling. Obtained cross-sectionally for English child and adult L2 learners of Dutch, the three-stage sequence of

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2 Unsworth defines child L2 acquirers as L2ers who started learning a second language between 4 and 7 years of age; if the age of onset is later, a subject is classified as an adult L2 acquirer (see also Schwartz, 2003). The differences between child and adult L2 acquisition will not be of any further relevance to the present discussion.
the acquisition of scrambling identified by Unsworth corresponds to the stages proposed by Clahsen (1988) for adult L2 learners of German of different L1 backgrounds.

In sum, previous research on the comprehension and production of scrambling shows that

(a) at least intermediate and advanced learners recognize scrambling as a distributional option in the TL (Iwasaki, 2003; Jackson, 2005; Koda, 1993; Neeleman & Weerman, 1997),
(b) at least very advanced learners demonstrate grammatical knowledge of scrambling and its syntactic constraints going beyond surface distributional properties (Hopp, 2002; 2005; Schreiber & Sprouse, 1998),
(c) the L2 acquisition of the syntax of scrambling is not limited to speakers of L1 scrambling languages (e.g. Jackson, 2005; Unsworth, 2005), although L1 transfer appears to facilitate the L2 acquisition of scrambling (Koda, 1993),
(d) the production of scrambling seems to follow a developmental sequence for L2ers whose L1 lacks scrambling that proceeds from a non-scrambling stage to a stage where obligatory scrambling across negation is fully acquired. As far as can be induced from the data available to date, this sequence seems to hold cross-linguistically and across different kinds of L2 acquirers, namely, child L2 learners and adult L2 learners (Clahsen, 1988; Unsworth, 2005).

5.3. The L2 acquisition of the interfaces of scrambling

Acquiring the distributional options of scrambling constitutes only one aspect of achieving target-like knowledge of word order optionality. L2 learners also need to acquire the interface aspects of scrambling, namely, the interpretive changes resulting from the interaction of scrambling and definiteness (Chapter 3.8.5) and the discourse effects of scrambling resulting from the interaction of scrambling and information structure (Chapter 3.8.1). Previous research on the interfaces of syntax with interpretation (e.g. Belletti & Leonini, 2004; Hertel, 2003; Lozano, 2006; Sorace, 2005; Valenzuela, 2006) has shown that L2 learners show protracted difficulty in constraining the optionality of word orders to appropriate interpretive contexts. Scrambling has thus far only received very little attention in this respect. Two recent relevant studies will be reviewed here.

In the context of the study on syntactic constraints on scrambling in English-German and Japanese-German Interlanguage discussed above, Hopp (2004) notes that the non-native groups differ in acceptance rates of scrambling amongst each other and from natives. More specifically, for scrambled phrases containing definite NPs, L1 English learners show consistently lower acceptability ratings than L1 Japanese learners and German natives, while for scrambled indefinite NPs, both L1 groups demonstrate
significantly higher acceptance ratings than the German natives. No differences between groups arise for topicalization of definite or indefinite NPs. Hopp (2004) argues that these construction-specific differences systematically reflect the incomplete acquisition of interface properties of scrambling in that L1 English learners do not master the information-structural (defocusing) restrictions on scrambling and neither L2 group attains knowledge of the marginality of scrambling indefinites (Chapter 3.8.5). The non-convergence of the L2 groups is argued to be due to L1 transfer, as non-convergence on the TL precisely aligns with differences between L1 and TL interface properties.

In a series of experiments on interface aspects of scrambling in English-Dutch Interlanguage, Unsworth (2005) studies the production and comprehension of scrambled indefinites by adult and child L2 learners of Dutch. Recall from Chapter 3.8.5 that scrambling an indefinite forces a specific reading. In two comprehension experiments, L2 learners were tested on their interpretation of scrambled NP objects in the context of negation and the frequency adverbial *twee keer* (‘twice’). In a truth-value judgement task adopted from Krämer (2000), stories were constructed about a character and three objects. The character manipulated two objects, removing them from their original position, and left one unmanipulated object behind. In the context of (11), for instance, a boy caught two of three fish in a pond, leaving one (uncaught) fish behind.

