THE USE OF GRAMMATICAL KNOWLEDGE IN AN ADDITIONAL LANGUAGE: EFFECTS OF NATIVE AND NON-NATIVE LINGUISTIC CONSTRAINTS

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Abstract

This thesis investigates whether multilingual speakers' use of grammatical constraints in an additional language (La) is affected by the native (L1) and non-native grammars (L2) of their linguistic repertoire.

Previous studies have used untimed measures of grammatical performance to show that L1 and L2 grammars affect the initial stages of La acquisition. This thesis extends this work by examining whether speakers at intermediate levels of La proficiency, who demonstrate mature untimed/offline knowledge of the target La constraints, are differentially affected by their L1 and L2 knowledge when they comprehend sentences under processing pressure. With this purpose, several groups of La German speakers were tested on word order and agreement phenomena using online/timed measures of grammatical knowledge. Participants had mirror distributions of their prior languages and they were either L1English/L2Spanish speakers or L1Spanish/L2English speakers. Crucially, in half of the phenomena the target La constraint aligned with English but not with Spanish, while in the other half it aligned with Spanish but not with English. Results show that the L1 grammar plays a major role in the use of La constraints under processing pressure, as participants displayed increased sensitivity to La constraints when they aligned with their L1, and reduced sensitivity when they did not. Further, in specific phenomena in which the L2 and La constraints aligned, increased L2 proficiency resulted in an enhanced sensitivity to the La constraint. These findings suggest that both native and non-native grammars affect how speakers use La grammatical constraints under processing pressure. However, L1 and L2 grammars differentially influence participants' performance. While L1 constraints seem to be reliably recruited to cope with the processing demands of real-time La use, proficiency in an L2 can enhance sensitivity to La constraints only in specific circumstances, namely when L2 and La constraints align.

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List of abbreviations

La	Additional non-native language
L1	Native language
L2	Non-native language
P*n*	Position *n*
RTs	Reading Times (Chapter 3) and Response Times (Chapter 4)
SAJT	Speeded acceptability judgment task
SPR	Self-paced reading

Chapter 1

Introduction

1.1. The use of grammatical constraints in multilingual speakers

Research on the multilingual speaker has gradually gained attention in the past ten years. This is a welcome direction of research, as the world's multilingual population keeps growing and the need for a cognitive model of this type of speaker becomes more pressing. Furthermore, the globalized character of the modern world is giving great importance to multilingualism, which is now a priority of European countries and institutions (see the Eurobarometer, 2012).

This dissertation aims to contribute to the growing body of research on multilingualism by focusing on the effects of multilingual speakers' native (L1) and non-native (L2) grammars when they are using a new, additional language (La) during comprehension. So far, most research on the role of L1 and L2 grammars on a La comes from the field of La acquisition, which has focused on the initial stages of development of the new language. Researchers in this area are primarily interested in the extent to which the L1 or the L2 grammars are used as a departure point at the initial stages of La acquisition. To investigate this subject, studies on La acquisition have mainly tested initial state La learners on their oral and written production, or have tested their comprehension using untimed measures of grammatical knowledge (for a review, see González Alonso, Rothman, Berndt, Castro, & Westergaard, 2017; De Bot & Jaensch, 2015; Jaensch, 2013; Rothman, Alemán Bañón, & González Alonso, 2015; Rothman & Halloran, 2013) These studies have found effects of the prior grammars in the acquisition of the La. For instance, some studies found La speakers had higher chances of acquiring an La constraint if it was instantiated in their L1 (Lozano, 2002). Other studies found that La learners had higher sensitivity to an La constraint if it was similar to the equivalent L2 constraint, and lower sensitivity if it was dissimilar (Falk & Bardel, 2011). A third group of studies found that both L1 and L2 could affect the acquisition of an La

constraint, depending on whether the given constraint was similar to the equivalent constraint in the L1, L2 and La (Flynn, Foley, & Vinnitskaya, 2004) , or depending on whether the La was globally similar (i.e. typological distance, Croft, 2002) to the L1 or L2 (Rothman, 2011, 2015; Rothman & Cabrelli Amaro, 2010).

Given the limited scope of research into La grammatical knowledge, there is little information on how prior grammars affect later stages of La proficiency. Likewise, given the focus on testing beginner learners with untimed grammaticality tasks, few studies have used timed tasks to tap into La processing (to our knowledge, only Lago, Stutter Garcia, & Felser, 2019).

The current thesis aims to address these gaps in the recent field of La grammatical knowledge. In particular, it attempts to measure intermediate La speakers' use of grammatical constraints with methods that exert processing pressure during reading. By using timed measures of grammatical knowledge to test La speakers who already show mature knowledge of the constraint in untimed tasks, this thesis addressed the following open questions:

1) Are intermediate La speakers with mature knowledge of an La constraint capable of applying it during real-time comprehension?
2) Is their success in applying this metalinguistic knowledge during real-time comprehension affected by how a given constraint is instantiated in their prior grammars?

These two questions have two potential outcomes. In the case of the La speakers' use of grammatical constraints in the La under processing pressure, it is possible that once they have acquired the constraint, as shown by their consistent use of it in untimed metalinguistic tasks, they can apply it in an error-free manner during processing. Alternatively, due to the observed processing difficulties learners have when processing an L2 (for a review non-native processing see Clahsen & Felser, 2006b), it is possible

that La speakers' processing resources are overwhelmed by the task, and that as a consequence they fail to apply the required constraints.

As for the effects of prior grammars, it is also plausible that after participants have acquired the constraint, whether this constraint was instantiated in the speaker's previous languages in a different way no longer has an effect. Alternatively, it is also possible that constraints that posed particular difficulties for La learners during their initial acquisition might persist when these learners are put under processing pressure. These difficulties, in turn, might be traced back to how the constraint is instantiated in the L1 and L2.

To investigate these possibilities, two groups of La German speakers were tested on word order phenomena and agreement phenomena. Participants had mirror distributions of their prior languages: they were either L1 English - L2 Spanish speakers or L1 Spanish - L2 English speakers. Crucially, the German phenomena under investigation differed in how their constraints aligned with Spanish and English. In some cases, La German constrains aligned with Spanish but not with English, and other cases they aligned with English but not with Spanish. With this cross-linguistic selection of participants and phenomena, it should be possible to distinguish between the effects of native constraints and non-native constraints when they align and when they misalign with the target La constraint. Importantly, participants were tested with two different timed tasks that restricted the way in which participants read the stimuli, thus applying processing pressure: a self-paced reading task with end-of-sentence grammaticality judgments (Study 1), and a speeded acceptability judgment task (Study 2). Both methods recorded participants' metalinguistic judgments, as well as the time it took them to read the region where a grammatical violation was displayed (i.e. self-paced reading task), or the time it took them to make their judgment after the items had been presented at a pre-determined speed (i.e. speeded acceptability judgment task).

1.2. Theoretical and methodological assumptions

In order to address the main questions of this thesis, a series of theoretical assumptions were made. The first assumption was that speakers have

separate grammars for each of the languages that they have acquired, and that these grammars are made up of the representations required to produce and understand sentences in the target grammar. A major part of research on non-native morphosyntactic acquisition and processing is built on this assumption (for a review on generative approaches to La acquisition, see García Mayo & Rothman, 2012).

The second and third assumptions are that grammatical knowledge and the language processor are separate systems, and that the processor is fed by grammatical knowledge in both comprehension and production. These are two commonly held assumptions in psycholinguistic research (for a discussion of the grammar-parser relationship, see Lewis & Phillips, 2015; Phillips, 2012), which has observed that L2 speakers with nativelike grammatical knowledge can display non-nativelike L2 processing (Felser & Cunnings, 2012; Sato & Felser, 2010). These three assumptions are important for this dissertation, given that its purpose is to observe whether La speakers who already have mature knowledge of a grammatical constraint can apply it under processing pressure, and whether their use of the constraint is affected by their native and non-native grammars.

The final assumption relates to the automatization of mechanisms for grammatical processing. Psycholinguistic studies have observed that different cognitive factors can impact L2 processing, such as working-memory and processing speed (e.g. Hopp, 2006, 2010; McDonald, 2006). These studies have argued that L2 processing requires more cognitive resources than L1 processing, which results in less automatic L2 processing. Based on these studies, I will assume that L2 and La processing are less automatic than L1 processing, and that increased exposure to the La and L2 languages could lead to the increased automatization of the L2 and La mechanisms. This is a critical assumption for the investigation of La speakers' sensitivity to violations of grammaticality under time pressure. Contrary to untimed tasks, the timed tasks used in this dissertation required participants to adopt automatic processing mechanisms to cope with the task demands, therefore providing insight into how La speakers use grammatical constraints during processing (see Chapter 2).

Finally, although the predictions for the experiments are based on findings observed in La acquisition (given the absence of research specifically on La processing), this thesis does not investigate the acquisition of La constraints (i.e. the development of the La constraints, or the conditions under which they were acquired). Rather, this thesis investigates how La constraints are applied during reading comprehension under processing pressure by speakers who have already overcome the initial stages of La acquisition. Similarly, although the experiments make use of processing assumptions and methods that tap into processing by providing reading times recorded during the unfolding of sentences (in self-paced reading tasks), and response times to errors placed at the end of sentences (in speeded acceptability judgment tasks), the results cannot speak directly as to how participants processed the constraints. For that purpose, another set of experiments that observe comprehension in the absence of metalinguistic judgments would have to be conducted, which is beyond the scope of this dissertation. Instead, speeded methods are employed in this thesis to put participants under processing pressure by limiting the time to process linguistic stimuli, while time measures are used to draw inferences as to the processing costs involved in the detection of violations of the target La constraints. Therefore, the results in this thesis can only speak indirectly to the question of the mechanisms employed by participants to process the constraints of interest.

1.3. Terminology

Throughout this thesis, the **term 'La'** refers to participants' additional non-native language that is under study in the experiments of this dissertation, in this case German. It is used to distinguish it from participants' native language (L1) and their other non-native languages (L2). The term 'additional language' has been employed in previous studies of La transfer with a similar meaning (e.g. Cenoz & Jessner, 2009; Clyne, 1997; De Angelis & Selinker, 2001; Gass & Selinker, 1992). Other terms such as L3 or Lx have been used to distinguish the additional language under study from the native and other non-native languages of the multilingual learner. However, the term L3 has also been attributed different meanings in other

studies on additional language acquisition, ranging from an indicator of the chronological order in which the additional language was acquired, to the degree of dominance or the degree of use as opposed to the other languages of the multilingual speaker. Although chronology and dominance are relevant factors for the acquisition and processing of an additional language, they are not the main interest of this thesis, which aims at distinguishing the effect of prior grammars in terms of native/non-nativeness. Therefore, in order to avoid a terminological confusion, 'La' will be used to refer to the additional language.

The terms **'transfer'** or **'cross-linguistic influence'** are also used frequently when discussing the effects of prior languages in the La acquisition literature (see González Alonso et al., 2017 for a terminological discussion). In this thesis, the term 'transfer' and 'influence' are used interchangeably to refer to the effect of prior grammatical knowledge (native or non-native constraints) on the use of a specific constraint in an additional language. This term is discussed more extensively in Chapter 2 as the reader is introduced to prior La acquisition research.

1.4. Outline of the thesis

The next chapters are structured as follows. While Chapter 1 introduced the topic of this dissertation and clarified assumptions and terms that will be used throughout, Chapter 2 summarizes previous studies that have addressed the role of prior grammars in the acquisition of La morphosyntactic knowledge, and discusses the accounts of La initial state transfer that emerged from these studies. It highlights the existing gaps and methodological problems of prior La research, and explains how it will attempt to address these using timed measures of grammatical knowledge. It concludes with the specific research questions investigated in the two empirical studies.

Chapter 3 presents an empirical study on La participants' sensitivity to violations of word order in German using a self-paced reading paradigm with end-of-sentence grammaticality judgments, and an untimed grammaticality judgment correction task (e.g. *Olivers alte Oma {betrachtete ihn/*ihn betrachtete} durch das Fenster* – 'Oliver's old

grandma {observed him/*him observed} through the window'). Findings show La participants do not differ in their judgments, but do show differential reading patterns. This hints at potential differences in how La speakers' are affected by the violations during reading, but suggests that these differences do not have an impact on the outcome of their processing. Additionally, L1 Spanish speakers' proficiency in L2 English was found to facilitate their rejection of infelicitous sentences. These findings are discussed in relation to accounts of La grammatical use.

Chapter 4 investigates the sensitivity of La participants to violations of agreement in German using a speeded acceptability judgment task, and an untimed grammaticality judgment correction task (e.g. *Herr Jung zeigte stolz {seine/*sein} Werke,* 'Mr Jung showed proudly his(pl)/*his(sg) works'). Results show that La speakers are significantly affected by the native constraints in their judgments and reaction times, and additionally show facilitation of their respective L2 proficiency for constraints that align between the L2 and La. This suggests both native and non-native constraints can simultaneously affect the real-time use of grammatical constraints during La comprehension.

Finally, Chapter 5 discusses findings in both studies, which suggest that both L1 and L2 constraints affect La speakers' grammatical sensitivity under processing pressure. While native mechanisms appear to be recruited to cope with the processing demands of La real-time comprehension for metalinguistic purposes, knowledge of an L2 that aligns with the La may enhance participants' sensitivity to La violations.

Chapter 2

The role of prior linguistic knowledge in the acquisition of La morphosyntax

2.1.Introduction

This chapter introduces studies conducted to date on the role of native and non-native grammars in multilinguals speakers' grammatical knowledge in an additional language. Given the limited scope of studies in this field, which have focused on language transfer at initial stages of La acquisition using mostly untimed tasks, the second part of this chapter highlights the need for conducting studies on later levels of La proficiency, and on the use of La constraints during real-time processing. The last section of the chapter discusses how this thesis addresses the methodological and theoretical gaps in the research on transfer in an La by looking at intermediate La speakers with timed measures of grammatical knowledge. It presents the research questions addressed by the experiments, and briefly introduces the general predictions based on findings from La acquisition research.

2.2. Transfer of prior grammatical knowledge to an additional language

Transfer has generally been conceptualized as the influence of one or several languages (Ln(s)) on other languages (Lz(s)). A frequently cited definition of transfer is Odlin (1989: 27): "Transfer is the influence resulting from the similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired."

As Odlin (1989) himself acknowledges, this is a very general definition that should be further nuanced for the particular aspect of language that is being investigated. In the case of La morphosyntax research, the concept of similarity and difference between the languages has been adopted as an explanation for the outcome of transfer in acquisition, but not necessarily as

the factor leading to transfer. For instance, if an La learner transfers a grammatical constraint that is similar between the L*n* and the target La, this transfer should result in target-like use. Therefore, the similarity between the constraint of the source language L*n* and the constraint in the target La should result in a positive outcome. However, if this transferred constraint is dissimilar between source language L*n* and the target La, the transfer of a dissimilar feature should be non-facilitative, resulting in non-target use of the La constraint.

Despite the importance of the concept of similarity, there is ambiguity as to what it means and at what levels of granularity it can be measured. La morphosyntax researchers have investigated from word order phenomena such as subject-verb inversion in Romance languages (e.g. Rothman, 2010), to null pronouns (Rothman & Cabrelli Amaro, 2010) and possessive pronoun gender agreement with an antecedent (Lago, Stutter Garcia & Felser, 2019). This ambiguity can be attributed to the recency of the field, as well as to the number of constraints involved in testing multilingual participants on cross-linguistic transfer, which multiply the difficulty of finding linguistic phenomena that overlap (or not) between the two or more languages of the participants, and enhance the complexity of elaborating rigorous experimental designs that take into account the linguistic overlap, and participant factors (e.g. proficiency levels or order of acquisition). This restricts the definition of similarity and the levels at which it happens to a case-by-case basis, but should give way to a concrete and generalizable definition once enough studies have been produced in the field to extract it from reliably, or once research is undertaken to specifically address the question of similarity.

The different accounts of transfer of prior grammatical knowledge in an La have addressed the concept of facilitative and non-facilitative transfer differently. While all accounts generally assume facilitative transfer takes place when the learner benefits from the morphosyntactic similarities between the Ln and the La, non-facilitative transfer is not unanimously accepted as the result of the transfer of constraints that are differently

instantiated in the L1, or absent in the L1. Some accounts suggest non-facilitation takes place when the learner's knowledge of an La constraint is influenced by a constraint that is dissimilar in the Ln (e.g. Falk & Bardel, 2011; Rothman, 2011, 2015; Westergaard, Mitrofanova, Mykhaylyk, & Rodina, 2017); Other accounts, however, suggest that in cases in which there is divergence in the representation of the La and Ln constraint, no transfer takes place (Flynn, Foley, & Vinnitskaya, 2004). The specific differences in this conceptualization of transfer are addressed later in this chapter when each representative study is discussed (see sections 2.2.1, 2.2.2, 2.2.3).

Another aspect in which accounts of La morphosyntactic transfer differ is in the role that they attribute to similarity between languages and between constraints during transfer (e.g. Flynn et al., 2004; Rothman, 2011; Westergaard et al., 2017). For instance, Rothman (2011, 2015) claims that the language that is most similar to the target La in the different areas of language (lexicon, morphology, phonology and syntax) is selected by the speaker as the source of global grammatical transfer to form the initial hypotheses of La grammar. On the other hand, other studies have claimed that similarity is relevant only on a property-by-property level, not on the global language level. For example, Flynn et al. (2004) claim that morphosyntactic constraints transfer to the La from any of the prior grammars that share these constraints. Moreover, Flynn et al., (2004) claim that if there is no similarity between the La constraints and those in the prior languages, no transfer takes place. Interestingly, only Flynn et al., (2004) consider a no-transfer scenario as a possibility in their study and in their model of La transfer.

Contrary to these similarity-based transfer studies, another set of studies on La morphosyntactic transfer claim that the status of the prior languages is the sole factor that determines from which language transfer takes place. For these studies, similarity of the constraints in the languages determines the type of outcome resulting from transfer, as discussed above (Falk & Bardel, 2011; Hermas, 2010, 2014; Lozano, 2002). One set of these latter studies

claim only native language constraints transfer to the initial La acquisition stages (Hermas, 2010, 2014; Lozano, 2002), while the other group claims only non-native constraints transfer to the La (Falk & Bardel, 2011). The transfer accounts can be summarized as follows (2.1):

(2.1) Transfer takes place:

Based on language status

a) Only native constraints are transferred, due to learners' acquisition and exposure to them since birth, leading to stronger representations and more proceduralized processing mechanisms than for the non-native constraints (Hermas, 2010, 2014; Lozano, 2002).
b) Only non-native constraints are transferred due to their shared foreign status with the La (Falk & Bardel, 2011)

Based on similarity

a) Global similarity between languages determines transfer (Rothman, 2011, 2015)
b) Property-by-property similarity determines transfer (Flynn et al., 2004; Westergaard et al., 2017)

Transfer is therefore generally conceptualized in La acquisition research as the use of prior grammatical constraints to form initial hypotheses of the La grammar. Studies in this field focus on identifying where transfer comes from, the factors that determine the origin, and to what extent it takes place.

Recently, the role of other factors independent of the status or similarities of the language have been investigated, such as the role of metalinguistic knowledge in the L1 in the success of La acquisition (Falk, Lindqvist, & Bardel, 2015), or the relevance of the language of communication, regardless of status or similarity (Fallah, Jabbari, & Fazilatfar, 2016). In these studies, transfer is shown to be significantly modulated by these

individual factors, which presents a new level of complexity in the definition of transfer. Interestingly, however, no study in this field has so far presented a case in which no transfer took place, except for Flynn and colleagues (2004). The studies supporting each transfer account are discussed in more detail in the following subsections.

2.2.1. Transfer of native constraints

It is intuitively plausible that the predominant influence on transfer comes from the constraints of the language that has been acquired since birth and hence counts on robust morphosyntactic representations. However, although some studies have claimed to observe transfer of native constraints at the initial stage of La acquisition (Hermas, 2010; Jin, 2009; Lozano, 2002; Na Ranong & Leung, 2009), no native-constraint transfer model has been put forward so far to account for these effects at the initial stages of La acquisition. This absence is due to the studies' methodological shortcomings, as acknowledged by the authors. In most cases, these shortcomings consisted of a lack of statistical power due to small participant groups and few experimental items (Jin, 2009; Na Ranong & Leung, 2009), or the absence of an La comparison group (e.g. Hermas, 2010, 2014). In the other cases, patterns of transfer from prior grammars was not the focus of the study (Lozano, 2002).

Nonetheless, it is possible to outline what an L1 transfer account could propose regarding transfer. As mentioned earlier, in a sequential multilingual learner, the native tongue is the first and only language acquired fully and effortlessly since birth. Speakers of a later-acquired non-native language usually show incomplete acquisition and processing difficulties in this L2 (for a review of L1 and L2 processing differences see Clahsen & Felser, 2006a, 2006b). Considering the qualitative and quantitative differences in the grammatical representations of a native language and a non-native language, it is reasonable to assume that when shaping the initial state of a new language, La speakers draw on their most robust and proceduralized grammatical knowledge: their L1 grammar. Further, if La speakers draw on their L1 constraints at the initial stages of

La acquisition, it is plausible to expect facilitation when the L1 constraints align with the La target constraint, and non-facilitation when the L1 constraint and the La constraint do not align.

Furthermore, the studies conducted on La acquisition that have observed L1 effects claimed that there was facilitation as well as non-facilitation, and attributed the prevalence of L1 effects to its quality as the first and most robust grammar of a sequential La speaker.

For instance, Lozano (2002) tested two groups of Spanish learners in order to observe whether they could acquire language-specific constraints as opposed to constraints considered to be universal. He expected the universal constraints to be acquired regardless of whether they were instantiated in the learners' L1 or not, while language-specific constraints would elicit lower sensitivity from learners that did not have the constraint in their L1 compared to learners whose L1 did have the constraint. His two participant groups were L1 English - L2 Spanish speakers and L1 Greek - L2 English – La Spanish speakers, and both groups were at an advanced level of proficiency in Spanish. Crucially for the study, Spanish and Greek are null-subject languages, while English is not. Lozano tested the Overt Pronoun Constraint (OPC), a restriction in null-subject languages and hence instantiated in Greek and Spanish, which does not allow an overt pronoun in an embedded clause to bind with a quantified expression in the main clause whenever the alternation of null/overt is possible (see (2), in which only *pro* can bind with *cada estudiante*). Contrary to Spanish and Greek, English does not allow null pronouns, and hence the OPC restriction does not apply, allowing an overt subject to bind with the quantified expression of the main clause in English (*he* and *each student* in (2.2)).

(2.2) Overt Pronoun Constraint

Context: The government has published a report about students' financial situation. The report concludes that...

a. cada estudiante$_i$ dice *él$_i$/*pro*$_i$ que tiene poco dinero. (Spanish)

b. o kathe mathitis$_i$ lei *aftos$_i$/*pro*$_i$ ehi liga lefta. (Greek)

c. each student$_i$ says that he$_i$/**pro*$_i$ has little money. (English)

Importantly for the design, the OPC has been claimed to derive from Universal Grammar, and hence should be available to all learners including adults, as long as they have access to Universal Grammar, regardless of whether this property differs from the property in their L1 (for a detailed discussion of the reasons for this claim, see Lozano, 2002: 55). Lozano also tested the Contrastive Focus Constraint (CFC), a language-specific constraint that is instantiated in Greek and Spanish, but absent in English. According to this constraint, when an overt subject is used in an embedded clause, it can establish coreference with another referent in the prior or subsequent discourse (2.3), signalling a contrastive focus. In the example given in (2.3), the antecedent of *él* ('he') is no longer the quantified expression *cada estudiante,* as the null pronoun indicated in the OPC (2.2), but a referent in the previous context: *Mr López*.

(2.3) Contrastive Focus Constraint

Context: Mr López$_j$ and Ms García$_k$ work at the university and at a famous publishers. However...

a. cada estudiante$_i$ dice que él$_j$/**pro*$_j$ tiene poco dinero. (Spanish)

b. o kathe mathitis$_i$ lei aftos$_j$/**pro*$_j$ ehi liga lefta. (Greek)

c. each student$_i$ says that he$_j$/**pro*$_j$ has little money. (English)

Participants were asked to complete an acceptability judgment task in which they had to rank two versions of a sentence for which they had been provided a context (see (2.4)).

(2.4) El señor López$_i$ y La señora García trabajan en La universidad y en una famosa editorial. No obstante...

a. cada estudiante$_j$ dice que él$_i$ tiene poco dinero.

b. *cada estudiante$_j$ dice que *pro*$_i$ tiene poco dinero.

Lozano found that the Spanish learner groups did not differ in their ratings of the OPC, and nor did either of them differ from a group of Spanish native speakers. All three groups preferred the grammatical null subject condition over the ungrammatical overt subject condition. His data also showed that English native speakers accepted the ungrammatical OPC items significantly more often when compared to the Greek group, but Lozano did not discuss this finding, focusing only on the comparison with the Spanish norm. As for the CFC, Lozano found that all groups were sensitive to the grammaticality manipulation, but the L1 English group was significantly less sensitive than the L1 Greek and L1 Spanish groups, accepting more ungrammatical items (2.4.b) and fewer grammatical items (2.4.a). Lozano took this as confirmation of his predictions: the universal OPC constraint showed target-like accuracy when compared to the native norm in both learner groups despite its absence in English, while the language-specific CFC showed an effect of the L1 constraints. L1 English speakers' reduced sensitivity in both constraints when compared to L1 Greek speakers is relevant evidence for a transfer account of native constraints, suggesting L1 English speakers have more difficulties than L1 Greek speakers with language-specific as well as universal constraints, due to the absence of these constraints in English. However, Lozano's statistical comparisons investigated differences between La Spanish speakers and the L1 Spanish norm, leaving this potential L1 effect on the universal OPC constraint unaddressed.

Similarly to Lozano (2002), Hermas (2010) also investigated the extent to which constraints not instantiated in the L1 can be acquired in an La. However, contrary to Lozano (2002), Hermas' goal was to test different La

transfer scenarios. For this purpose, he investigated the comprehension of sentential negation and the placement of frequency adverbs in La English by speakers of L1 Moroccan Arabic and intermediate-advanced L2 French. According to Hermas, the linear word order for the placement of frequency adverbs and sentential negation differs across the three languages due to the type of computation they require. Moroccan Arabic (MA) allows pre-verbal placement of the frequency adverb (before the finite verb) as well post-verbal placement (after the finite verb). French, however, only allows placement of the adverb after the finite verb, while English requires its placement before the finite verb (see (2.5), (2.6) and Table 2.1 as provided by Hermas, 2010: 346). As for the linear order of sentential negation, MA and French show a similar placement of negation particles, requiring one before and after the main, finite, content verb. English, however, conjugates an auxiliary verb, which is then followed by the negation particle, and relegates the content verb to a non-finite form after the negation particle (see (2.6), Hermas, 2010: 346).

(2.5) Adverb placement

(a) Ali ka-y-srab dima atay.
Ali asp-3MS-drink always tea

(b) Ali dima ka-y-srab atay.
Ali asp-3MS-drink always tea
'Ali always drinks tea.'

(c) Jean embrasse souvent Marie.
Jean kisses.$_{V}$ often$_{ADV}$ Marie.
'Jean often kisses Marie.'

(d) John often kisses Mary.

(2.6) Sentential negation

(a) ma-ka- n- fham-s dima jar-i
Neg-Asp-1-understand-Neg always neighbour-my
'I don't always understand my neighbour'.

(b) Jean (n') aime pas les chiens.
Jean Neg like.3MS Neg the dogs
'Jean does not like dogs'
(c) John does not like dogs.

Table 2.1. Placement of adverbs and negative particles in Moroccan Arabic, French and English.

	Moroccan Arabic (L1)	French (L2)	English (LA)
Frequency adverbs	$A_{dverb}V_{erb}O_{bject}$	-	$A_{dverb}V_{erb}O_{bject}$
	$V_{erb}O_{bject}A_{dverb}$	$V_{erb}O_{bject}A_{dverb}$	-
Negation	$N_{eg}V_{erb}N_{eg}$	$N_{eg}V_{erb}N_{eg}$	-
	-	-	$N_{eg}V_{erb}$

In order to observe whether the L1 word order instantiation affects L2 and La grammatical knowledge, Hermas tested the L2 French and La English of the L1 Moroccan speakers with a preference task and an acceptability judgment task. He then compared their performance in the tasks to that of native speakers of each second language (i.e. L1 French and L1 English speakers) to determine whether or not participants had acquired the constraint. His results showed that the learners were less sensitive to the constraints in their initial La English than in their intermediate L2 French. This is not surprising, given the proficiency differences between English (initial) and French (intermediate). They also had more difficulties with adverb placement in both target languages (L2 French and La English) than with sentential negation in both preference and acceptability tasks. Hermas interpreted participants' difficulties with adverb placement and the differences in accuracy for French and English as evidence that the learner group were undergoing positive and negative transfer from MA: MA licenses both types of adverb placement, but each target language takes only one specific word order. Hence, Hermas claims that learners were simultaneously showing facilitative transfer in the grammatical items for L2

French as well as for the La English items, given that the grammatical items showed a licit word order in the superset MA. Similarly, Hermas suggests that participants showed non-facilitative transfer in the ungrammatical items; learners accepted both word orders due to the fact that MA accepts both placement locations for the adverb.

Although this might be a plausible case of transfer, Hermas did not have a comparison group of La speakers that would allow him to distinguish an effect of L2 French and L1 MA adverb placement in the ungrammatical items of La English, as both French and MA allow post-verbal placement. Hermas admits this caveat in his study but maintains his interpretation. Similarly, Hermas compared the La speakers' performance to the native norm in order to investigate whether the La speakers showed L1 or L2 influence. The comparison of a non-native group to a native group is likely to show significant differences, especially if the non-native group is at the initial stages of acquisition (in the case of La English) or at the intermediate levels of proficiency (the case for the L2 French of Hermas' participants). Therefore, Hermas' choice of comparing native and non-native speakers to infer transfer patterns poses a methodological problem which again could be solved by testing another group of L1 MA and La English learners with an L2 that does not allow post-verbal adverb placement.

In his later study, Hermas (2014) continued to look at morphosyntactic phenomena at the initial stages of La English with the same population: L1 Moroccan Arabic speakers who were advanced in L2 French. Using the same tasks as in Hermas (2010), he investigated whether two phenomena instantiated in MA would be transferred into L2 French and La English: the inversion of the subject and verb in declarative sentences, and the instantiation of null expletive subjects. Neither French nor English allow subject-verb inversion in declarative sentences or null expletive subjects. He predicted La participants would transfer the L1 constraints instead of the L2 constraints at the beginning of La English, despite French and English being typologically closer than English and Moroccan Arabic, and despite their sharing the same target constraint. The accuracy scores of the preference

task and the grammaticality judgment task showed that participants were highly sensitive to the violation of subject-verb inversion in L2 French and La English. They were less sensitive to the violations of expletive subjects in L2 French and La English, but the decrease in sensitivity was more marked for the La English judgments than for the L2 French structures. In all cases, they differed significantly from the native norm. Once more, Hermas (2014) concluded that L1 MA had an effect on the judgments of the La participants for both phenomena. However, the same methodological problems apply as in Hermas (2010). The lack of a comparison group renders it impossible to conclude empirically that the constraint of L1 MA was the only factor responsible for the judgment rates of the La learners. In order to confirm this claim, Hermas would need to compare the L1 MA speakers' performance with the performance of another group of L2 French-La English speakers whose L1 does not instantiate subject-verb inversion in declaratives nor allow null subjects.

Although more studies have suggested the prevalence of L1 transfer over other types of transfer at the initial stages of La acquisition (Jin, 2009; Na Ranong & Leung, 2009), these, as well as Hermas (2010, 2014) present important methodological issues that do not allow differentiation between transfer of native or non-native constraints during the acquisition of La grammar. Furthermore, the absence of comparison groups makes it empirically impossible to determine whether the observed pattern of errors is due to transfer or to factors unrelated to L1/L2 constraints, such as group-specific characteristics or learner effects (i.e. in specific tasks and for specific language properties, learners show reduced sensitivity and reduced ease of processing compared to native speakers, not because of differences between their L1 and the non-native language, but because of the added difficulties of real-time processing of a language which is not native or due to characteristics of the linguistic phenomenon that make it universally difficult to acquire and process, see page 38 for more on this account).

In conclusion, the studies discussed above claim that the configuration of morphosyntactic constraints in the L1 has a crucial role in the acquisition

and use of constraints in an La. However, the methodological shortcomings of these studies render their findings inconclusive, which in turn explains why no formalized account of L1 transfer has been proposed so far.

2.2.2. Transfer of L2 constraints

A series of studies claim that L2 morphosyntactic constraints should prevail over L1 constraints during acquisition of the La (Bardel & Falk, 2007 on L2 effects in production; Falk & Bardel, 2011 on L2 effects in comprehension). They argue that the sociolinguistic and cognitive similarities between a non-native language and an additional non-native language, as opposed to the native language, lead to their co-activation whenever either non-native language is used (Falk & Bardel, 2011:64). According to this account, the co-activation of the L2 during the use of La involves the entire L2 grammar, leading to facilitation when the L2 and La constraints align, and non-facilitation when they do not align. This account of language transfer is called 'the L2 status factor' account.

Factors shared by an L2 and La include (Falk & Bardel, 2011: 63)

- age of acquisition;
- outcome;
- learning situation: natural/informal vs. classroom;
- degree of metalinguistic knowledge;
- learning strategies present in L2 but not in L1;
- degree of awareness of the language learning process.

Falk and Bardel (2011) tested the predictions of their account in La morphosyntactic comprehension by investigating the placement of object pronouns in German La. Their La participants were divided into two groups: a group of L1 French-L2 English speakers, and a group of L1 English-L2

French speakers, who were in turn matched for intermediate level of proficiency in German La, and in their respective L2s. The constraints for the placement of object pronouns differ in the three languages involved. While English places object pronouns after the finite verb (e.g. *I saw him*, SVO), French places the equivalent canonical form, clitic pronouns, before the finite object (e.g. *Je l'ai vu* – 'I him saw'; SOV). However, German shows different placement of the object pronoun depending on the type of clause: in main clauses, the finite verb invariably takes second position due to German's V2 rule, which translates into a canonical SVO word order for the placement of the object in main clauses. This word order resembles the canonical placement for English object pronouns, but it differs from French object pronoun placement. In German subordinate clauses, German follows its base word order, SOV, placing the finite verb at the end of the clause, with all objects preceding it. This reflects a placement for the pronoun that is canonical in French, but not in English. Falk and Bardel gave their participants a grammaticality correction judgment task in La German with a total of 60 items in a 2x2 design: grammaticality (grammatical/ungrammatical) by clause type (main/subordinate). With this task, they aimed to probe participants' sensitivity to the placement of direct object pronouns, indirect object pronouns and reflexive pronouns (see (2.7), Falk & Bardel (2011: 69).

(2.7) Example sentences in Falk and Bardel (2011)

(a) Ich sehe ihn
I see him.
'I see him.'

(b) *Ich ihn sehe
I him see.
'I see him.'

(c) […] dass ich ihn sehe.
[…] that I him see.
'[…] that I see him.'

(d) *dass ich sehe ihn
[…] that I see him.
'[…] that I see him.'

The results confirmed the authors' predictions: L2 English speakers accepted SVO word order significantly more often than L2 French speakers when it was grammatical (main clauses) as well as when it was ungrammatical (subordinate clauses). Equally, L2 French speakers accepted SOV word order significantly more often than L2 English speakers when it was grammatical (subordinate clauses), as well as when it was ungrammatical (main clauses). With this data, Falk and Bardel concluded that L2 grammatical constraints play a larger role than L1 constraints in sensitivity to errors in the placement of German (La) object pronouns, even in cases in which L1 constraints would have led to target-like sensitivity and L2 constraints to non-target-like judgments. They suggest that transfer of the L2 grammar is global, and consequently its effects can be facilitative if the L2 and La show similar constraints, and non-facilitative when the L2 and La show different constraints.

Therefore, the L2 status factor hypothesis (Bardel & Falk, 2007; Falk & Bardel, 2011) claims that L2 status plays a larger role than the native tongue in La acquisition at initial as well as intermediate stages. This influence can even block transfer from an L1 that may be typologically and structurally similar to the target La (Falk & Bardel, 2011: 480).

2.2.3. Transfer based on similarity

The studies in this section distance themselves from the relevance of language status in La acquisition transfer, and instead base their predictions on the similarities between the languages or between the properties in question. While one group of studies suggest that transfer takes place globally from the language that shares most similarities with the target La at all linguistic levels (Rothman 2011, 2015), another group of studies support property-by-property transfer from any language that instantiates a

constraint similar to the target La, regardless of the global similarity between the languages themselves (Flynn et al., 2004; Westergaard et al., 2017). These two positions are presented separately in the following sections.