(11) *De jongen heeft een vis niet gevangen.*

The boy has a fish not caught

‘There is one fish the boy did not catch.’

(from: Unsworth, 2005: 273)

As translated in the gloss, the scrambled object NP in (11) induces a specific reading of the object as opposed to the existential interpretation (i.e. the boy did not catch any fish) of the unscrambled order. In the given context, then, (11) requires a positive response in a truth-value judgement task. L2 acquirers, irrespective of proficiency level or age of onset (child versus adult), fail to achieve above-chance accuracy.

In a second truth-value judgement task, participants were presented with non-scrambled object NPs or object NPs scrambled across the temporal adverbial *twee keer* (‘twice’). In the scrambled variant (12b), the object NP receives a specific interpretation, while the non-scrambled order is ambiguous between a specific and a non-specific reading.

(12) a. *Het meisje heeft twee keer een aap gekieteld.*

The girl has two times a monkey tickled

‘The girl tickled a(ny) monkey twice.’

b. *Het meisje heeft een aap twee keer gekieteld.*

The girl has a monkey two times tickled

‘The girl tickled a (certain) monkey twice.’

(from: Unsworth, 2005: 298)
Whereas the L2 participants overwhelmingly give target-like responses in the no-scrambling condition (12a), the adult and child L2 groups furnish target-like responses in the scrambling condition ranging from 7.1% to 63.6% only, with the more proficient groups achieving the greater accuracy. In all, though, 22 of the 73 participants show consistently target-like performance, which suggests that the acquisition of the interpretive constraints of scrambling is possible \textit{per se}.

On both tasks, the target-deviance of adult and child L2 speakers resembles the performance of monolingual children acquiring Dutch. For scrambling across negation (11), Krämer (2000), Philip (2003) and Unsworth (2005) report that monolingual Dutch children fail to give more than 50% target-like responses for specific NPs up to the age of eight (Krämer, 2000), nine (Unsworth, 2005) or even twelve (Philip, 2003) when tested on comparable truth-value judgement tasks. For scrambling across adverbials (12b), monolingual Dutch children between 4 and 5 years of age (Krämer, 2000; Unsworth, 2005) achieve less than 50% accuracy in the scrambling condition; in fact, it is only at 12 years of age and above that children demonstrate consistent behaviour at 90% accuracy and above.

For L1 acquisition, Krämer (2000) relates the late acquisition of the correct interpretation of scrambling to a delayed development of discourse integration, namely, the ability to use discourse context for the structural interpretation of a linguistic element and connecting utterances into a coherent discourse (see also Avrutin, 1999). In explaining the concomitant delay of accurate comprehension of scrambled indefinites in L2 acquisition, Unsworth (2005) adopts Krämer’s explanation in terms of limited discourse integration. She argues that particularly lower-proficient L2 learners are affected, i.e., L2ers whose processing capacities are not sufficiently developed to allow for an adequate integration of grammatical and discourse information (Unsworth, 2005: 369). However, neither Krämer nor Unsworth provides any psycholinguistic evidence that processing difficulties underlie the non-target-like performance on scrambling in the judgement tasks.

5.4. The L2 processing of non-canonical word orders in German

Although it does not address L2 on-line processing as such, some research on subject-object alternations in the framework of the Competition Model (e.g., MacWhinney, 2005) is informative with respect to the comprehension strategies in the L2.

The functionalist Competition Model holds that speakers rely on different competing cues, e.g., word order, animacy, case, verb agreement, etc., in attempting direct form-to-function mappings in communication (see e.g. MacWhinney, Bates & Kliegl, 1984). With respect to L2 acquisition, the primary research question of studies couched within the Competition Model is whether L2 learners apply the (interaction) of L1 cues in L2 comprehension or whether they come to acquire the cue strengths of the TL-system.
For native German, MacWhinney, Bates & Kliegl (1984) suggest that the relative importance of cues is Case>Agreement>Animacy>Word Order (‘>’ means ‘is stronger than’).