2.2.3.1. Language-based similarity

Accounts of La acquisition that investigate the similarity between languages and its impact on cross-linguistic influence distinguish between what they call "typological distance", i.e. the abstract similarities of the languages at different levels such as lexicon, phonology, and syntax; and "psycho-typological distance", i.e. learners' perceived similarity between the languages, which may or may not correspond with the abstract similarities (Kellerman, 1983). However, some studies make use of both constructs to account for La transfer findings.

For instance, (Rothman, 2011, 2015) claims that the language, native or non-native, that is perceived by the learner's parser as closer to the La should be the sole source of grammatical transfer in the very initial stages of La acquisition. He claims that this transfer pattern is based on principles of cognitive economy: global transfer of the grammar that shares more abstract similarities with the La at all linguistic levels should reduce processing costs at the initial stages of La acquisition. Following this principle, Rothman suggests that the parser selects a grammar to be transferred once it has identified which of the prior languages is closer typologically to the target La (Rothman, 2015: 180). This identification process follows a hierarchical order; each level offers an opportunity for the parser to identify similarities between the L1/L2 and the target La. If the first level does not suffice for this identification, the parser goes on to the next level, until a match is found (Rothman, 2015:186):

Lexicon→ Phonological/Phonotactic Cues→ Functional Morphology → Syntactic Structure

Given the holistic character of Rothman's concept of transfer, the resulting acquisition of morphosyntax at initial La stages should show facilitative and non-facilitative transfer. Specifically, facilitation should take place when the mental representation transferred from the source language is similar to the target La constraint, while non-facilitation should occur when the transferred mental representation is in disagreement with the target constraint (Rothman, 2015: 180).

The findings of several studies have been offered as support for this account (J. Rothman & Cabrelli Amaro, 2010; Rothman, 2010, 2011). However, as was the case for the L1 transfer studies, their methodological limitations render it impossible to differentiate between L2 transfer and language-based similarity transfer, as in Rothman & Cabrelli Amaro (2010), or between these and a case of general learner effects in which transfer has no role, as in Rothman, (2010) and (2011) (see section 2.6. for more information on the learner effect).

For instance, Rothman & Cabrelli Amaro (2010) tested the acquisition of the null-subject parameter in Italian and French with native speakers of English. In order to observe the role of the typologically closest language as opposed to the role of L1 or L2 status, the authors tested four groups learning either the target language French or the target language Italian. Two groups were English native speakers learning either L2 Italian or L2 French. The other two groups were also English native speakers, who had learned L2 Spanish to a high proficiency and were at that time starting with either La French or La Italian. All groups were at the initial stages of acquisition in French as L2 or La, and Italian as L2 or La. While Italian and Spanish allow null subjects and generally reject overt expletive subjects, French and English do not allow null subjects in finite clauses at all, and require overt expletive subjects. The authors gave each group of participants a grammaticality judgment correction task and a sentence-matching task in their target languages (L2 Italian, L2 French, La Italian, La French). They then compared the number of times that each group accepted null and expletive subjects in their respective target languages. Given that Spanish is

typologically closer to the target La French and La Italian than English, the authors expected the ratings of the two La groups to show the influence of Spanish constraints when compared to the L2 groups who lacked Spanish knowledge.

The authors found differences between the L2 and the La groups of each target language in both tasks that hinted at an effect of the L2 Spanish on the La judgments when compared to participants without L2 Spanish. Specifically, they found that French La speakers accepted more null subjects than L2 French speakers did. Therefore, the La group was less accurate than the L2 group, given that French does not allow null subjects. Interestingly, like the French La speakers, the Italian La group also accepted more null subjects and rejected more overt expletive subjects than the Italian L2 group. In this case, the Italian La learners were more accurate than the Italian L2 learners, given that, unlike French, Italian does accept null subjects and rejects overt expletive subjects. The authors interpreted this as evidence of the influence of L2 Spanish, which licenses null subjects and generally rejects overt expletive subjects. According to them, the reason that both La groups accepted more null subjects was because of the transfer of Spanish L2 pronoun constraints, which resulted in facilitative transfer for the La Italian speakers, but in a detrimental effect for the La French learners. However, Spanish was the L2 of both trilingual groups, and it was therefore not possible to distinguish between an L2 status factor and a typological factor in this study, a fact acknowledged by the authors.

Rothman (2010) addressed this confound by testing two groups of La speakers that had an inverse L1-L2 distribution of the language that was typologically closest to the La. Specifically, he investigated the initial acquisition stages of La Brazilian Portuguese (BP) with two mirror groups of La BP learners: a group of L1 Spanish – L2 English speakers and a group of L1 English – L2 Spanish speakers. Both La groups had attained a high level of proficiency in their respective L2s, but were at the initial stages of La BP acquisition. With this mirror design, Spanish, the typologically closest language to BP, was the L1 of the first group and the L2 of the

second group. Importantly, although BP and Spanish belong to the Romance branch of languages, they show different word order constraints for declarative and interrogative clauses.[1] While BP and English require SV word order in declarative sentences, Spanish licenses VS word order (although it is non-canonical). In interrogative clauses, however, both English and Spanish require subject-verb inversion (VS), while BP does not require inversion and only licenses SV word order. Rothman used a grammaticality judgment correction task to test the word order restrictions with a 2x2 design (clause type and grammaticality). The results showed no differences between the two La groups in both word order constraints tested. While they were highly accurate for the declarative items, all participants wrongly rejected SV word order in the interrogative sentences. Rothman (2010) interprets the absence of any differences between the La groups and the type of errors they made as evidence of transfer from Spanish as an L1 and as an L2. According to Rothman, the parser of both La groups detected more similarities between Spanish and BP than between English and BP, and hence transferred the entire Spanish grammar at the initial stages of La BP. This resulted in the erroneous rejection of SV word order in interrogative items.

Despite having partially addressed the confound in Rothman & Cabrelli Amaro (2010), this last study still presents several problems. Firstly, both English and BP disallow SV word order in interrogative sentences, which therefore creates the same confound as the previous study: participants could have transferred from either English or Spanish. Equally, English, Spanish and BP allow SV word order in declarative sentences, therefore participants' high accuracy and the absence of differences between the groups could be due to the transfer of English as well as Spanish.

[1] This study also looked at relative clause attachment preferences. This part of the study is left out given that it is unclear whether there are consistent attachment preferences in the languages mentioned. Similarly, previous studies have shown great variability in attachment preferences in L2 learners as well as no differences between L2 learners with different L1 attachment preferences (Dussias, 2003; Felser, Roberts, Gross, Marinis, 2003; Papadopoulou and Clahsen, 2003)

Rothman (2011) presents the same methodological problem. In this study he tested two groups of La learners on the placement and interpretation of pre- and post-nominal adjectives in two Romance Las. Specifically, he tested a group of L1 Italian-L2 English speakers learning La Spanish, and a group of L1 English - L2 Spanish speakers learning La Brazilian Portuguese. With this design, one group of speakers had a Romance language as L1, and the other group had a Romance language as the L2. Adjectives can be placed pre- and post-nominally in Spanish, Brazilian Portuguese and Italian, but only pre-nominally in English. In these Romance languages, the placement of the adjective usually involves a semantic difference ('the brave soldiers' - *los soldados.N valientes.ADJ* denotes a set of soldiers who are brave while *los valientes soldados* implies all soldiers are brave). In a semantic interpretation task, Rothman asked participants to select one of two possible semantic interpretations for the items shown (five items contained a pre-nominal adjective and five a post-nominal adjective). In a cloze task, participants were given 10 contexts in which a noun required a pre-nominal (n = 5) or a post-nominal (n = 5) adjective. Participants were given an adjective and asked to place it before or after the noun. Results showed high accuracy in both tasks by both La groups in their respective target language (La Spanish and La BP), and no significant differences in their ratings. Rothman interpreted this as evidence of typological transfer: while the L1 Italian – L2 English transferred the Italian adjective placement and interpretation to Spanish La, the L1 English – L2 Spanish transferred the adjective placement and interpretation from their L2 Spanish into their La Brazilian Portuguese. In both cases, the transferred patterns are claimed to have originated from the language typologically closer to the target. However, given that there were no comparison groups that did not have a non-Romance L1 and/or L2, the question still remains whether what Rothman observed was transfer from the typologically closest language, a learner effect in which all learners show the same sensitivity regardless of their linguistic repertoire, or simply a case of a constraint that is easily acquired by learners of all L1/L2 backgrounds.

In conclusion, although the data obtained by previous studies suggest a possible effect of global language similarity, there are several methodological confounds that need to be addressed before this can be claimed to be the only factor influencing transfer for the constraints and languages investigated. Further, it is important to highlight that these studies make claims for the first encounter of La speakers with the La grammar, which is not the case for participants in other La studies, such as the ones presented in the next section, nor is it the case for participants in the studies presented in this dissertation.

2.2.3.2. Property-based similarity

Property-based similarity approaches to La transfer begin with the premise that all the languages that a multilingual speaker knows are active during language acquisition and use (Flynn et al., 2004; Slabakova, 2017; Westergaard et al., 2017). This means that transfer during La acquisition may happen from either or both languages. The primary difference between the models that subscribe to this view of language transfer is what outcomes they expect from transfer.

Flynn et al. (2004) in their Cumulative Enhancement Model (CEM) view language acquisition as a cumulative process, whereby any constraint that is similar between the prior languages and the target La will be transferred to facilitate acquisition. Therefore, if the prior languages lack the constraint similarity, no transfer should take place (Flynn et al., 2004: 5). Contrary to Flynn et al. (2004), other studies claim that, in addition to facilitative transfer, non-facilitative transfer can also take place in property-by-property transfer when the learners fail to detect the similarity or dissimilarity of the languages (the Linguistic Proximity Model, Westergaard et al., 2017; The Scalpel Model, Slabakova, 2017).

In order to test their claims concerning the accumulative and facilitative character of language acquisition, Flynn et al. (2004) observed the production of restrictive relative clauses with an elicited imitation task. They tested two groups of La English speakers: a group of adult learners

and a group of child learners. Both groups had the same language background: they were native speakers of Kazakh and L2 speakers of Russian. Flynn and colleagues compared the performance of the two La groups to that of English learners from a prior study who had carried out the same task (Flynn, 1983, 1987): two groups of adult L2 English learners (a group of L1 Spanish speakers and a group of L1 Japanese speakers), as well as a group of L1 English child learners.

Crucial for the development of restrictive relative clauses is the head directionality and branching of the language. While Spanish, Russian and English are head-initial and right-branching languages; Japanese and Kazakh are head-final and left-branching languages.

With this selection of speakers, Flynn et al. (2004) aimed to observe whether the four groups of English learners went through the same developmental stages or whether the trajectory differed depending on their prior grammatical knowledge, by comparing the rate of correctly imitated free relative clauses (3rd example in Table 2.2) to correctly imitated restrictive relative clauses (1st and 2nd example Table 2.2). The participants' English proficiency in each L1 group ranged from beginner to advanced.

Table 2.2. Example of items for each of the three conditions tested in the elicited imitation task (Flynn et al., 2004).

Lexical head with semantic content	The owner questioned the businessman [who greeted the worker].
Lexical head with no semantic content	The janitor criticised the person [who called the lawyer.
Free relative	The professor introduced [whoever greeted].

The prior studies (Flynn, 1983, 1987) had shown that L1 Japanese speakers and child L1 English learners, who lack knowledge of a head-initial language, produced the free relative clause as a precursor to the lexically headed form (i.e. they produced more often correct clauses in the free relative clause condition than in the restricted relative clause conditions). However, L1 Spanish speakers had not shown this

developmental step and instead produced an equal amount of correct clauses in the three conditions. Flynn et al. (2004) hypothesized that if prior grammatical knowledge has an effect on the acquisitional path, L1 Kazakh – L2 Russian speakers should consistently produce restricted relative clauses accurately, given that they had knowledge of a head-initial, right-branching language (Russian), an advantage that the L1 Spanish speakers had in the prior studies.

Flynn et al. (2004) found that the adult L1 Kazakh – L2 Russian group performed like the L1 Spanish group: they did not show evidence of free-relative clauses as a developmental step, producing an equal amount of correct clauses in the three conditions. However, the child L1 Kazakh – L2 Russian group produced fewer correct restrictive clauses as compared to free clauses, similar to the L1 Japanese and child L1 English group from the prior studies (Flynn, 1983, 1987). The authors remark that the La child group was acquiring Russian and English simultaneously, which might have led to this unexpected result. With this evidence, Flynn et al. (2004) conclude that 'patterns of acquisition in a new language will depend upon the nature of the linguistic knowledge already represented in the mind/brain of the learner' (p. 15). Their results are taken as supporting evidence that language acquisition is accumulative, and that transfer takes place in a facilitative, property-by-property manner.

In their Linguistic Proximity Model (LPM), Westergaard et al. (2017) suggest that non-facilitative influence takes place due to the learner's misanalysis of the La input: the learner mistakenly assumes that a property is shared between the La and either/both of the prior languages. In their study, Westergaard and colleagues examined the acquisition of English as an La in a bilingual Norwegian-Russian population (children of 11-14 years of age who were simultaneous bilinguals), and in two monolingual child populations learning L2 English: a group of L1 Norwegian children, and a group of L1 Russian children. The bilingual Norwegian-Russian population and the Norwegian monolingual speakers were both recruited in the same Norwegian school, which suggests that Norwegian was the language of the

immediate surroundings for the bilingual children. In order to observe the role of the prior grammars, the authors tested two phenomena that presented cross-linguistic differences between the three languages involved: adverb-verb word order, which shows similar constraints between English and Russian, and different constraints in Norwegian; and subject-verb inversion in interrogative sentences, which is present in English and Norwegian but absent in Russian, which maintains SVO word order. Participants completed a grammaticality judgment task on both phenomena; declarative sentences with adverbs and questions with auxiliaries (see (2.8) and (2.9), Westergaard et al. 2017:8).

(2.8) a. Susan often eats sweets.
b. *Susan eats often sweets.

(2.9) a. What will the little girl read?
b. *What the little girl will read?

Based on the LPM's main claims, they made the following predictions:

Adverb placement (Adv-V)

- Russians L1 speakers should perform at ceiling, due to word order similarity between their L1 Russian and L2 English.
- Norwegians L1 speakers should transfer the Norwegian V2 property, resulting in non-target performance.
- The bilingual Norwegian-Russian group should outperform the L1 Norwegian group, due to access to Russian. However, they should be less sensitive than the L1 Russian group, due to non-facilitative influence from Norwegian.

S-Aux inversion (Aux-S)

- L1 Norwegian speakers should perform at ceiling, due to facilitative transfer of verb movement.
- L1 Russian speakers should have difficulties, due to non-facilitative influence from Russian.

- The bilingual Norwegian-Russian group should outperform the L1 Russian group, due to access to Norwegian. However, they should score lower than the L1 Norwegian group, due to non-facilitative influence from Russian.

The authors found no significant differences between the three groups in the subject-auxiliary inversion experiment, for which Norwegian and English share the constraints. However, the trends showed that the L1 Russian group was less accurate than the other two groups, as they had predicted. The groups did differ statistically in the adverb-verb placement experiment (where English and Russian share the constraints): the bilingual Norwegian-Russian group and the L1 Russian group were more accurate overall than the L1 Norwegian group, indicating that they had a facilitative effect from Russian. However, the bilingual group was less accurate than the L1 Russian group, which the authors in turn interpreted as a non-facilitative transfer from L1 Norwegian for the bilingual group. Therefore, according to Westergaard et al. (2017), the three groups showed transfer from their prior languages for the adverb-verb placement constraint: L1 Russian speakers received facilitative transfer from Russian, which shows similar constraints to the target La; L1 Norwegian speakers received non-facilitative transfer from Norwegian, which is dissimilar to the target La constraint; and the bilingual group showed facilitative effects from their L2 Russian and non-facilitative effects from L1 Norwegian.

As discussed earlier, Westergaard and colleagues argue for the existence of property-by-property transfer due to the learner's capacity to detect abstract structural similarities between the prior languages and the target La. All prior languages are claimed to be available at every stage of the learning process, and no language is 'blocked' (Westergaard al., (2017:5). Despite this positive setting for La and Ln acquisition, they suggest there is facilitative and non-facilitative transfer. However, their concept of non-facilitative transfer is hard to justify considering the verb-adverb findings in the bilingual group learning La English. According to Westergaard et al.'s

(2017) model, the bilingual participants detected the similarity between Russian constraints and the target La English. They then transferred these constraints during the task. However, the authors argue that these children also received non-facilitative transfer from their Norwegian constraint, which implies that they also considered it similar to the English La structure. From this it follows that the same group of participants simultaneously considered Russian and Norwegian constraints similar to the target English constraints, holding therefore two contradictory beliefs about the similarity of their prior grammars and the target constraint. Moreover, this contradiction resulted, according to the authors, in facilitation as well as non-facilitation simultaneously. The authors do not elaborate on how these two types of influence coexist.

This conceptualization of facilitative and non-facilitative transfer is unconvincing due to the absence of further explanations by the authors as to how these contradictory processes could be simultaneous in the same group of participants. Alternatively, these results could be interpreted under the CEM framework of facilitative or no-transfer (Flynn et al., 2004). Westergaard and colleagues' findings showed that both L1 Norwegian and Norwegian/Russian bilingual children were less accurate than the L1 Russian children in the word order that was similar between Russian and English. They also found that the Norwegian/Russian bilingual children were more accurate than the L1 Norwegian children. This could be interpreted as evidence of the facilitative influence of Russian, and the absence of facilitation of Norwegian. Considering the evidence of the role of dominance in cross-linguistic influence (Fallah et al., 2016), and given that the bilingual Norwegian/Russian children were in a Norwegian school and most likely more exposed to this language than to Russian, it is reasonable to hypothesize that the degree of "accumulated" exposure to Russian modulated the amount of facilitation it exerted on children's judgments. While L1 Russian children obtained the maximal amount of facilitation, the bilingual Norwegian/Russian children received reduced facilitation because Norwegian rather than Russian was the dominant

language in their surroundings. Finally, the L1 Norwegian monolinguals obtained no facilitation due to their lack of Russian knowledge. This account of Westergaard and colleagues' results would require further research to determine whether it is the proficiency, exposure, dominance or other factors that determine the degree of transfer and facilitation of prior grammatical knowledge. Furthermore, similarity-based accounts should discuss extensively their conceptualizations of facilitation and non-facilitation in order to avoid vagueness in the interpretation of their results.