Kempe & MacWhinney (1998) study L1 English beginning learners of German and Russian, based on the assumption that the higher degree of unambiguous case marking in Russian (what they term ‘cue validity’) should lead to greater reliance of case marking by learners of L2 Russian compared to learners of L2 German. To test this hypothesis, Kempe & MacWhinney (1998) crossed the factors animacy (animate-inanimate), case-marking (ambiguous vs unambiguous) and word order (SVO vs OVS) in three-word noun-verb-noun strings, which then formed partly ambiguous or illogical sentences. In a timed decision task, subjects had to identify the agent of these sentences (e.g. *The spoon looks for the pie*). The results show that L1 English learners of L2 Russian are faster and more accurate in identifying OVS orders by case than learners of L2 German are, who appear to primarily use animacy and word order as cues for sentence interpretation. Even though these results were obtained using partly ungrammatical stimuli in an unnatural task (‘agent-identification’) which measured the outcome of post-processing interpretation processes (for discussion, see, e.g., Fernandez, 2003), they suggest that L2 speakers of German use partially different information in comprehending the TL compared to natives (as reported in MacWhinney et al., 1984), namely, L1 English speakers overrely on animacy and word order at the expense of case marking. Some more recent processing research that uses natural stimuli corroborates these results.

For L1 English learners of German, Jackson (2005) compares reading times and comprehension accuracy of German embedded sentences which vary by word order (SO versus OS) and animacy of the subject (inanimate versus animate), illustrated in (3) above and repeated in (13) for convenience.

(13) a. Ich glaube, dass die Oma den Enkel beschreibt. (SO, animate)  
   I think that the grandmother describes the grandson.

b. Ich glaube, dass den Enkel die Oma beschreibt. (OS, animate)  

   I think that the grandson describes the grandmother.

c. Ich glaube, dass der Brief den Enkel beschreibt. (SO, inanimate)  
   I think that the letter describes the grandson.

d. Ich glaube, dass den Enkel der Brief beschreibt. (OS, inanimate)

Eighteen intermediate and 23 advanced L1 English tutored learners read these sentences and answered comprehension questions. Reading times of the total sentences and accuracy on the comprehension questions were recorded. As for comprehension accuracy, both the native and advanced groups, though significantly different from each other in terms of absolute judgement levels, show effects of word order and animacy, with SO order and, surprisingly, inanimate-animate orders being rated most acceptable.
The intermediate group only shows an effect of animacy, suggesting they do not judge word order differences significantly differently.\(^3\)

In terms of whole-sentence reading times, native speakers demonstrate a main effect of word order and an interaction of word order and animacy (Jackson, 2006), which reflects the fact that OS sentences incurred increased processing effort only if both NPs are animate. Hence, both structural and lexical (animacy) cues interact in determining native sentence comprehension patterns. The intermediate L2 group does not show any differences between conditions at all, thus demonstrating a lack of sensitivity to either factor (word order, animacy) of the experimental manipulation. The results of the advanced group yield a main effect of word order and a main effect of animacy, yet no interaction between these factors. These findings suggest that as proficiency increases, English learners of German begin to use word order and animacy cues in sentence comprehension, although they fail to display native-like reading patterns.

Both the lexical decision study by Kempe & MacWhinney (1998) and the reading comprehension study by Jackson (2005; 2006) indicate that the non-native comprehension of word order optionality in L2 German, at least at lower levels of proficiency, is not guided by target morphosyntactic factors such as case marking. Rather, lexical and distributional information, such as animacy and linear position, appear to inform IL comprehension of L2 German word order up to and including fairly advanced proficiency levels (see also Chapter 2). However, neither study offers data on the on-line processing of L2ers as it unfolds in real time. In Jackson (2005), the experimental sentences were presented in total, so that potential incremental reanalysis effects in processing or their loci could not be recorded. Moreover, the participants in these studies were not at or near L2 ultimate attainment, so that their attested behaviour does not speak to the potentially attainable comprehension strategies in L2 acquisition. Therefore, it cannot be decided whether the differences between natives and L2ers in the studies point to asymmetries in the architecture or mechanisms of native versus non-native comprehension. Finally, since only L1 English learners were tested, the question remains open as to whether the observed performance is specific to this L1-TL pairing or whether, e.g., L2 speakers whose native language has scrambling and/or case marking show greater sensitivity to case marking in L2 processing and/or different processing patterns.