All in all, Flynn et al. (2004) and Westergaard et al. (2017) show that either of the prior languages could have an effect on the use of the target La constraint. Specifically, both studies show cases in which the L1 facilitated L2 performance (L1 Spanish – L2 English speakers in Flynn et al., 2004, and L1 Russian – L2 English in Westergaard et al., 2017), as well as L2 facilitation of L3 performance (L2 Russian facilitation of L3 English production in Flynn et al., 2004, and L2 Russian facilitation of L3 English in Westergaard et al., 2016). Furthermore, both studies show there is a lack of facilitation, which could also be interpreted as non-facilitation, especially when the L1 does not align with the target La constraint: Flynn et al. (2004) observed L1 Japanese - L2 English learners were less target-like than L1 Spanish - L2 English speakers in the structure shared by English and Spanish, while Westergaard and colleagues found L1 Norwegian - L2 Russian - L3 English children were less target-like than L1 Russian - L2 English and L1 Norwegian – L2 English children in the word order that was similar between Russian and English and dissimilar to Norwegian.

Finally, in her Scalpel Model (Slabakova, 2017), which agrees in its main tenets with the Linguistic Proximity Model (Westergaard et al., 2017), Slabakova enumerates a series of factors that can lead to the misanalysis of the abstract similarities of the constraints by the language learner, and cause non-facilitation. Amongst several factors, she focuses on the relevance of the construction's frequency, the availability of unambiguous input, and the structural linguistic complexity. Although these seem legitimate

explanations for a non-facilitative effect, they have not yet been tested as relevant linguistic factors in La studies.

2.2.4. Individual factors in transfer

Although not a main focus at the moment in La morphosyntactic acquisition, three relevant studies have addressed the role of individual factors in the transfer of prior grammars. One of the first studies to investigate this matter was Williams & Hammarberg (1998). In a case study on that investigated oral production, they looked at which individual factors played a role in determining what grammar was subconsciously transferred when producing sentences in a new language. They concluded that the production errors that were attributable to transfer originated from the language that summed the highest number of the following individual and linguistic factors: the speaker's frequency and recency of use of the prior language; the language's status as a foreign language when compared to the native language; and the typological similarity of the prior grammar to the target language. Some of these factors have been made the central factors of La acquisition transfer accounts in the comprehension of morphosyntax (foreign status in the L2 Status Factor, Bardel & Falk, 2007; Falk & Bardel, 2011; and the role of typological similarity in the Typological Primacy Model, Rothman, 2011, 2015). However, the individual factors such as recency and frequency of use have been relegated to a secondary role in most subsequent research on the comprehension of La morphosyntax. La studies have mostly acknowledged the role of individual variables and attempted to control for factors such as age of acquisition and proficiency in the target language so as to restrict the scope of the effects that they are investigating.

Another relevant study on the role of individual factors in transfer during La acquisition is Falk et al.'s (2015) production study. They tested how L1 Swedish metalinguistic knowledge (MLK; measured by a questionnaire on the explicit rules of the L1) affected accuracy in the production of colour adjectives in relation to the noun in the initial stages of acquisition of La

Dutch. As an L2, participants spoke L2 English and at least one Romance language. While Dutch and Swedish attributive adjectives are pre-nominal, Romance languages require post-nominal placement for colour attributive adjectives. The authors predicted that explicit knowledge (MLK) of the L1 Swedish adjective placement would facilitate the correct placement in La Dutch, while no explicit knowledge of the L1 constraint would result in an influence of the L2 constraints because of the L2 status factor (Falk & Bardel, 2011). The authors found a correlation between MLK scores and the correct placement of La Dutch adjectives: speakers with lower L1 MLK were significantly less accurate in the placement of adjectives than speakers with higher L1 MLK. Based on this finding, they claimed that enough MLK in the L1 should counter non-facilitation from the L2 in cases in which the L1 would lead to facilitation and the L2 to non-facilitation. Nevertheless, the statistical methods used to analyse the correlation between MLK and accuracy in an La neglected to include relevant factors such as proficiency in the L2 English (which also places adjectives pre-nominally) and the Romance L2s in order to confirm the non-facilitative effect of L2 knowledge for the low MLK group, a caveat that the authors acknowledge. Despite the shortcomings of the study, it is an interesting start to research on the role of La speakers' explicit knowledge of the constraints of their L1 and L2.

More recently, Fallah et al. (2016) tested the role of another individual factor: language dominance. They tested three populations of La English learners at the initial stages of acquisition on the placement of attributive possessives: two groups of L1 Mazandarani - L2 Persian speakers who differed in their language of regular communication (either primarily Mazandarani or primarily Persian), and a group of L1 Persian - L2 Mazandarani, who communicated primarily in Persian. The goal of their study was to observe whether there were any differences in the groups' comprehension of English attributive possessives depending on how the constraint was instantiated in the language in which they communicated more frequently, rather than in the status of their language as native or non-

native, or the status of the language as typologically closer to or distant from the target La. Importantly, English and Mazandarani share similar constraints regarding the placement of possessors: they both place the possessor before the possessed noun (e.g. “my class”, see (2.12), Fallah et al., 2016: 231) and the possessive adjectives before the nouns (e.g. “Ali’s book”, (2.10), Fallah et al., 2016: 231), while Persian places possessives post-nominally ((2.11) in Fallah et al., 2016: 231).

(2.10) Me kelas gaet hæsse. (Mazandarani)
My class big is
‘My class is big.’

(2.11) Kelas-e mæn bozorg æst. (Persian)
Class-EZ my big is
‘My class is big.’

(2.12) My class is big (English)

Participants completed three tasks: a grammaticality judgment task, an element rearranging task and an elicited oral imitation task. The authors found that the group that communicated primarily in Mazandarani, the language that resembles English in the placement of attributive possessives, were significantly more accurate in all three tasks compared to the other two groups, who communicated primarily in Persian, which differs in word order placement from English and Mazandarani. This finding is extremely interesting given that half of the participants who communicated primarily in Persian were native speakers of Mazandarani. The authors concluded that at the initial stages of La acquisition, transfer originates from the language of communication, posing a challenge to the central claims of language status accounts (the L1 effect, e.g. Hermas, 2010, 2014; the L2 Status Factor, Falk & Bardel, 2011) and similarity-based accounts (the CEM, Flynn et al., 2004; the TPM, Rothman, 2011, 2015). The relevance of the language of communication, they argue, may be due to the effect of

frequency of use: the higher the frequency of use of an abstract structure, the higher the chances that it gets used in the future (Paradis, 2004).

Finally, the degree of proficiency in the L2 and La has been claimed to be a crucial factor in determining whether transfer takes place from this language, although this has not been directly tested so far in any La study. Those who have discussed the role of L2 proficiency have generally suggested that in order for complex structures to transfer from a non-native language to the La, learners need to have reached enough proficiency in the non-native language (Bardel & Falk, 2007; Falk & Bardel, 2011; J. Rothman & Cabrelli Amaro, 2010; Rothman, 2011, 2015). Similar claims have been made for La lexical transfer (Bardel & Lindqvist, 2007; de Bot, 2010).

Further research has been conducted on the effect of individual factors in L2 acquisition and processing, suggesting that cognitive differences play a role in the acquisition and processing of constraints in a non-native language, such as working memory, global intelligence, or verbal and non-verbal aptitude (Abrahamsson & Hyltenstam, 2008; Bond, Gabriele, Fiorentino, & Alemán Bañón, 2011; Juffs, 2005; Robinson, 2001; Sagarra & Herschensohn, 2010; Sasaki, 1996).

2.2.5. No transfer

Generally, accounts of transfer in La acquisition assume that transfer takes place across the board at the initial stages. Except for Flynn et al. (2004), who argue that transfer should not take place if it results in non-target performance, no other studies have suggested that there are phenomena in which transfer does not occur. Instead, they categorize cases of target performance as facilitative transfer, and non-target performance as non-facilitative transfer.

However, there are multiple factors leading to non-target-like performance in an La that are not necessarily related to transfer. This makes the selection of population and material extremely important when it comes to distinguishing transfer from other phenomena that might have caused the

effects. For instance, Odlin (1989) discusses possible developmental factors and universal characteristics of specific phenomena that render them hard to acquire by any adult or child language learner, regardless of their L1 and L2 backgrounds (e.g. for a study on L2 acquisition that found evidence against transfer effects, see Clahsen and Muysken, 1986). This is supported by evidence from the field of L2 acquisition and processing. Sato & Felser (2010) investigated transfer of morphosyntactic knowledge in an L2 by comparing speakers whose L1 differed in similarity to the target L2 constraint, finding no differences between the L1 groups, but observing a significant difference from the native norm. Other studies looking at the processing of non-local dependencies have observed similar results (e.g. Marinis, Roberts, Felser, & Clahsen, 2005).

Therefore, for the sake of completeness in La transfer research, and especially in the light of evidence from L2 research, the no-transfer scenario should be considered as a possibility in La morphosyntax for specific syntactic phenomena.

2.2.6. Summary of the transfer accounts

Research on the effect of prior grammars in La morphosyntax has focused on the acquisition of La constraints at the initial stages of proficiency. Studies used untimed metalinguistic tasks to test which prior grammar was the departure point for the initial La grammar. Findings from this research have produced a series of accounts that attempt to predict which prior grammar should transfer at the initial stages of La acquisition (2.1).

(2.1) Transfer scenarios presented in Section 2.1.

Based on language status

a) Only native constraints are transferred, due to learners' acquisition and exposure to them since birth, leading to stronger representations and more proceduralized processing mechanisms than the non-

native constraints (Hermas, 2010, 2014; Lozano, 2002).

b) Only non-native constraints are transferred due to their shared foreign status with the La (Falk & Bardel, 2011).

Based on similarity

c) Global similarity between languages determines wholesale transfer (Jason Rothman, 2011).

d) Property-by-property similarity determines transfer (Flynn et al., 2004; Westergaard et al., 2017),

Additionally, more recent studies have focused on specific individual factors, such as metalinguistic knowledge (Falk et al., 2015) or language of communication (Fallah et al., 2016), and have suggested that these significantly affect which language will transfer into the acquisition of the La.

Given the focus of the field on acquisition, and especially at the initial stages of proficiency, there is very little information on the effects of prior grammars in later stages of La proficiency. Furthermore, given the widespread use of untimed metalinguistic tasks, there is little information on whether La speakers are able to apply their knowledge of La constraints in real-time comprehension, and whether they apply the constraints differentially depending on their prior grammars. Research in the field of L2 acquisition and processing has consistently found differences between the untimed judgments of L2 learners and how they apply their untimed knowledge under time pressure (Felser, Roberts, et al., 2003; Marinis et al., 2005; Papadopoulou and Clahsen, 2003). The research in this dissertation addresses these open questions in La research, which is an essential next step in building a cognitive and linguistic model of the multilingual speaker. Moreover, it aims to overcome the methodological shortcomings frequently found in La acquisition studies by carefully controlling the design of materials, by testing two different groups of La speakers for comparison,

and by investigating La speakers' sensitivity to seven La phenomena that present cross-linguistic differences between the L1/L2 of the La participant groups.

The following section describes the methods that are used in this dissertation to test La speakers' grammatical knowledge under time pressure, it presents findings in the field of L2 processing that illustrate the possibility of investigating prior grammatical transfer during processing, and it discusses how it will test for transfer in La metalinguistic use under processing pressure.

2.3. Beyond untimed measures of La grammatical knowledge

While there is already a substantial body of research on the patterns of morphosyntactic transfer during the initial stages of acquisition of an La, few studies have addressed whether these transfer patterns are also found when La speakers use their metalinguistic knowledge during timed tasks at later stages of La proficiency (see Lago et al., 2019, for a more recent study using processing measures). Research into L2 speakers has already investigated differences between untimed grammatical knowledge and its use during processing, revealing differences between the two. The next paragraphs briefly discuss the timed methods used in this dissertation to test La grammatical knowledge during processing, i.e. the speeded acceptability judgment task and the self-paced reading task, and briefly introduces studies of L2 processing that have used this task to test transfer patterns.

The two timed paradigms employed in this thesis to investigate grammatical knowledge under processing pressure are the speeded acceptability judgment task and the self-paced reading task with grammaticality judgments (Just, Carpenter, Woolley, 1982). These two paradigms differ in how the stimuli are presented and recorded, as well as in the type of data that they elicit.

The SAJT (henceforth SAJT) task used in this dissertation presented sentences in a word-by-word fashion, also called rapid serial visual presentation (RSVP). The first word in the sentence appeared in the middle

of the screen and then disappeared giving way to the next word in the sentence. The rate of presentation of the words in the sentence was pre-determined, at 500 ms stimulus onset asynchrony[2]. At the end of the sentence, participants had to give their acceptability judgment as fast as possible, with a three-second timeout. The task's pre-determined fast speed and the word-by-word presentation of the sentences require participants to build the structure and meaning of the sentence as it quickly unfolds, putting great pressure on their working memory because of the impossibility of re-reading the parts of the sentence that have already been presented. The requirement that a quick judgment be made at the end of the sentence additionally restricts any attempt to revise their acceptability intuition. These reading conditions have been shown to reliably tap into participants' processing mechanisms: they need to resort to the most automatic and proceduralized grammatical knowledge in order to parse the sentence and make a judgment (Drenhaus, Saddy, & Frisch, 2005; Parker & Phillips, 2016; Wagers, Lau, & Phillips, 2009). Therefore, it can be safely assumed that the less robust participants' representation of the constraint is, the more errors they will make, as they have no time to reflect on their initial intuition.

An example of how SAJT was used to tap into the transfer of L1 grammatical constraints to an L2 during processing is Hopp (2010), who used RSVP to test the processing of verbal and case inflection by three groups of near-native speakers of L2 German: speakers of L1 English, L1 Dutch and L1 Russian. All three languages as well as German have a similar system of verbal inflection. However, they all differ in how they inflect for case when compared to German. In terms of the degree of differences in case marking, English and Dutch fall into a simpler case marking system, and differ more in regard to German than does Russian, which has a richer case system. Hopp's goal was to investigate to what extent the similarities and differences between the L1 and L2 inflection systems had an effect on

[2] SOA: The amount of time between the start of the first word and the start of the next word in the sentence.

the robustness of near-native representations in the L2. He found that the near-native groups had ceiling sensitivity for both verbal and case inflection in an untimed judgment task and in a self-paced reading task: they were as accurate as native speakers, and showed a disruption in their reading times caused by the violation. However, when probed with a speeded acceptability judgment task, the three groups of near-native L2 German speakers showed a significant decrease in accuracy for case inflection, although not for verbal inflection. Moreover, the L1 English and L1 Dutch groups suffered a steep drop in accuracy compared to the L1 Russian group for case inflection. Hopp concluded that reduced processing efficiency was responsible for non-native performance in L2 ultimate attainment, but that this efficiency was further taxed when the constraints (here case inflection) did not match in the realizations of L1 and the L2.

The self-paced reading paradigm (henceforth SPR) used in this dissertation presented sentences in a non-cumulative moving-window manner. With this presentation, participants determine their own reading pace by clicking on a button to see each word in the sentence. Participants initially see the entire sentence masked behind dashes. Each dash represents a letter of a word, and each word is separated by an empty space (for more detail, see Figure 3.1). When participants click the button for the first time, the dashes corresponding to the first word reveal the word. As soon as they click the button again, this word turns back into dashes, and the next word is revealed. This continues until the participant has clicked through the entire sentence. At the end of the sentence, they are asked to judge the acceptability of the sentence as fast as possible. Assuming that the eye is a window to processing, the time taken to read each region is interpreted as the time that participants need to process that region (Just et al., 1982). By comparing the reading times for licit sentences with counterparts that contain a grammatical violation, it is possible to observe whether participants are sensitive to the violation, and at what point in the sentence. Self-paced reading research assumes that when the reader slows down while reading a violation or shortly after it, they are experiencing processing costs

caused by the detection of the violation (Blackwell, Bates, & Fisher, 1996; Just et al., 1982; Keating & Jegerski, 2015). In this dissertation, participants were asked about the grammaticality of the sentence after its end. This grammaticality question fulfils two purposes: it provides a measure of participants' grammatical knowledge when tested under real-time comprehension, and, by looking at the reading times for correctly-responded items, it allows the measurement of the point in the sentence where participants started to be sensitive to the violation. By comparing the judgments and reading times of different groups of La speakers, it should be possible to observe whether they differ in their use of La constraints under time pressure, and whether they differ in how they reach the correct judgment.

An example L2 processing study which used self-paced reading with grammaticality judgements is Tokowicz & Warren (2010). They investigated whether English native speakers learning L2 Spanish at the beginning stages were sensitive to different types of morphosyntactic agreement violations: gender agreement, number agreement and tense agreement. Some of the morphosyntactic structures tested were similar in both Spanish and English (number and tense agreement), and some were unique to Spanish (gender agreement between determiner and noun). In the reading time data of the self-paced reading task they found that learners were sensitive to the violations of agreement systems that were similar between the two languages (i.e. number and tense agreement), as shown by slower reading times on the words immediately after a violation. However, they were not sensitive to agreement violations of the system that was unique to Spanish (i.e. gender agreement within the DP). This difference in sensitivity between similar and unique structures in the reading data was also reflected in the end-of-sentence grammaticality judgments, which showed that participants generally failed to detect the three types of violations in their judgments, but they were especially inaccurate in the unique agreement type. The authors concluded that learners at initial stages of acquisition can be sensitive to violations of agreement systems that are

similar in their L1 and the L2, as observed in their reading times, but that they are insensitive to violations of a system unique to the L2. By using both timed and untimed measures of grammaticality judgments, the authors were able to observe differences in the sensitivity of the learners beyond their untimed judgments, which showed no sensitivity to the constraints at all.

Summing up, SAJT and SPR data can provide insights into how non-native learners process linguistic input as they encounter it, information that cannot be obtained from untimed judgments. This dissertation used SAJT data to investigate the robustness of La representations, and SPR to investigate the timing of the use of the representation, i.e. whether the constraint is applied during comprehension, and when it starts to be applied. In both cases, differences between the groups of La learners should show whether their L1 and L2 constraints affect the use of the target constraint under processing pressure.

To my knowledge, this is the first time that these methods have been used to look into the role of prior grammars in La speakers (see Lago et al., 2019, for a recent study). The next section discusses the specific research questions addressed by this dissertation, and how the findings of La acquisition studies and L2 processing studies are integrated to generate the predictions.

2.4. Research questions, methodology, and predictions of this thesis

As discussed throughout this chapter, most research on La grammatical knowledge has been devoted to investigating the role of native and non-native grammars in shaping the initial stages of La acquisition. The findings of these La acquisition studies can be summarised in four different accounts of La transfer: the sole transfer of L1 constraints, the transfer of non-native constraints, the transfer of the constraints from the typolinguistically closest language (Rothman, 2011, 2015), or from any language that contains a similar constraint (Flynn et al., 2004; Westergaard et al., 2017). There is, however, very little research that has looked into whether transfer of native

or non-native constraints is observed in later stages of La proficiency, and even less research that has looked at the use of the grammatical constraints of the La in processing tasks.