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\(^3\) In fact, Jackson (2005) tested the same individuals on the same structures in the same tasks three times in the course of seven months to investigate potential learning effects. I only report the results from the first tests, since, as Jackson acknowledges, the changes between tests are most likely due to test-retake effects, rather than developmental changes in processing competence. Jackson also studied the acceptability and reading times of three-place predicates in German embedded clauses (e.g. *It is great that the musician explained the song to the friend*), which will not be discussed here.
5.5. Summary

By way of summary, I briefly assess the evidence supplied by previous research on scrambling in L2 acquisition with reference to four key issues of the present thesis, namely, convergence, syntax versus interfaces, L1 transfer and processing.

As for convergence, no study to date has been explicitly directed at ultimate attainment of scrambling in the L2. For non-endstate L2ers, the comprehension and production studies on the syntax of scrambling reviewed in Sections 5.1 and 5.2 indicate that the syntactic option of scrambling is acquired by L2 speakers of different L1s, although several studies note that the acceptance levels of scrambling of the L2 participants fall below native-speaker scores (e.g. Iwasaki, 2003; Jackson, 2005; Koda, 1993). Chapters 6 to 8 will explore the extent to which L2 speakers at (near-)native proficiency levels converge on native judgement levels.

As for the interface dimensions of scrambling, previous research on the syntax-semantics interface of scrambling (Unsworth, 2005) finds that even advanced L2 learners suffer difficulties identifying the discourse function and the semantic constraints on scrambling (see also Hopp, 2004). Important though the contribution of the Unsworth study is, its conclusions are limited to the particular interface studied and do not afford inferences as to whether these problems are specific to the syntax-semantics interface or whether they extend to other interfaces. To add to the investigation of interfaces, Chapters 7 and 8 will address other interfaces of scrambling.

As for L1 transfer, Koda (1993) and Hopp (2002; 2005) find that L1-TL matches in scrambling lead to higher acceptability ratings of scrambling in the L2. It is as yet an open question as to whether this L1 difference is a matter of degree leading to incomplete acquisition of scrambling in the TL or whether L1 transfer can entail permanent non-convergence in L2 scrambling. Further, existing studies leave open whether syntactic and interface aspects of scrambling are differentially affected by L1 transfer. In order to address these issues, all experiments reported in Chapters 6 to 8 will consider L1 transfer as a variable.

As for processing, Clahsen (1988), Koda (1993), Hopp (2002), Iwasaki (2003) and Unsworth (2005) all speculate that TL-divergence on scrambling in L2 speakers at various levels of proficiency is related to processing difficulties (a) of non-canonical word orders in general and (b) of integrating different types of linguistic information (i.e. syntactic, morphological, semantic, contextual) for the successful comprehension of scrambling in particular. An experimental study on real-time comprehension of scrambling in English-German Interlanguage (Jackson, 2005) further suggests that non-native whole-sentence reading patterns diverge from natives, although its conclusions are limited to intermediate and advanced L2ers. The processing experiments in Chapters 6 to 8 contribute data from highest-proficiency L2ers.
Before we move on to the empirical part of this thesis at last, this chapter will draw to a
close with a section outlining the research questions and the hypothesis for the
experiments.

5.6. Research questions, hypotheses and predictions

The preceding reviews of (a) data from L2 acquisition (Chapter 1), (b) data from L2
processing (Chapter 2), (c) the theoretical background on scrambling (Chapter 3), (d)
psycholinguistic research on the processing of scrambling (Chapter 4), and (e) the L2
acquisition of scrambling (this chapter) have created a background against which
different models of adult L2 acquisition and L2 processing can be empirically evaluated.