It is possible that native or non-native grammars are no longer relevant at later stages of La proficiency once La speakers have acquired a constraint. However, it is also possible that the same La constraints that were affected by prior grammars during La acquisition continue to be affected at later stages of proficiency and in La processing. In order to answer these open questions, it is therefore relevant to investigate whether La speakers that demonstrate mature knowledge of a constraint in an untimed task can apply this knowledge in time-pressure metalinguistic tasks. This dissertation addresses these open questions by looking at intermediate La speakers who have already demonstrated mature knowledge in an untimed task by testing them in a timed metalinguistic comprehension task. More specifically, the studies conducted in this dissertation address these research questions:

1) Do La speakers differ in how they apply the La constraint under time pressure depending on how it is instantiated in their native language?
2) Do La speakers differ in how they apply the constraint under time pressure depending on how it is instantiated in their non-native language? And is this effect modulated by proficiency in the L2?

While addressing these questions, this dissertation attempted to overcome the methodological problems frequently encountered in La acquisition studies. In order to distinguish between the transfer of native constraints and non-native constraints, two groups of intermediate La German speakers with a mirror distribution of their L1 and L2 were tested:

L1 English – L2 Spanish

L1 Spanish – L2 English

Furthermore, in order to distinguish between the influence of English constraints and Spanish constraints, two different types of constraints were used:

> The target German constraint is:
> a) similar to English and dissimilar to Spanish
> b) similar to Spanish and dissimilar to English

Fillers and constraints that presented no divergence between Spanish and English were used as baselines to make sure any differences between the La groups were not due to intrinsic or constraint-specific effects, but to the language background manipulation. With this design, it should be possible to observe the role of English and the role of Spanish as an L1 and as an L2 when they show similar constraints to German as well as when they show dissimilar constraints to German.

Given the absence of prior research into La grammatical knowledge during processing, the predictions for the experiments were elaborated based on findings in the field of La acquisition.

> *L1 effect account*. If La speakers' L1 constraints affect their sensitivity to La constraints, differences in sensitivity to the constraints should be observed between the two groups. Specifically, La speakers whose L1 aligns with the German constraint should be more sensitive than La speakers whose L1 does not align with the German constraint.
>
> *L2 effect account*. If La speakers' L2 constraints affect their sensitivity to La constraints to a greater degree than their L1 constraints, then differences in constraint sensitivity should be observed between the two groups. Specifically, La speakers whose L2 aligns with the German La constraint should show more

sensitivity than participants whose L2 does not align with the German La constraint.

Constraint similarity account. If participants La sensitivity under processing pressure is affected by the similarity of the target constraint to a constraint in either of the prior grammars, regardless of the prior language's status as native or non-native, then participants of both groups should show similar degrees of sensitivity to the La constraints, as due to the experimental manipulations either their L1 or L2 instantiate a constraint similar to the La. However, if the likelihood of the effect depends on participants' proficiency in the language sharing the target constraint, then participants whose L1 constraints align with the La should be more sensitive than participants whose L1 constraints do not align with the La. In turn, these latter should show a modulation of their performance depending on their proficiency in the L2, which aligns with the target La constraint due to the design of the studies in this dissertation.

No transfer account. If prior grammars do not affect La speakers' use of grammatical knowledge under processing pressure, La German speakers should not show different degrees of sensitivity to the constraints. However, a general learner effect may be observed to the extent that they might show reduced sensitivity compared to native German speakers.

Note that the terms *facilitative* and *non-facilitative effect* are not used in the predictions that address La speaker group differences. Given that the design included two populations whose L1 and L2 either showed alignment or misalignment with the La constraint, in the event of observing differences between the groups, it would not be possible to attribute the cause of differences to facilitation thanks to alignment or non-facilitation due to misalignment of the prior grammar with the La. A baseline group that showed no alignment/misalignment with the La would be required for the

comparison, from which facilitation or non-facilitation could be derived. As such a group was not tested in this dissertation, any differences between La groups are described comparatively in terms of sensitivity, e.g. L1 Spanish speakers were less sensitive than L1 English speakers in Experiment 4. However, when speaking about the impact of L2 proficiency within each La group, facilitation and non-facilitation were observable thanks to the inclusion of range of L2 proficiency, and hence these terms are used to describe the results. The general predictions based on La findings above are specified for each of the seven constraints tested in this dissertation in their corresponding chapters.

2.5. Summary

Most studies of La grammatical knowledge have investigated the initial stages of acquisition using untimed measures of metalinguistic knowledge. These studies suggest that there are different ways in which prior languages may affect the acquisition of an additional language: some studies suggest that only native constraints are transferred at the initial stages of La acquisition, other studies suggest that only non-native constraints are transferred, whereas a third group of studies argue that it is down to the similarity of the constraints between the languages, or to the similarity of the languages at all levels. Due to the limited scope of this nascent field, the use of La grammatical knowledge under processing pressure and in later stages of proficiency has not been systematically investigated. This dissertation contributes to La research by addressing these two gaps with timed measures of grammatical knowledge with intermediate La speakers. Additionally, it attempts to take research on La speakers a step further in avoiding some of the methodological confounds found in La acquisition research. The following Chapters 3 and 4 present the studies conducted to address the research questions.

Chapter 3

La Sensitivity to word order constraints under processing pressure

3.1. Introduction

This chapter presents a study that investigated whether and how the L1 and L2 grammars of multilingual speakers impact their degree of sensitivity to violations of word order in an La when they are tested during real-time reading. To investigate the role of native and non-native grammars, a control group of German native speakers and two groups of German La intermediate speakers were tested. The two groups of La German speakers showed a mirror L1-L2 distribution: they were either L1 English-L2 Spanish speakers or L1 Spanish-L2 English speakers. The three groups were administered a self-paced reading task with end-of-sentence grammaticality judgments and an untimed grammaticality judgment correction task on three word order phenomena.

Experiment 1 tested the placement of object pronouns in main clauses, which shows similar surface word order in German and English, but a different order in Spanish. Experiment 2 tested the placement of object pronouns in subordinate clauses, which shows the same surface word order in German and Spanish, but a different order in English. Finally, Experiment 3 tested the placement of objects within verbal groups, which requires a word order in German that is illicit in both English and Spanish. While the untimed task ensured that only participants with mature knowledge of the target constraints were included, the goal of the self-paced reading task was to investigate potential differences between the La speakers' in their sensitivity to the constraints as they read the sentences, and in their judgments. It was hypothesized that, if prior grammars affect La speakers' use of grammatical knowledge under time pressure, they should

show differences in their processing and metalinguistic judgments that can be attributed to either the L1 word order or their L2 word order.

The following section 3.2 presents a description of the linguistic differences between German, English and Spanish regarding the three word order phenomena. Section 3.3 discusses studies that have investigated these word order phenomena in La and L2. After these background sections, Study 1 is presented in section 3.4, and the findings are used to discuss a potential account of La grammatical use during real-time processing in section 3.5.

3.2. Object and object pronoun placement in German, English and Spanish

The three German surface word order phenomena investigated in Study 1 were selected for their similarity and dissimilarity to the equivalent word order in English and Spanish. Table 3.1 presents an overview of the differences.

Table 3.1. Overview of the German word order phenomena and the equivalent phenomena in English and Spanish. The experimental manipulation is boldfaced.

Experiment	Language	Example sentences
Exp. 1 Main clause Object pro. Placement	German	Olivers Oma **betrachtete ihn/*ihn betrachtete.**
	English	Oliver's grandma **observed him/*him observed.**
	Spanish	La abuela de Oliver **lo observaba/*observaba lo.**
	Word order is similar in German and English, dissimilar in Spanish.	
Exp. 2 Subord. clause Object pro. Placement	German	Samuel sagte, dass die Nachbarn **ihn hörten/*hörten ihn.**
	English	Samuel said that the neighbours **heard him/*him heard**.
	Spanish	Samuel dice que los vecinos **lo oyeron/*oyeron lo**.
	Word order is similar in German and Spanish, dissimilar in English.	
Exp. 3 Verb group Object placement	German	Das Team darf **Sport treiben/*treiben Sport**.
	English	The team can **practice sports/*sports practice**.
	Spanish	El equipo puede **practicar deporte/*deporte practicar**.
	Word order is present in German, and absent in English and Spanish.	

3.2.1. The placement of object pronouns

Object personal pronouns are placed in different positions in relation to the finite verb in German, English, and Spanish. In German, an SOV language, the placement of the object personal pronoun in main clauses is dependent on German's V2 constraint. This constraint requires the finite verb, which

originally follows SOV word order, to move to second position, leading to a superficial SVO word order (3.1).

(3.1) Ich liebe sie.
I love her.
'I love her.'

Contrary to main clauses, German subordinate clauses do not have verb movement and show SOV word order, placing finite and non-finite verbs at the end of the clause. Therefore, in subordinate clauses, the subject and objects necessarily precede the finite verb (3.2).

(3.2) Er weiß, dass wir ihn lieben.
He knows that we him love.
'He knows that we love him.'

Contrary to German, the placement of object pronouns in English and Spanish (SVO languages) does not depend on the type of clause, but remains the same for main and subordinate clauses. However, when it comes to the object personal pronoun, English and Spanish differ in its placement.

In English, object pronouns are canonically placed after the finite verb. Placement of the object pronoun between the subject and the verb is illicit ((3.3)a-e). Therefore, the placement of object pronouns in English main and subordinate clauses resembles the placement of object pronouns in German main clauses, but not German subordinate clauses.

(3.3) a. We saw Sara.
b. We saw her.
c. *We her saw.
d. We thought we saw her.
e. *We thought we her saw.

Spanish, unlike English and German, has two types of object personal pronouns that take different forms and obey different word order constraints: clitic pronouns and strong pronouns. Both represent an object antecedent, but they are used in different pragmatic contexts: the canonical and unmarked form is the clitic pronoun (*me, te, le/la/lo, nos, os, los/las* for *me, you, him/her/it, us, you, them*), which is placed between the subject and the finite verb in main and subordinate clauses ((3.4)a, b). Placement of the object clitic after the finite verb is illicit in Spanish (3.4).

(3.4) a. (Nosotros) vimos a Sara.
(We) saw PREP Sara.
'We saw Sara.'

b. (Nosotros) la vimos.
(We) her saw.
'We saw her'.

c. *Nosotros vimos la.
(We) saw her.
'We saw her.'

d. (Nosotros) pensábamos que la vimos.
(We) thought that her saw.
'We thought that we saw her.'

Additionally, Spanish also counts with strong object pronouns that are marked and used for emphatic purposes. However, they cannot appear on their own and must be accompanied by a clitic placed before the finite verb (compare (3.5)a and (3.5)b). Strong pronouns appear with the preposition 'a' (*to* in English) **after** the finite verb. Therefore, the placement of unmarked and canonical clitic objects in Spanish main and subordinate clauses resembles the placement of object pronouns in German subordinate clauses, but not German main clauses.

(3.5) a. Nosotros la vimos a ella.
We her.$_{CLITIC.PRO}$ saw PREP her.$_{STRONG.PRO}$.
'We saw her.'
b. *Nosotros vimos a ella.
We saw PREP her.$_{STRONG.PRO}$.
'We saw her.'

Summing up, German, Spanish and English differ in their canonical placement of unmarked object pronouns. German places the object pronouns differently in main and subordinate clauses: whereas in main clauses the object pronoun is canonically placed after the finite verb (3.6), in subordinate clauses it is placed before the finite verb (3.7). English places object pronouns after the finite verb, resembling object placement in German main clauses (3.1), while Spanish places object clitics before the finite verb, resembling the placement of object pronouns in German subordinate clauses (3.2).

(3.6) a. Die Frau liebt ihn.
The woman loves.$_{V}$ him.$_{PRO}$.
'The woman loves him.'

(3.7) a. Er sagt, dass die Frau ihn liebt.
He says, that the woman him.$_{PRO}$ loves.$_{V}$.
'He says that the woman loves him.'

These cross-linguistic differences between German, Spanish and English were used in Experiment 1 on German object pronoun placement in main clauses, in which English and German show similar word order and Spanish does not; and in Experiment 2 on German object pronoun placement in subordinate clauses, in which Spanish and German show similar placement of the object and English does not (Table 3.1).

3.2.2. The placement of objects in complex verb groups

In Spanish, English and German, simple verb groups have a main, lexical verb that carries the lexical meaning and finiteness (3.8). Complex verb groups, however, consist of a finite auxiliary or modal verb and a non-finite form of the lexical verb (3.9), or of more than two verbs.

(3.8) a. Ich ass die ganze Torte.
I ate the entire pie.
b. (Yo) comí la tarta entera.
I ate the pie entire.
c. I ate the entire pie.
'I ate the entire pie.'

(3.9) a. John hat den Zug verpasst.
John has the train missed.$_{LEX.V}$.
b. John ha perdido el tren.
John has missed the train.
'John has missed the class.'
c. John has missed the train.
John has missed the train.

Complex verb groups in German, English and Spanish can be used to represent modality and compound tenses, such as the perfective present tense, both of which were used in Experiment 3. Crucially, English and Spanish verb groups place the finite and non-finite parts of the verb group in contiguous positions following an SVO word order (3.10, 3.11). While English allows certain types of adverbs between the parts of the verb group (e.g. *I have **always** admired your work, I have **definitely** seen the film*) and the negation particle *not* (*e.g. I have **not** seen the film yet)*, Spanish does not allow other words in the verb group.

(3.10) I have missed the train.
I have$_{\text{FINITE}}$ missed.$_{\text{NON.FINITE}}$ the train.$_{\text{OBJECT}}$.

(3.11) He perdido el tren.
(I) have.$_{\text{FINITE}}$ missed.$_{\text{NON.FINITE}}$ the train.$_{\text{OBJECT}}$.
'I have missed the train.'

German, however, allows objects within a verb group in main clauses due to its V2 rule. In main clauses, the finite part of the verb group (the auxiliary or modal verb) is placed in V2 position, while the non-finite, main verb is placed at the end of the clause. This allows for all other words in the clause to be placed between the two verb group constituents (3.12), including objects.

(3.12) Ich habe den Zug verpasst.
I have.$_{\text{FINITE}}$ the train.$_{\text{OBJECT}}$ missed.$_{\text{NON.FINITE}}$.
'I have missed the train.'

Therefore, all three languages differ in the amount of constituents that they allow between the components of a complex verbal group. Crucially for Experiment 3, German allows direct objects between the finite and non-finite parts of the group, while Spanish and English do not.

3.3. The acquisition of object placement in La German

Although there are currently no studies of the processing of object pronoun placement in La German (to my knowledge), several studies of La acquisition have investigated this phenomenon and other related word order phenomena. For instance, Falk & Bardel (2011) investigated the placement of object pronouns in La German using untimed measures of metalinguistic knowledge. This study found that La speakers' use of object pronouns in German was affected by how their L2 instantiated the target constraint, producing facilitation when it aligned with the target word order, and non-

facilitation when it did not align. Similarly, although not directly testing the placement of object pronouns, Bohnacker (2006) looked into the specific acquisition of the V2 rule in La German, and found that knowledge of a non-V2 L2 was detrimental for learning La German. Finally, Montrul, Dias, and Santos (2011) tested the acquisition of La object pronouns in Brazilian Portuguese with the goal of determining whether language status or language similarity was more relevant for transfer of prior grammars.

So far, only Falk and Bardel (2011) have looked specifically into the role of prior grammars in the acquisition of object placement and object pronoun placement in La German. They investigated whether the native and non-native grammars of multilingual speakers affected their acquisition of object pronouns in German main and subordinate clauses. They tested two groups of intermediate La German speakers who showed L1-L2 mirror distributions: L1 French-L2 English speakers and L1 English-L2 French speakers. Participants completed a pen-and-paper grammaticality judgment correction task that had a two by two design: type of clause (main/subordinate), and the grammaticality of the word order (grammatical/ungrammatical). While in main clauses German places pronominal objects after the finite verb, in subordinate clauses it places pronominal objects before the finite verb. French and English, however, have only one canonical placement of object pronouns for both types of clauses: French, like Spanish, places clitic objects before the finite verb (3.13, 3.14), while English places pronominal objects after the verb (3.13, 3.14). This means that the placement of objects in German main clauses is similar to English, while the placement of objects in German subordinate clauses is similar to French clitic placement (3.13, 3.14).

Example from Falk and Bardel (2011), p.60:

(3.13) German: Ich sehe ihn.
I see him.
French: Je le vois.
I him see.

English: I see him.

(3.14) German: Du weisst dass ich ihn sehe.
You know that I him see.
French: Tu sais que je le vois.
You know that I him see.
English: You know that I see him.

Falk and Bardel created the grammaticality violation in each clause type by reversing the placement of the object and verb. While the violation in German main clauses showed a pre-verbal object pronoun, a word order illicit in German and English but licit in French (3.15), the violation in the subordinate clauses showed a post-verbal object pronoun, which is illicit in German and French, but licit in English (3.16). The items contained direct and indirect objects and reflexive pronouns.

(3.15) Ich sehe ihn.
*Ich ihn sehe.

(3.16) […] dass ich ihn sehe.
*[…] dass ich ihn sehe.

To investigate whether their La speakers were differentially affected by their prior grammars, the authors compared the judgment rates of both groups for each sentence type (grammaticality x clause type). They found significant differences between the La groups for each of the four conditions (see acceptance rates in Table 3.2). Specifically, L1 English-L2 French speakers accepted pre-verbal object placement more often than L1 French-L2 English speakers when it was grammatical (in subordinate clauses) and when it was ungrammatical (in main clauses). Because French requires pre-verbal object placement, these findings were taken as evidence that L2 French was facilitating L1 English speakers' judgments for subordinate clauses, and non-facilitating their judgments for main clauses, blocking any effects from their English native tongue even when it was facilitative (i.e. in

main clauses). Similarly, they found that L1 French-L2 English speakers accepted post-verbal object placement more often than L1 English-L2 French speakers when it was grammatical (in main clauses) and when it was ungrammatical (subordinate clauses). Given that English requires post-verbal object placement, Falk and Bardel interpret this as evidence that L2 English facilitated L1 French speakers' judgments for main clauses, and was non-facilitative for their judgments in subordinate clauses, blocking any effects of their French native tongue even when it could have led to the correct response (i.e. in subordinate clauses).

Table 3.2. Acceptance rate in percentages per grammaticality and clause condition for each La group. Adapted from Falk and Bardel (2011), who presented total accuracy scores per condition.