As previewed in the introduction, the general question underlying all of the
following experiments is formulated in (14).

\[(14) \text{ General research question}
\]

Do adult speakers at L2 ultimate attainment converge on target off-line
grammatical knowledge and target on-line processing patterns of German
scrambling and its associated interface properties?

To answer this question, the following experiments test L1 Dutch, L1 English and L1
Russian advanced to near-native speakers of German as well as native-speaker controls.
The experiments consider the interaction of syntax and its interfaces in off-line
grammaticality judgements and in on-line processing focusing on reanalysis. With respect
to the general research question, three subquestions will be addressed (15).

\[(15) \text{ Subquestions for research}
\]
a. Is there a disjunction in convergence between the syntax and the interfaces
   of scrambling?
b. Is there a disjunction in convergence between grammatical representation
   and grammatical processing at the interfaces in the L2?
c. Do L1 properties affect L2 convergence (L1 influence)?

An overview of the experiments is given in Table 5.1.
<table>
<thead>
<tr>
<th>Interface</th>
<th>Phenomenon</th>
<th>Experiment number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax - Morphology</td>
<td>Word order &amp; Case marking</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Reanalysis: Incremental reanalysis according to morphological cues</td>
<td>2, 3</td>
</tr>
<tr>
<td>Syntax - Semantics</td>
<td>Definiteness constraints</td>
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<tr>
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<td>Context effects on scrambling</td>
<td>5</td>
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<tr>
<td>Structure</td>
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<tr>
<td>Syntax - Lexicon</td>
<td>Reanalysis: Dative experiencers</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 5.1. Overview of experiments.

5.6.1. Hypothesis

In the sciences, the experimental investigation of potential differences between treatments or groups proceeds by falsifying the experimental null hypothesis, namely, that no significant differences between treatments or groups exist. With respect to the question of whether critical period constraints force an asymmetry between native and late non-native language acquisition, Bialystok & Hakuta (1999) express the rationale of null hypothesis testing.

One must be prudent, therefore, in accepting the hypothesis for a critical period in second language acquisition. Methodologically, one must begin with the null hypothesis that no such limitations exist and produce reasons why this hypothesis should be rejected. (Bialystok & Hakuta, 1999: 163)

Similarly, research probing whether the mental representations of L2 grammars are epistemologically identical or distinct from native grammars starts by assuming the experimental null hypothesis that no such differences exist (e.g. Schwartz, 1987; 1998; White, 1996). Translated into the context of this study, the experimental null hypothesis would predict statistically indistinguishable performance of L2 speakers and natives. Note, however, that an experimental null hypothesis stating equality between groups cannot be verified as such. If no group differences are found between non-natives and natives, this could mean that the experimental null hypothesis is correct; alternatively, it

4 Others claim that “positing maturational constraints [...] is the unmarked hypothesis, because they are so well attested in the development of other animal species, in other types of human learning, and in other human neurological abilities” (Long, 1990: 233, italics in original; see also Bley-Vroman, 1990; Hyltenstam & Abrahamsson, 2003). Note that such approaches frame the investigation of late L2 acquisition differently by comparing it to other types of neurocognitive development across species, namely, those subject to a critical period, rather than comparing it to first language acquisition. From a linguistic point of view that aims to uncover the linguistic mechanisms and architecture of late-learned L2s, though, the experimental null hypothesis must posit identity with native linguistic architecture.
could be that there is in fact a group difference, yet it was not found, i.e. a Type II error may have occurred.

We can substantiate the experimental null hypothesis by relating it to the working definition of the Critical Period Hypothesis given in Chapter 1.4.1, and repeated in (16).

(16) Critical Period Hypothesis (working definition)
There is a critical period for language acquisition terminating at the latest by puberty, beyond which it is not possible to acquire native-like neurocognitive representations and processing of (components of) syntax and its interfaces.