	Main clauses		Subordinate clauses	
	Gram.	Ungram.	Gram.	Ungram.
EnglishL1/FrenchL2	63	71	93	17
FrenchL1/EnglishL2	95	7	86	61

Falk and Bardel's findings suggest that L2 constraints influence the acquisition of German object pronouns. The authors argue that this L2 influence blocks potential effects (facilitative or non-facilitative) from L1 constraints, and suggest that this predominant role of L2 constraints is due to the similarities between the status of the L2 and the La as foreign languages when compared to the nativeness of the L1.

Although not directly testing object pronoun placement in La German, other studies have investigated La word order acquisition (e.g. Bohnacker, 2006; Montrul et al., 2011). For instance, Bohnacker (2006) investigated the acquisition of the OV/V2 rule in *ab initio* La German, and reported how learners placed constituents in relation to the finite and non-finite verb. She investigated a group of L1 Swedish-L2 English-L3 German speakers and a group of L1 Swedish-L2 German learners. While German and Swedish both share the V2 rule that requires the finite verb to be placed in second position

in a clause, English does not. By comparing the production of these two groups, Bohnacker aimed to observe whether knowledge of a non-V2 language such as English had an effect on the correct production of V2 clauses in German. She collected data at three different points in time (at the beginning of instruction, after 4 months and after 9 months), and analysed a total of 1574 clauses that contained a subject and a verb. She found that participants who had not learned English as an L2 did not violate the V2 rule in German, producing the V2 rule in all obligatory contexts after 4 months of instruction, while those who had learned English as an L2 violated the V2 rule in up to 50% of the obligatory contexts. Based on this evidence, Bohnacker claimed that participants' knowledge of a non-V2 language (English) obscured V2 transfer in the trilingual learners.

Montrul et al. (2011) investigated the placement of clitics in beginner and intermediate La Brazilian Portuguese (BP) by two groups of trilingual speakers with mirror L1 and L2 languages: a group of L1 English-L2 Spanish learners of La BP, and a group of L1 Spanish-L2 English learners of La BP. Montrul and colleagues tested their learners with an oral production task and a written grammaticality judgment task. While BP and Spanish have a clitic system, English does not. However, the constraints for the use of the clitics differ between BP and Spanish. Following predictions of the Typological Primacy Model (Rothman, 2011), the authors expected participants to transfer from the language that shows more typological closeness to the target, in this case Spanish, even if this transfer is non-facilitative. Their results showed that participants in both groups produced clitics in ungrammatical contexts that would have been correct word order in Spanish. The same was observed in the written acceptability judgment task, with participants of both groups accepting the erroneous placement of BP clitics in contexts that would have been acceptable in Spanish. Montrul and colleagues concluded that participants transferred their Spanish knowledge (either as L1 or as L2) into the acquisition of the BP clitics due to the typological similarity of Spanish and BP as opposed to English.

Taken together, these studies suggest that prior grammars can have facilitative and non-facilitative effects on the acquisition of word order in La German (Bohnacker, 2006; Falk & Bardel, 2011), as well as in other languages (BP in Montrul et al., 2011). While some of these studies found that participants were only affected by the constraints of their L2 (Falk & Bardel, 2011), other studies suggested that it was the global similarity between the languages that shaped participants' acquisition of the La. Importantly, besides these studies, which looked at participants' untimed metalinguistic knowledge, there are no studies that have investigated the use of La word order constraints during real time comprehension in La speakers who show mature knowledge of the constraints in untimed metalinguistic tasks. Study 1 in this dissertation undertook this task with the goal of finding out whether, as was found in the acquisition studies described above, prior grammars affect La speakers' sensitivity to word order constraints in La German. On the one hand, it is possible that the same factors that led to transfer of prior grammars in the acquisition of the constraints are still relevant during processing at later stages of La proficiency. On the other hand, it is possible that, once participants have acquired the constraints, their processing and metalinguistic judgments are independent of the constraints in their other grammars.

3.4. Study 1: Sensitivity to violations of object placement in La German during reading

So far, studies of the effects of prior languages have focused on La acquisition, using untimed metalinguistic tasks to probe the grammar of La speakers at initial levels of proficiency, and in fewer cases, at intermediate levels of proficiency. Little is known about La speakers' use of grammatical constraints during real-time processing once they have acquired the constraint. Specifically, there is, to our knowledge, no information on whether intermediate La speakers who have shown mature knowledge of the constraint in untimed tasks are capable of applying the constraints during

real-time processing, and whether prior grammars still play a role under these conditions.

The aim of this study is to address these gaps by testing the role of prior grammars in the use of La word order phenomena during intermediate La German speakers' real-time comprehension. The cross-linguistic differences between Spanish, English and German in the placement of object pronouns renders this phenomenon a highly suitable context for testing effects of L1 and L2 constraints in an La. A similar cross-linguistic setting has already been tested in La acquisition studies, which have claimed that La learners' L2 constraints play an essential role in their acquisition of the La German constraint (Bohnacker, 2006; Falk & Bardel, 2011). Equally, the differences in the placement of objects in verb groups in Spanish and English when compared to German render object placement a good baseline phenomenon for assessing how intermediate German La speakers perform in La word orders that are unacceptable in both their L1 and L2.

This study included two tasks: an untimed grammaticality judgment correction task which served to identify and include only participants with mature knowledge of the constraint (above 75% accuracy), and a self-paced reading task with end-of-sentence grammaticality judgments, which was designed to investigate the reading patterns of participants as they encountered violations of word order, and their metalinguistic judgments. Prior L2 processing studies have found that L2 speakers may show entirely different sensitivity to constraints when tested in timed and untimed measures (e.g. Hopp, 2010; Sato & Felser, 2010), showing error-prone processing when put under time pressure. Amongst other accounts, these difficulties have been attributed to processing limitations due to reduced working memory capacity (Mcdonald, 2006; Sagarra & Herschensohn, 2013), difficulty integrating information across different domains (Hopp, 2009; Sorace, 2011; Sorace & Serratrice, 2009), or problems revising their initial parses in light of information presented late in sentences (Hopp, 2013; Jacob & Felser, 2016; Pozzan & Trueswell, 2015). Therefore, one possible outcome is that La speakers show error-free use of their

metalinguistic knowledge in the self-paced reading task, given that they have already acquired the constraint. Another possibility is that, due to processing limitations found in non-native speakers, La speakers' metalinguistic knowledge cannot be retrieved as effectively as in untimed tasks, leading to errors during processing.

In order to observe whether La speakers use metalinguistic knowledge differently due to influence from their prior grammars, we compared a group of L1 English speakers who had learned L2 Spanish, and a mirror group of L1 Spanish speakers who had learned L2 English. They were tested on three word order phenomena. Experiment 1 investigated object pronoun placement in main clauses, similar in German and English but dissimilar in Spanish. Experiment 2 investigated object pronoun placement in subordinate clauses, which is similar in German and Spanish but dissimilar in English. Finally, Experiment 3 tested the placement of object NPs within a verb group, a word order licensed in German but not licensed in English or Spanish.

With this mirror distribution of participants' background and word order phenomena, this study addressed the following research questions:

1) Do native word order constraints affect La German speakers' sensitivity to German word order violations during real-time comprehension?
2) Do non-native word order constraints affect La German speakers' sensitivity to German word order violations during real-time comprehension?

By addressing these specific questions, this thesis aimed to find out which of the four accounts better predicts La grammatical use under processing pressure (i.e. *L1 effect account, L2 effect account, constraint similarity account* and the *no transfer account*).

3.4.1. Method

3.4.1.1. Participants

A group of native speakers of German and two groups of non-native speakers of German as an additional language were recruited to observe the possible effects of a native language (L1) and another non-native language (L2) during the use of word order constraints in an additional language (La). The non-native groups were matched for their proficiency in German, and differed in the distribution of their native language and other non-native language: one group consisted of native speakers of Spanish who spoke English as a second language, while the other group consisted of native speakers of English who had learned Spanish as a second language. A control group of German native speakers was tested in order to obtain a baseline, and to ensure that the results for the experimental groups were not due to task artifacts.

An original pool of 27 L1 Spanish speakers and 23 L1 English speakers were recruited for the study. However, four L1 Spanish speakers and one L1 English speaker were not included in the final participant groups because they did not meet the basic requirements: they had acquired Spanish and English simultaneously since birth, or they had scored under 50% accuracy in the Goethe placement test (Goethe Institut, 2010), equivalent to an intermediate level of proficiency.

The biographical information of the final non-native participants is presented in Table 3.3.

Table 3.3. Demographic and linguistic information of the two La participant groups in Study 1. Ranges in brackets.

	L1 English (n = 22)	L1 Spanish (n = 23)
Age	28 (21 - 60)	27 (19 - 37)
Proficiency La (%)	70 (53 - 97)	63 (50 - 87)
AoA La	21 (11 - 42)	20 (10 - 26)
Length LaA (years)	6 (0.1 - 13)	4 (1 - 11)
L2	Spanish	English
Proficiency L2 (%)	72 (20 - 98)	74 (36 - 98)
AoA L2	15 (6 - 25)	8 (3 - 15)
Length L2A (years)	10 (0.75 - 30)	13 (5 - 21)

3.4.1.1.1 Native speakers of English

Participants were 22 native speakers of English, who had learned Spanish and German as second languages. The group was recruited via social media posts and language academies. They completed the tasks in Germany, where they were residing at the time. Participants had an intermediate mean level of German proficiency (70% according to the Goethe placement test, a B1 level in the CEFR). Their mean proficiency in Spanish was intermediate, 72% according to the compounded score of DELE (Spanish Embassy, Washington, DC, USA) and MLA (Educational Testing Service, Princeton, NJ, USA). Participants in this group showed above-chance accuracy in the filler items of the self-paced reading task, which indicates that they were capable of making grammaticality judgments while carrying out the task. Although an effort was made to recruit participants that only spoke the three languages relevant to this study, some participants had learned additionally other second languages. Of the 22 participants, 15 had learned additional languages. The majority had learned French (n = 9), whilst other languages included Arabic (n = 2), Dutch (n = 1), Portuguese (n = 1), Russian (n = 1), Swedish (n = 2), Danish (n = 2), Finnish (n = 1), Norwegian (n = 1), and Punjabi (n = 1). In most cases, these participants had only learned one of these additional languages (n = 11). Finally, six participants had learned

German before Spanish, while the rest of the participants in the group had learned Spanish before German (n = 16).

3.4.1.1.2. Native speakers of Spanish

Participants were 23 native speakers of Spanish who had learned English and German as second languages. All of them resided in Berlin at the time of testing, and had been contacted through social media posts and language schools. Their mean age was 27 years (range 19-37 years), their mean level of German was also intermediate (63% according to the Goethe Einstufungstest, equivalent to a B1 level in the CEFR). Their mean level of English proficiency was intermediate-advanced (74% according to the Oxford Placement Test II, equivalent to a B2 in the CEFR). They showed above-chance accuracy in the filler items of the self-paced reading task, which confirms that they were capable of making grammaticality judgments while carrying out the task. An effort was made to recruit L1 Spanish participants that only spoke the three languages relevant to this study. However, some participants had learned additionally other second languages. Of the 23 participants, approximately half spoke another foreign language (n =13), in most cases French (n = 7). Other languages participants spoke: Latin and Greek (n=1), Italian (n = 2), Catalan (n = 2), Chinese (n =1) and Russian (n = 1). In most cases, participants only spoke one of these languages (n = 9).

3.4.1.1.3. Native speakers of German

24 native speakers of German (mean age: 24, range: 19-31) were recruited and taken as a baseline for Experiments 1 - 3. In order to minimize the potential impact of other languages on the performance of the native speakers on the SPR, only participants that reported low proficiency in their foreign languages were selected. They were primarily drawn from the campus population at the University of Potsdam.

3.4.1.2. Design of the materials

The three experiments in this study were designed following a 2x3 design: *condition* (grammatical/ungrammatical) and *language group* (L1 German/L1 English/L1 Spanish). Each experiment investigated sensitivity to a different type of word order in German with a non-cumulative, moving window self-paced reading task. Participants had to make end-of-sentence grammaticality judgments within a two-second time-out. An untimed grammaticality judgment correction task was used to select only participants that showed mature knowledge of the constraint when no processing pressure was applied. Mature knowledge was set at the threshold of 75% accuracy in the untimed task, a measure used in recent La acquisition studies to determine whether the constraint was acquired or not in grammaticality judgment tasks (Falk & Bardel, 2011; Foote, 2009; Hsien-jen Chin, 2009).[1] Although it is an arbitrarily selected threshold, it should filter out participants who are at chance level (50% accuracy), and select from the remaining ones those who can apply it consistently (75% and over).

The three experiments were conducted in a single testing session, during which participants first completed the SPR with the pseudo-randomized items from Experiments 1-3, and then the untimed grammaticality judgment task, with pseudo-randomized items from Experiments 1-3. Afterwards, participants completed a vocabulary checklist and the proficiency tests.

The following sections present the design of each task and the materials included. The procedure is described afterwards.

3.4.1.2.1. Self-paced reading judgments

Each self-paced reading experiment consisted of a total of 20 experimental items in two conditions: grammatical/ungrammatical. The grammaticality manipulation reversed the position of the finite verb and the object in the critical region (boldfaced in (3.17-3.19)), leading to an ungrammatical word

[1] Other studies have used different measures (Eubank et al., 2016; Eubank and Grace, 1996 set the minimum accuracy at 70% correct production of morphemes as sign of acquired constraints).

order in German. This was the case for all three experiments: Experiment 1 on object placement in main clauses (18), Experiment 2 on object placement in subordinate clauses (19) and Experiment 3 on object placement in verb groups (20).

(3.17) a. Olivers alte Oma **betrachtete ihn** täglich durch das Fenster.
Olivers old grandma **observed him** daily through the window.
b.*Olivers alte Oma **ihn betrachtete** täglich durch das Fenster.
Olivers old grandma **him observed** daily through the window.
'Oliver's old grandma him observed daily though the window.'

(3.18) a. Samuel erzählte, dass die Nachbarn **ihn hörten** und sofort
Samuel said that the neighbours **him heard** and immediately
reagierten.
reacted.
b. *Samuel erzählte, dass die Nachbarn **hörten ihn** und
Samuel said that the neighbours **heard him** and
sofort reagierten.
immediately reacted.
'Samuel said that the neighbours heard him and immediately reacted.'

(3.19) a. Der Mitarbeiter hatte **Proteste organisiert,** denn er war
The worker had **protests organized** because he was
unzufrieden.
unsatisfied.
b.*Der Mitarbeiter hatte **organisiert Proteste,** denn er war
The worker had **organised protests** because he was
unzufrieden.
unsatisfied.
'The worker had organized protests because he was unsatisfied.'

Items were shown in a non-cumulative, moving window presentation: participants saw the sentence structure in dashes for each letter of a word. At the end of each item, participants were prompted to make a grammaticality judgment (see the procedure description in section 3.4.1.8 for more details).

Note that self-paced reading tasks generally use comprehension questions to check participants' sentence processing for comprehension. However, the goal of this study was to observe whether participants differed in how they process a sentence when they are explicitly requested to use their metalinguistic knowledge, and whether they show differences in the outcome of this processing, depending on how their L1 and L2 instantiate the La word order.

To ensure that any effects were due to the grammatical manipulation and not due to task effects, the number of words per sentence was kept uniform within each experiment and the critical region was located in the same position. The syntactic structure before the critical region was kept identical within experiments, and a spillover region of at least two words was present after all critical regions. As the critical region involved a verb in all three experiments, all verbs in the region were checked for strong transitive subcategorisation bias using Schulte im Walde and Brew's (2002) list. This ensured that upon reading the verb in the ungrammatical items of Experiment 1 and 3, participants would not perceive the sentence as complete but would instead be encouraged to search in subsequent regions for the object of the mentioned verb.

The critical region in Experiment 1 and 2 also included a direct or an indirect object pronoun. Due to the ambiguity that some German object pronouns involve (e.g. *sie* can refer to 3rd person singular feminine in nominative and accusative, i.e. "she/her", as well as 3rd person plural nominative and accusative "they/them"), only the following pronouns were used for the experiment: *ihn* (3rd person singular masculine, direct object), *ihm* (3rd person singular masculine, indirect object), *dich* (2nd person singular, direct object) and *dir* (2nd person singular, indirect object). The

sentences were constructed so that the pronouns always had a clear antecedent that did not match other potential referents (3.20):

(3.20) Marks amerikanische Cousinen trafen ihn […]
Mark's American cousins met.$_{PRS.3PL}$ him.$_{PRS.1SG}$ [...].
'Mark's American cousins met him […]'.

The vocabulary used in the experimental items was selected to match the knowledge of intermediate users of German (B1 in the Common European Framework of Reference for Languages, CEFR), so that the learner population would not encounter comprehension difficulties. Verbs and nouns were extracted from the vocabulary available in the B1 certificate preparation book of the Goethe Institut (Glaboniat, Perlmann-Balme, & Studer, 2012), and items with the highest frequency were then selected.

Two pseudo-randomised lists were created with all items: 70 items in total for the three experiments, 20 items per experiment and 10 fillers. The items were arranged in a Latin square design so that each participant would see only one condition of each item, allowing the occurrence of no more than three consecutive items from the same experiment. The two lists were duplicated and the item order was manipulated so that the first block (35 items) would appear in the second half of the duplicate list, and the second half of the list (35 items) would appear in the first half of the duplicate. With these four lists, possible task effects such as tiredness, strategy development or distraction could be controlled for.

3.4.1.2.2. Untimed grammaticality judgments

Each SPR experiment had its equivalent untimed grammaticality judgment correction task that addressed the same word order phenomenon in the same conditions (grammatical/ungrammatical). The task was designed to ensure that participants had mature knowledge of the structure under study. The baseline of 75% accuracy in untimed tasks has been previously used in L2 and La studies (Falk & Bardel, 2011; Foote, 2009; Hsien-jen Chin, 2009).

Participants were presented the task on paper and were given unlimited time to complete it. Sentences from all three experiments (six items per experiment, and six fillers) were listed on the sheet, with two options next to each sentence: correct/incorrect. Participants were asked to tick either of the boxes depending on their judgment, and in case they considered a sentence incorrect, they were asked to offer the correct alternative in the space provided next to each sentence.

The number of words was kept constant in each experiment, with the critical region situated in the same position of the sentence. Likewise, the vocabulary was kept to a lower-intermediate level to avoid comprehension difficulties. Two pseudo-randomised, Latin square design lists were created with the items of each experiment (24 items in total), which were duplicated in order to obtain two further lists with reversed order. Participants were assigned to one of four lists. The linguistic design of each the sentences for each experiment is described in the next sections.