Since the Critical Period Hypothesis in (16) appeals to qualitative differences in grammar representation and processing as the consequence of maturation, the experimental null hypothesis can be reconceptualized in the Fundamental Identity Hypothesis in (17).

(17) 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.

The subsequent chapters will explore to what extent the Fundamental Identity Hypothesis in (17) can be upheld in face of the off-line and on-line data on the syntax of scrambling and its interfaces. It is important to note that the Fundamental Identity Hypothesis does not predict statistical identity in performance for non-natives and natives. The Fundamental Identity Hypothesis refers to qualitative identity in native and non-native grammatical and processing architecture, and not to quantitative identity in performance data. If quantitative differences between non-native and native performance are found, what must be evaluated is whether they index qualitative differences reflecting critical period effects or whether they can be accounted for in terms of aspects of L2 acquisition that are not maturationally bounded.

Nevertheless, since the Fundamental Identity Hypothesis derives conceptually from the experimental null hypothesis, the inherent problems of null hypothesis testing in terms of verifiability outlined above carry over to the Fundamental Identity Hypothesis. This should be kept in mind in the interpretation of the findings. In order to assess whether the experimental findings could be interpreted as pointing to qualitative

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5 The Fundamental Identity Hypothesis derives the name from its opposition to Bley-Vroman's (1990) 'Fundamental Difference Hypothesis' which posits qualitative differences between non-native and native grammatical representation and processing as a consequence of a critical period. However, the Fundamental Identity Hypothesis is by no means novel, and its assumptions and content underlie much previous research and theorizing in L2 acquisition. Most directly, it is related to the Full Transfer/Full Access model (Schwartz & Sprouse, 1996) of L2 grammar acquisition (for variants, see Herschensohn, 2000; White, 2003b).
differences due to a critical period, the results from the experiments will thus also be
discussed with reference to different approaches to L2 acquisition outlined in Chapters 1
and 2 that do partly posit qualitative differences between non-natives and natives.

5.6.2. Approaches to L2 acquisition and their predictions

Three families of approaches to L2 ultimate attainment will be considered, namely
approaches postulating (a) grammatical impairment as a result of a critical period, (b)
divergence in processing routes as a result of a critical period, and (c) limitations in
computational capacity. At this point, I outline the general predictions of these
approaches as they relate to the subquestions guiding the experiments in (15).

5.6.2.1. Grammatical impairment

5.6.2.1.1. Syntax-morphology interface: The ‘Failed Functional Features’ Hypothesis

As discussed in Chapter 1.3.6.2.1, the ‘Failed Functional Features’ Hypothesis postulates
that specific subparts of syntax, so-called uninterpretable features associated with
inflection, are immune to resetting in adult L2 acquisition (e.g. Hawkins & Chan, 1997;
Tsimpli, 2003). Due to maturational fixation of morphosyntactic parameters, adult L2
speakers are argued to be restricted to uninterpretable features of the L1 and to attempt to
emulate different TL systems within the limits of the L1 syntax.

This approach predicts that the L1 determines convergence on scrambling and its
associated interface properties. Since impairment is postulated for syntax, i.e. at the level
of grammatical knowledge, no principled difference are expected between off-line and
on-line tasks since both require the availability of target morphosyntax.

5.6.2.1.2. Syntax-discourse interface: The ‘Interpretable Features’ Hypothesis

As discussed in Chapter 1.3.6.4, the ‘Interpretable Features’ Hypothesis holds that non-
convergence in advanced and endstate L2 acquisition affects only the syntax-discourse or
syntax-lexicon interface that express interpretive effects. Sorace (2003; 2005) argues that
these interfaces remain indeterminate, such that adult L2 learners waver between the L1
option and the TL option, thus manifesting divergent ‘residual optionality’ in form-to-
interpretation mappings of the TL.