Participants' answers were considered correct when:

a) They marked a grammatical item as "correct".
b) They marked an ungrammatical item as "incorrect", and made the appropriate correction.

Their answers were marked as incorrectly responded when:

a) They marked a grammatical item as "incorrect".
b) They marked an ungrammatical item as "correct".

The following answers were excluded from the analyses:

They marked an ungrammatical item as "incorrect" but provided no correction, or corrected an unexpected part of the sentence that had no relation with the experimental manipulation.

3.4.1.3. Experiment 1: Object pronoun in main clauses

Items in Experiment 1 displayed a nine-word long declarative main clause with a personal object pronoun (3.21).

(3.21) a. Olivers alte Oma betrachtete ihn täglich durch das Fenster.
Olivers old grandma observed him daily through the window.

b.*Olivers alte Oma ihn betrachtete täglich durch das Fenster.
Olivers old grandma him observed daily through the window.
'Oliver's old grandma him observed daily though the window.'

The critical region was preceded by a 3-word noun phrase and succeeded either by a 4-word adverbial phrase or by a prepositional phrase. Of the 20 experimental items, half contained the 3rd person masculine object pronoun in the direct form *ihn* (five items) or in the indirect form *ihm* (five items). The other half of the experimental items contained the 2nd person object pronoun in the direct form *dich* (five items) or in the indirect form *dir* (five items). Only these forms were used, in order to avoid the potential ambiguity of other personal object pronouns in German.

Grammatical items showed a word order similar to the placement of object pronouns in English, and dissimilar to Spanish. Ungrammatical items presented an erroneous pre-verbal object pronoun, ungrammatical in German (3.22) and English (3.23), but grammatical in the Spanish equivalent word order (3.24).

(3.22) a. Olivers Oma betrachtete ihn.
Oliver's grandma observed him.
b. *Olivers Oma ihn betrachtete.
Oliver's grandma him observed.
'Oliver's grandma observed him.'
(3.23) La abuela de Oliver lo observaba
The grandma of Oliver him observed.
(3.24) Oliver's grandma observed him.

The items in the untimed task (n = 6) were made up of an initial noun phrase, followed by the critical region and ending with an adverbial phrase (3.25).

(3.25) a. Karinas komplizierte Argumente überzeugten dich nie.
Karina's complicated arguments convinced you never.

b.*Karinas komplizierte Argumente dich überzeugten nie.
Karina's complicated arguments you convinced never.
'Karina's complicated arguments never convinced you.'

As in the SPR task, half of the items contained the direct form of either the 2nd person singular object pronoun, or the 3rd person singular object pronoun (*dich*, n = 1; *ihn*, n = 2). The other half contained the indirect version of the pronouns (*dir*, n=1; *ihm*, n = 2).

For an entire list of the SPR items, see Appendix A.2, for untimed items, see Appendix A.3.

3.4.1.4. Experiment 2: Object pronoun in subordinate clauses

Items in Experiment 2 displayed a ten-word long subordinate clause with a personal object pronoun (3.26).

(3.26) a. Samuel erzählte, dass die Nachbarn ihn hörten und sofort
Samuel said that the neighbours him heard and immediately
reagierten.
reacted.

b. *Samuel erzählte, dass die Nachbarn hörten ihn und sofort
Samuel said that the neighbours heard him and immediately
reagierten.
reacted.
'Samuel said that the neighbours heard him and immediately reacted.'

The critical region was preceded by a main clause with a proper name or a personal subject pronoun (such as *ich, du* or *wir*, 'I, you, we'), followed by a verb that introduced a subordinate clause. The subordinate clause began with the subordinate conjunction *dass* (that), and was followed by the

subject of the subordinate clause (a noun phrase), which mismatched the pronoun in gender or number in order to avoid potential ambiguity. The critical region appeared next, made up of the object pronoun and the main verb of the embedded clause. As in Experiment 1, half of the items contained the 3rd person masculine direct object pronoun *ihn* (five items) or the 3rd person masculine indirect object pronoun *ihm* (five items). The other half of the experimental items contained the 2nd person object pronoun in the direct form *dich* (five items) or in the indirect form *dir* (five items). The spillover region consisted of a 3-word copulative or adversative clause, introduced by either *und* (and), *oder* (or), or *aber* (but).

Grammatical items showed a word order similar to the placement of object pronouns in Spanish, and dissimilar to English. Ungrammatical items presented an erroneous post-verbal object pronoun, ungrammatical in German (3.27) and Spanish (3.28), but grammatical in the English equivalent word order (3.29).

(3.27) a. Samuel sagte, dass die Nachbarn ihn hörten.
Samuel said that the neighbours him heard.
b.*Samuel sagte, dass die Nachbarn hörten ihn.
Samuel said that the neighbours heard him.
'Samuel said that the neighbours heard him.'

(3.28) Samuel dice que los vecinos lo oyeron.
'Samuel said that the neighbours him heard.'

(3.29) Samuel said that the neighbours heard him.

The manipulation of the untimed judgments in the pen-and-paper task followed the same design, with six items in two grammaticality conditions, but did not include a spillover region (3.30).

(3.30) a. Robert erzählte, dass die Künstlerin ihn fotografierte.
Robert said that the artist.$_{FEM}$ him.$_{pro}$ photographed.$_{V}$.'
b. *Robert erzählte, dass die Künstlerin fotografierte ihn.
Robert said that the artist.$_{FEM}$ photographed.$_{V}$ him.$_{pro}$.

'Robert said that the artist photographed him.'

3.4.1.5. Experiment 3: objects in verb groups

Items in Experiment 3 showed a nine-word long sentence which included main clause with a verb group (3.31).

(3.31) a. Der Mitarbeiter hatte Proteste organisiert**,** denn er war
The worker had protests organized because he was
unzufrieden.
unsatisfied.

b. *Der Mitarbeiter hatte organisiert Proteste**,** denn er war
The worker had organised protests because he was
unzufrieden.
unsatisfied.
'The worker had organized protests because he was unsatisfied.'

The critical region (bolded in (3.31) above) was preceded by a noun phrase and the declined form of the auxiliary *haben* ('to have') in half of the items, or by a modal verb *(können, dürfen* – 'can', 'be allowed') in the other half. The critical words appeared next, containing the object noun phrase and the non-finite, lexical verb (e.g. *organisiert Proteste* in the example above). The spillover region was then made up of a copulative, adversative or causal clause, which was introduced either by *und, aber*, *denn* or *weil* ('and, but, as, because'). In the grammatical condition, the critical region showed the object followed by the non-finite lexical verb (e.g. [*hatte*] *Proteste organisiert* – '[had] protests organised'). This word order is grammatical in German, but ungrammatical in Spanish and English. The ungrammatical condition reversed this order, presenting the object phrase after the non-finite, lexical verb (e.g. [*hatte*] *organisiert Proteste* – '[had] organized protests'. This word order is ungrammatical in German (3.32), but grammatical in Spanish (3.33) and English (3.34).

(3.32) a. Das Team darf Sport treiben.
The team can sports.$_{NP}$ practice.$_{V}$.
b. Das Team darf treiben Sport.
The team can practice.$_{V}$ sports$_{.NP}$.
'The team can practice sports.'

(3.33) El equipo puede practicar deporte.
The team can practice.$_{V}$ sport$_{.NP}$.
'The team can practice sports.'

(3.34) 'The team can practice sports.'

The untimed, pen-and-paper judgments of Experiment 3 (n = 6) followed the same design, without a spillover region (3.36).

(3.35) a. Das Buch hat Preise gewonnen.
The book had prizes.$_{N}$ won.$_{V}$.
b. *Das Buch hat gewonnen Preise.
The book had won.$_{V}$ prizes.$_{N}$.
'The book had won prizes.'

3.4.1.6. Fillers

Besides Experiment 3 in which Spanish and English converge, and which served as a baseline, a series of fillers were added to the tasks. This ensured that participants had sufficient knowledge of German and were capable of completing the task. They also served to distract participants from the main structures tested by the experimental items.

A total of ten fillers were interspersed among the experimental items in the self-paced reading task (3.36), and a total of six were included in the untimed judgment task (3.37). These fillers started with a prepositional or adverbial phrase in order to break with the monotony of initial noun phrases, which had been used in Experiment 1-3. Their grammaticality manipulation was located in different sections of the sentence, including initial and final positions. The goal was to counterbalance the experimental

items, in which the critical region was always located in the same mid-sentence position. The grammaticality violations focused on constraints extraneous to the word orders tested in Experiments 1-3 (example (3.36), see Appendix A.2.4 for the full list of SPR fillers, and A.3.4 for untimed fillers):

(3.36) Self-paced reading filler

*Gestern hat der Bär einen großen Fisch fressen.
Yesterday has the bear a big fish eat.
'Yesterday ate the bear a big fish.'

(3.37) Untimed judgment filler

*Auf diesem Baum sitzen der Koalabär schon stundenlang.
On this tree sit.$_{PL}$ the koala-bear.$_{SG}$ already hours.
'The koala bear has been sitting on this tree for hours now.'

3.4.1.7. Proficiency tests and vocabulary checklists

3.4.1.7.1. Vocabulary checklist

Participants completed a vocabulary checklist that included the nouns and verbs in the regions of interest for the three experiments (see the entire list in Appendix A.6). The list also included the nouns that were presented in the first noun phrase of each experimental item, since these were fundamental for the correct understanding of the items. Participants were instructed to read the checklist after they had completed the SPR and the untimed judgment task. They had to cross the words in the list which were unfamiliar to them, and which they would not know how to use in a sentence. The experimental sentences containing words that had been marked as 'unknown' were excluded from the analyses on a by-subject basis to ensure that any results were not due to lack of knowledge of the critical vocabulary.

3.4.1.7.2. Proficiency tests

The level of proficiency in the participants' La German was determined by the Goethe-Institut Einstufungstest, a 30-question placement test (Goethe Institut, 2010). A minimum of 50% correct answers, equivalent to a B1 in the CEFR, was required for participation in the experiments.

The level of proficiency in the participants' L2 (Spanish or English) was assessed with a shortened version of official placement tests: the Oxford English Placement Test (Allan, 1992) Part II as a measure of L2 English proficiency; and a combination of the reading/vocabulary section of the MLA Cooperative Foreign Language Test (Educational Testing Service, Princeton, NJ) and a cloze test from the Diploma de Español como Lengua Extranjera (Spanish Embassy, Washington, DC) as a measure of L2 Spanish proficiency. No minimum level of proficiency was required for the L2 placement tests, as this factor was included as a continuous variable in the statistical analyses of participants' judgments and reading times.

3.4.1.8. Procedure

Before starting the experiment, participants were informed of the general purpose of the study, although the exact structures under scrutiny were not revealed. They were then asked to complete the consent form (Appendix A.8). Both steps were conducted entirely in the mother tongue of the participants so that they understood the relevant information clearly. Subsequently, they were given explicit instructions for each task orally, which were supplemented by written instructions in German, the language of testing. Participants were also informed that they could take a break after each task, and in the explicitly designated part of the SPR task (indicated with a message in the middle of the screen upon finishing the first half of the items).

The SPR was conducted on a 17" experimental laptop with the experimental software package DMDX (Forster & Forster, 2003), which recorded the reading times (RTs) and responses to the grammaticality questions. Participants were seated approximately 50cm away from the

screen, and they were asked to hold a game pad with both hands, so that they could easily press the right and the left button of the pad to respond to the grammaticality judgment question after each sentence. These buttons also served to pace the display of the words in each sentence.

The presentation of the experiment was adapted for both right and left-handed participants, so that right-handed participants would use the right button to indicate "correct", and left-handed could use the left button for the same purpose. In order to ensure that the participants had familiarized themselves with the experimental instruments as well as with the task, four practice items of the SPR were completed with the help of the researcher.

After the participants confirmed they had understood the mechanism of the SPR task, they were left to themselves with the experimental part of the task, and they were asked to focus on the sentences, following a steady pace that allowed them to carefully read the sentences and to respond to the grammaticality questions. The SPR was constructed in a non-cumulative version of the moving window. After the final word of the sentence, the grammaticality question prompt "korrekt ? inkorrekt" (correct ? incorrect) appeared in the middle of the screen, the positions of the answers corresponding to the position of the correct/incorrect buttons on the game pad. Once the selection was made, the participants proceeded to the next trial.

Upon completion of the self-paced reading task, participants completed the untimed pen-and-paper judgment task. Participants were asked to read each sentence carefully and determine whether it was grammatically correct or incorrect, marking the appropriate box next to the sentence. If they detected an incorrect sentence, they should mark the section that contained the mistake, and adequately correct it (see Appendix A.5 for the task template). Once the questionnaire was concluded, they were asked to read through the vocabulary checklist, and mark those words that they did not recognize.

After the vocabulary checklist, the La German groups completed their corresponding L2 and La German language tests. They first completed the

German Goethe Einstufungstest, and then their respective L2 language test: the L1 Spanish-L2 English group completed the adapted English placement test, while L1 English-L2 Spanish group completed the adapted Spanish placement test.

The experimental sessions took place in a silent room in either the laboratory at the Potsdam Research Institute for Multilingualism, or at the experimenter's private residence. In some occasions, the experiment was conducted in a public library, in a silent and private environment. The testing session lasted approximately 70 minutes (or 30 minutes for the native German control group, who did not complete any proficiency tests). All participants were rewarded with 8 Euros for their participation, while the control group was rewarded with 4 Euros, given that they required half the amount of time and tasks. All participants were given the option to follow up the results of the study, as well as their performance in the proficiency tests. If they agreed to participate in further studies, they were not informed of the specific structures tested in the experiment. If they decided to not participate in further experiments, and enquired about the specifics of the study, participants were debriefed.

The order of tasks was as follows:

1. Greeting
2. Participant background information and consent form
3. Precise instructions for the self-paced reading task, examples and explanations
4. Self-paced reading task with timed grammaticality judgments
5. Untimed acceptability judgment correction task
6. German Goethe Einstufungstest (Proficiency Test) and second language test (DELE for L2 Spanish; the Oxford Placement Test II for L2 English)
7. Vocabulary checklists
8. Feedback from participants
9. Congratulations and compensation for their efforts

3.4.1.9. Data analysis for Study 1

3.4.1.9.1. Judgments

Analyses of participants' SPR grammaticality judgments for each experiment were conducted on the data of participants who had shown 75% or higher accuracy in the corresponding untimed judgment task. This required the exclusion of two participants from the L1 Spanish group and one from the L1 English group in Experiment 1, two participants from the L1 Spanish group and one from the L1 English group in Experiment 2, and one participant from the L1 English group and one from the L1 Spanish group in Experiment 3. Further, items that contained vocabulary marked as unknown by a participant were excluded on a subject-by-subject basis. This consisted of 2.58% of the data in Experiment 1, 1.37% in Experiment 2 and 0.08% in Experiment 3. Finally, responses that had taken over 3 seconds were excluded from the remaining data,[2] which consisted of 2.2% for Experiment 1, 2.9% for Experiment 2 and 2.3% for Experiment 3.

Three main analyses were conducted on the final grammaticality judgment data to investigate the research questions. Each analysis consisted of a general linear mixed effects model with the response variable coded as 1 when the participants rated an item as "correct", and 0 when the item was rated as "incorrect". The goal of these analyses was to find out how often participants accepted a sentence as correct when it was grammatical and when it was ungrammatical.

The first analysis examined whether the judgments of the two La German groups differed. The goal of this analysis was to assess the role that their L1-L2 background played in their grammaticality judgments, i.e. the first research question of Study 1. To address this question, the analysis was restricted to the non-native speakers. The model consisted of the fixed effects of Language Group (L1English/L1Spanish), Condition

[2] Participants were not given a timeout of 3000ms but were asked to give an answer as fast as possible. Given that 3000ms was also the timeout for responses in Study 2, and that there were several outliers with response times up to 5000ms, this cutoff point was selected.

(grammatical/ungrammatical) and their interaction, as well as a fixed effect of German proficiency, which was coded as a centered continuous variable obtained from the tests' range of 1 (low proficiency) to 30 (high proficiency) from the Goethe Einstufungstest. The random effects structure of the model contained random intercepts for subjects and items. If the combination of background languages (L1-L2) had an effect on participants' acceptability judgments, there should be a significant interaction between Language Group and Condition. Specifically, if participants' L1 affected their sensitivity to word order violations (*L1 effect account*), then participants whose L1 had similar word order to the German target structure should accept more grammatical items and fewer ungrammatical items than participants whose L1's word order constraints differed from those in German. However, if participants' L2 played a larger role than their L1 in their sensitivity to the violations (*L2 effect account*), the group whose L2 word order was similar to the target should accept more grammatical and fewer ungrammatical items than the participants whose L2 constraints differ from German. If both, L1 and L2 had an impact based on their similarity to the constraint (*constraint similarity account*), then participants whose L1 had similar word order to the German target structure should accept more grammatical items and fewer ungrammatical items than participants whose L1's word order constraints differed from those in German, but the latter group should see an increase in correct judgments as L2 proficiency increases (see next analysis). Lastly, if the combination of background languages had no effect on the judgments of the La German groups (*no transfer account*), the interaction of Language Group by Condition should not be significant.

The second analysis investigated whether participants' L2 proficiency modulated their grammaticality ratings within each La group, regardless of whether their L1 or L2 affected their judgments to a larger extent. To investigate this question, each non-native group was analyzed separately using a fixed effect of Condition (grammatical/ungrammatical), L2 proficiency, and their interaction, and La German proficiency. L2 and La

proficiency were coded as centered continuous variables obtained from an original range of 1 (low proficiency) to 50 (high proficiency). The random effects structure of the model contained random intercepts for subjects and items. If participants' L2 proficiency was a significant predictor of their judgments, then the interaction of Condition by L2 Proficiency should be significant. If L2 proficiency had a facilitatory effect for those speakers whose L2 constraints are similar to the target word order, these participants should show an increase in correct acceptance and in correct rejection of the sentences as their L2 proficiency increases. If L2 proficiency had a detrimental effect for those participants whose L2 constraints are dissimilar to target word order, these participants should show a decrease in correct acceptance and correct rejection of the sentences as their L2 proficiency increases. If L2 proficiency does not modulate La German speakers' judgments, no interaction between Condition (grammatical/ungrammatical) and L2 Proficiency should appear.