With respect to the research questions at issue, this approach predicts a clear
asymmetry between target-like syntactic knowledge and divergent interface knowledge.
Importantly, the approach claims that – ceteris paribus – only interfaces mapping
interpretive information, i.e. the syntax-semantics and the syntax-discourse interface,
should be associated with permanent difficulty. For these, convergence should be
restricted to L2 speakers whose L1 has analogous interpretive properties as the TL. As for task, representational problems with interpretive features should obtain across tasks.

5.6.2.1.3. Syntax-Parsing interface: The ‘Shallow Structure’ Hypothesis

As discussed in Chapter 2.7.1, the ‘Shallow Structure’ Hypothesis (SSH) claims that L2 speakers underuse syntactic information because L2 grammars allegedly do not represent abstract phrase structure (Clahsen & Felser, 2006b). Instead, the SSH assumes that L2ers rely on non-syntactic cues, e.g., animacy, plausibility, linear order, etc., for creating filler-gap dependencies such as scrambling.

The SSH predicts a correspondence between off- and on-line behaviour, albeit not necessarily a strict correspondence in that target-like off-line knowledge aligns with target-like on-line behaviour or deviant off-line knowledge with deviant on-line performance. Since off-line tasks are susceptible to metalinguistic knowledge and do not necessarily tap into implicit, subconscious linguistic knowledge, off-line tasks could show target-like behaviour, while on-line performance is deviant. As for L1 transfer, the SSH raises the option that L2 processing might be indirectly fed by L1 influence via the transfer of grammatical knowledge. However, the studies carried out in this framework fail to find such L1 effects (e.g., Felser & Roberts, 2007; Marinis et al., 2005; Papadopoulou & Clahsen, 2003), concluding that L1 effects do not modulate L2 processing.

5.6.2.2. Differences in mental processing: The ‘Declarative/Procedural’ (DP) model

As discussed in Chapter 2.7.2, the DP model by Ullman (2005), representing several related models, contends that two neurocognitive processing routes support language acquisition, the declarative memory system and the procedural system. For mature L1 speakers, the highly routinized processing of morphosyntax is supported by the procedural system. In adult L2 acquisition, maturational effects are argued to attenuate the procedural system, so that adult L2 speakers, unlike adult L1 speakers, rely predominantly on the declarative system, i.e. memorized chunks and schemas. According to the DP model, the involvement of the procedural system increases relative to proficiency, with the potential of convergence on the TL.

For the present experiments, L2 speakers should predominantly exhibit non-convergence in on-line tasks requiring the involvement of the procedural system. For the processing of dependencies like scrambling, the DP model predicts that group differences align with proficiency differences, rather than L1 differences.
5.6.2.3. Computational problems: Capacity limitations

As discussed in Chapters 1.3.6.2.2. and 2.7.3, this family of approaches, such as the ‘Missing Surface Inflection’ Hypothesis (Prévost & White, 2000b) and the Capacity model (e.g. McDonald, 2006), holds that non-convergence in L2 acquisition is not due to representational deficits but to computational or capacity limitations. In principle, then, these approaches subscribe to the Fundamental Identity Hypothesis in (17) by assuming no qualitative, and only quantitative, differences between non-native and native performance.

For the present study, this means that differences between native and non-native performance should not be specific to either syntactic or interface phenomena *per se*; rather, asymmetries should relate to the complexity of computational processes required, the computational task demands and the computational resources as well as the proficiency level of L2 speakers. Accordingly, a greater deal of divergence is likely to surface in on-line experiments, especially in speeded tasks, as the computational demands increase. As for L1 effects, it could be that computational problems affect L2 performance irrespective of L1 properties. However, in cases of identical or highly similar properties in the L1 and TL, it is conceivable that processing routines can transfer from the L1 to the L2, thus augmenting the efficacy of coordinating these information types in the L2.

In sum, the approaches recruited for the present study make different predictions as to (non-)convergence of non-native performance on syntax and its interfaces along different dimensions. I will return to them in the general discussion of the experimental findings in Chapter 9 in order to situate the research findings within the frameworks of the approaches on endstate L2 acquisition.