A third analysis was conducted to investigate whether native speakers and La speakers of German differed in their acceptability judgments. This information is relevant for testing the prediction of the *no transfer account*, and to observe whether the performance of a native speaker in these tasks was as expected. The model contained fixed effects of Language Group (native/non-native), Condition (grammatical/ungrammatical) and their interaction. The random effects structure contained random intercepts for subjects and items. A significant interaction of Language Group by Condition would indicate that the La German speakers behaved differently from native speakers in their grammaticality judgments. German native speakers were expected to show greater differences in their acceptability ratings between the grammatical and ungrammatical conditions as compared with the non-native speakers. That is, L1 German speakers should accept more grammatical items and fewer ungrammatical items than non-native La German speakers, given that the latter were B1 German speakers, and hence significantly less proficient than native German speakers.

All analyses were carried out using the *glmer* function from the lme4 package (Bates, Maechler, Bolker, & Walker, 2014) in R (R Development Core Team, 2014).

3.4.1.9.2. Reading Times

As is customary in psycholinguistic research, only the reading times of correctly responded items were analysed. Processing difficulty was taken to be reflected in slower reading times, which may also be accompanied by overall low accuracy rates (Blackwell, Bates & Fisher, 1996; McElree & Griffith, 1995; Meng & Bader, 2000; Sato & Felser, 2010). As violations of grammaticality have been found to elicit greater processing costs than the reading of grammatical items, participants' reading times to ungrammatical items were predicted to be longer than for grammatical items.

Analyses were conducted on the critical region where the violation manipulation was implemented, and the two subsequent words (used to capture any delayed effects caused by the violation, and henceforth termed the spillover region, Table 3.4). The mean reading times of the two words contained in the critical region were collapsed into one measure per sentence per subject for each experiment, as was necessary in order to compare the two conditions, which presented the critical words in reversed order. The two words following the critical region were analysed as Spillover 1 and Spillover 2.

Table 3.4. Example of critical and spillover regions for items in Experiment 1.

P1	P2	P3	Critical	Spill. 1	Spill. 2	P8	P9
Olivers	alte	Oma	betrachtete ihn	täglich	durch	das	Fenster.
*Olivers	alte	Oma	ihn betrachtete	täglich	durch	das	Fenster.

By comparing the mean reading times of the words involved in the critical region of the violation (**ihn betrachtete* above) and the spillover (*täglich durch*) to the same words in the grammatical condition (*betrachtete ihn* and *täglich durch*), it should be possible to observe whether participants

were affected by the violation: longer reading times at the violation and at the spillover regions compared to the grammatical condition were taken to indicate that participants were incurring processing difficulties, and hence that they were sensitive to the violation.

The analyses of these regions were conducted on the reciprocal-transformed reading time values of the correctly responded trials, as calculated by the box-cox formula of the R package Mass (Venables & Ripley, 2002), used to correct the usual non-normal distribution of reading time values in reading tasks. Excluded incorrectly responded trials for these reading time analyses consisted of 7.3% of items for Experiment 1, 10% for Experiment 2 and 9.3% for Experiment 3. Excluded items with raw reading times (henceforth RTs) shorter than 200 msec and longer than 3000 msec were excluded, as in other self-paced reading studies (e.g. Hofmeister, 2011; Vasishth & Drenhaus, 2011). This amounted to 1.5% of items in Experiment 1, 1.9% in Experiment 2 and 1.42% in Experiment 3.

With the remaining data points, three different analyses were conducted to investigate the research questions. Each analysis consisted of a linear mixed effects model with the reciprocal-transformed RT values as the response variable for each region of interest.

The first analysis examined whether the two La German groups differed from each other. The goal of these analyses was to assess whether their L1-L2 background differentially affected their reading patterns. The model consisted of the fixed effects of Language Group (L1English/L1Spanish), Condition (grammatical/ungrammatical) and their interaction, as well as a fixed effect of German proficiency, which was coded as a centered continuous variable obtained from an original range of 1 (low proficiency) to 30 (high proficiency). The random effects structure of the model contained random intercepts and for subjects and items. If the type of L1-L2 language combination played a role in the processing of the sentences, the interaction of Language Group by Condition should be significant. Specifically, if participants' L1 affected their reading patterns more than their L2 (*L1 effect account*), then participants whose L1 had a similar word

order to the target should show longer RTs for the ungrammatical condition than for the grammatical condition at the critical region and potentially at the spillover regions. However, if participants' L2 word order constraints played a larger role than their L1 (*L2 effect account*), then participants whose L2 is similar to German in its grammatical constraints should show longer RTs at the violation and potentially at the spillover regions. If both L1 and L2 had an impact based on their similarity to the constraint (*constraint similarity account*), then participants whose L1 had similar word order to the German target structure should show longer RTs at the violation and spillover regions than participants whose L1 word order constraints differed from those in German, but these latter should see an increase in RTs to the violation and in the spillover region as L2 proficiency increases (see next analysis). If the background L1-L2 combination does not affect La German speakers (*no transfer account*), the interaction should not be significant (see Table 3.5 for a summary of the predictions).

The second analysis investigated whether participants' L2 proficiency modulated their reading times in La German, regardless of whether the L1 or L2 affected their reading patterns to a larger extent. To investigate this question, each non-native group was analyzed separately using a fixed effect of Condition (grammatical/ungrammatical), L2 proficiency, and their interaction, and La Proficiency. L2 proficiency was coded as a centered continuous variable obtained from an original range of 1 (low proficiency) to 50 (high proficiency). The random effects structure of the model contained random intercepts for subjects and items. If participants' L2 proficiency was a significant predictor of their reading patterns, then the interaction of Condition by L2 Proficiency should be significant. If L2 proficiency had a facilitatory effect for those speakers whose L2 constraints are similar to the target structure's constraints, these participants should become more sensitive to the violation, showing slower reading times in the ungrammatical condition as their L2 proficiency increases. If L2 proficiency had a detrimental effect for those participants whose L2's constraints are dissimilar to the constraints of the target structure, these participants should

show decreased sensitivity to the violation, with faster reading times for the ungrammatical condition as their L2 proficiency increases. If L2 proficiency does not modulate the metalinguistic processing of the sentences, participants' reading times should not show a significant interaction between L2 proficiency and Condition.

A third analysis was conducted on participants' reading times to investigate whether there was a difference between German native speakers and La intermediate German speakers in their reading times. This analysis was necessary to test the prediction of the *no transfer account*, and to observe whether the performance of native speakers in these tasks was as expected. The model contained fixed effects of Language Group (native/non-native), Condition (grammatical/ungrammatical) and their interaction. The random effects structure contained random intercepts for subjects and items. German native speakers were expected to show longer RTs for the ungrammatical sentences than for the grammatical sentences at the critical region due to the processing costs associated with grammatical violations. If non-natives resemble native speakers in their degree of sensitivity to violations during reading, the interaction of Language Group by Condition should not be significant. However, if the non-native speakers do show reduced or increased processing costs through a reduction or increase in their reading times compared to native speakers, then the interaction of Language Group by Condition should be significant for each of the regions where native and non-native speakers differ.

Table 3.5. Predictions for judgment and RT data in Study 1 based on each of the La transfer accounts (by column), broken down by expected La group differences and expected L2 proficiency effects.

	L1 effect	L2 effect	Constraint similarity	No transfer
Judgments 1. La group differences 2. L2 proficiency effects	1. La speakers whose L1 aligns with La constraint accept more grammatical and fewer ungrammatical items than participants whose L1 does not align with La. 2. No L2 proficiency effects.	1. La speakers whose L2 aligns with La constraint accept more grammatical and fewer ungrammatical items than participants whose L2 does not align with La. 2. No L2 proficiency effects.	1. Same prediction as *L1 effect account*. 2. La speakers whose L2 aligns with La constraint accept more grammatical and fewer ungrammatical items as L2 proficiency increases.	1. No differences. 2. No effects.
RTs 1. La group differences 2. L2 proficiency effects	1. La speakers whose L1 aligns with La constraint show increased RT differences between conditions at the violation and spillover regions than participants whose L1 does not align with La. 2. No L2 proficiency effects.	1. La speakers whose L2 aligns with La constraint show increased RT differences between conditions at the violation and spillover regions than participants whose L2 does not align with La. 2. No L2 proficiency effects.	1. Same prediction as *L1 effect account* 2. La speakers whose L2 aligns with La constraint show increased RT differences between conditions at the violation and spillover regions as L2 proficiency increases.	1. No differences. 2. No effects.

3.4.2. Results

The following subsections present the results for the three experiments of Study 1. In each experiment, results for the untimed judgments are presented first, followed by results for the SPR judgments, and concluding with the results for the reading times.

3.4.2.1. Experiment 1: Object personal pronoun in main clause

Participants' mean percentage of expected responses in the untimed acceptability judgment correction task was 93% (SD 8) in the L1 English group (n= 20), 96% (SD 7) in the L1 Spanish group (n= 18), and 98% (SD 6) in the German native group (n= 24). The two groups of La German speakers did not differ in their accuracy in the task (*L1 English*: 93%; *L1 Spanish*: 96%, Wilcoxon signed-rank test, W = 148, p-value = 0.25), which suggests that they were aware of the word order constraint to the same extent.

3.4.2.1.1. Self-paced reading judgments

The mean percentage of correct answers for the three participant groups was over 87% in the judgments of the SPR (Table 3.6).

Table 3.6. Mean percentage of responses marked as 'correct' in the SPR task by group and condition of Experiment 1. Standard deviation in brackets.

	English	Spanish	German
Grammatical	84 (18)	84 (13)	95 (9)
Ungrammatical	10 (16)	10 (17)	1 (5)
Total correct	87 (13)	87 (12)	97 (6)

The three groups accepted the grammatical items as correct more often than the ungrammatical items. This was confirmed by a main effect of condition (ß = -6.45, SE= 0.47, z = -13.72, p = .00). Nevertheless, non-native speakers accepted fewer grammatical items and more ungrammatical items than the native group. This was supported by a significant interaction

of language group (native/non-native) by condition (ß = 3.79, SE = 0.82, z = 4.60, p = .00).

Differences between English and L1 Spanish speakers were minimal (total correct responses amounted to 87% for both groups). The statistical analyses revealed no effects of group (*English/Spanish*) nor an interaction of group by condition (grammatical/ungrammatical).

Concerning L2 Proficiency, it was a significant predictor of L1 Spanish speakers' grammaticality ratings, as indicated by the interaction of L2 proficiency by condition: ß = -0.88, SE= 0.44, z= -1.99, p = .05. As observable in the visualization of the effects (Figure 3.1), an increase in L2 English proficiency brought about an increase in correct acceptances (dotted, blue line) and a decrease of incorrect rejections (bold, red line). However, the follow-up tests did not show significant effects for the separate conditions. No effects of L2 proficiency were found for the L1 English group (Figure 3.2). See Appendix A.10 for the outputs of all analyses.

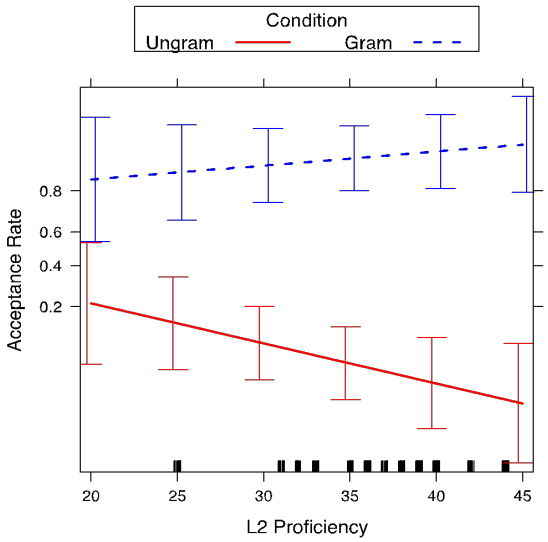

Figure 3.1. Effect of L2 proficiency on the grammaticality judgments of the L1 Spanish group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 1.

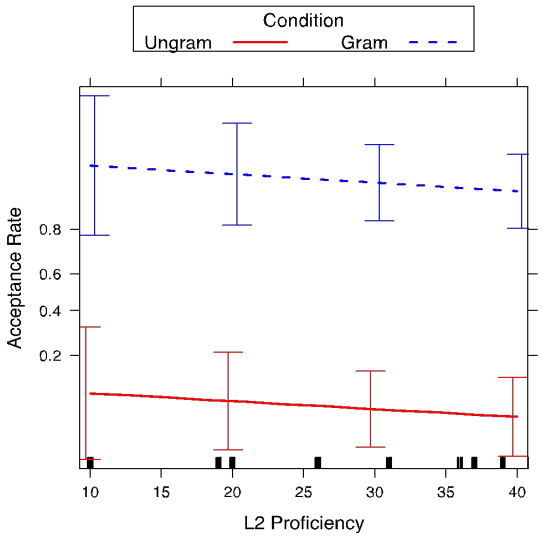

Figure 3.2. Effect of L2 proficiency on the grammaticality judgments of the L1 English group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 1.

3.4.2.1.2. Reading times

The critical region (CR) was computed as the mean RT for the two words contained in the manipulation (e.g. (3.38) "betrachtete ihn"). The two subsequent words were analyzed as the spillover region ("täglich" and "durch") to capture any spillover effects. The raw means of the correctly responded trials are presented below (Table 3.7), but note that analyses were conducted on the reciprocal-transformed reading times (see 4.3.9. section for further details). For the reading times for all regions, see Appendix A.9.1.

(3.38) a. Olivers alte Oma betrachtete ihn täglich durch das Fenster.

b.*Olivers alte Oma ihn betrachtete täglich durch das Fenster.

Table 3.7. Mean reading times for Experiment 1 per word position, and collapsed mean reading time for the critical region (P4 and P5). P6 shows the mean RTs for Spillover 1, P7 shows the mean RTs for Spillover 2. Standard deviation in brackets.

	P4		P5		Critical		P6		P7	
English										
Grammatical	989	(407)	817	(353)	944	(430)	816	(307)	672	(284)
Ungrammatical	838	(303)	921	(402)	929	(364)	878	(447)	574	(279)
Spanish										
Grammatical	1122	(378)	961	(374)	1096	(382)	906	(264)	750	(288)
Ungrammatical	1048	(351)	1079	(434)	1150	(461)	709	(217)	537	(178)
German										
Grammatical	566	(149)	483	(156)	524	(143)	486	(141)	435	(84)
Ungrammatical	540	(134)	483	(99)	510	(95)	399	(81)	343	(69)

Native speakers showed consistently faster reading times than the non-native speakers across regions and conditions, as expected. This was confirmed in the analyses of each region by a main effect of group (native/non-native) in each region (critical region: ß = -.77, SE = .13, t = -6.14, p = .00; Spillover 1: ß = -.80, SE = .14, t = -5.80, p = .00; Spillover 2: ß = -0.65, SE = .17, t = -3.85, p = .00). The table with the group effects is in Appendix A.10.

Critical region. The three groups showed very small differences in their RTs between conditions, to the extent that there was no significant main effect of condition. Furthermore, the La German groups did not differ significantly from each other in their RTs in each condition, reflected in the absence of a main effect of Language Group (L1English/L1Spanish) and of its interaction with Condition (grammatical/ungrammatical). Equally, L2 proficiency was not a significant predictor of the RTs of either La German group.

Spillover region. L1 German and L1 Spanish speakers showed faster RTs for the ungrammatical condition than the grammatical condition in Spillover 1 and 2. This speed up trend was confirmed by a main effect of condition (Spillover 1: ß = .38, SE = .04, t = 8.56, p = .00; Spillover 2: ß = .76, SE =

.05, t = 13.8, p = .00). However, L1 English speakers did not increase their speed in the ungrammatical condition compared to the grammatical condition in these regions to the same extent as Spanish L1 speakers. This difference between the La groups was confirmed by a significant interaction of Language Group (L1English/L1Spanish) and Condition (grammatical/ungrammatical): Spillover 1: ß = .40, SE= .12, t = 3.38, p = .00; Spillover 2: ß = .35, SE = .16, t = 2.19, p = .03. Follow-up tests showed that L1 Spanish speakers were significantly faster in the ungrammatical condition compared to the grammatical condition (ß = 0.53, SE = 0.09, t = 5.97, p = .00) for Spillover 1, while L1 English speakers did not show any differences between the conditions (ß = 0.12, SE = 0.08, t = 1.60, p = .11). In Spillover 2, both groups showed a significant effect of Condition (L1 Spanish: ß = .88, SE = .13, t = 6.66, p = .00; L1 English: ß = .50, SE = .10, t = 5.15, p = .00), and pairwise tests in each condition showed no differences between the groups.

As for L2 proficiency, it was not a significant predictor for either non-native group.

3.4.2.1.3. Summary of the results

The three groups showed sensitivity to the violations of word order, accepting grammatical items significantly more often than ungrammatical items. Interestingly, no group showed slower RTs for the ungrammatical items than for the grammatical items in the critical region. On the contrary, there was a general trend of faster RTs in the ungrammatical condition in the spillover region.

La German speakers were generally less sensitive to the word order constraint in their judgments and they were slower in their RTs compared to the native German group. Crucially, the non-native groups did not differ significantly in their judgment rates, but they did show differences in their RTs in the spillover regions: L1 Spanish speakers showed a significant acceleration in spillover RTs for ungrammatical items in the word after the violation (Spillover 1), whereas L1 English speakers did not. This effect was still observable albeit reduced in the following word (Spillover 2).

Finally, L2 proficiency was a significant predictor of the L1 Spanish group's judgments: an increase in L2 English proficiency brought about an increase in acceptance of grammatical items and a decrease in acceptance of ungrammatical items.

3.4.2.1.4. Preliminary discussion

Speakers of all groups were highly sensitive to the violations of word order in the self-paced reading task, as shown in their judgment rates for both conditions. Especially relevant is the fact that the La German groups were capable of consistently applying their metalinguistic knowledge during the self-paced reading, achieving a total of 87% correct responses. Surprisingly, however, neither native nor La German speakers showed sensitivity to the violation in their reading times of the critical region, as no slow down for ungrammatical items was observed. Interestingly, however, participants showed a general speed up effect in the spillover region. Traditionally, the self-paced reading paradigm has measured participants' reading times while they read for comprehension. At the end of the sentences, participants are either given a comprehension question that is unrelated to the phenomenon studied, or they are given no question. The goal is to observe "natural" reading patterns in participants (Just et al., 1982). In this study, however, participants were given a grammaticality judgment at the end of each item, focusing participants' attention on the form of the sentence and not only on its meaning. The aim of this study was to observe how La speakers read for metalinguistic purposes, and whether they are differentially affected by their prior grammars. This qualitative change of the traditional form of the SPR task is likely to have affected the reading patterns of participants: as soon as they identified a grammaticality violation (usually located mid sentence for the purpose of capturing spillover effects), they should start shaping the judgment required at the end of the sentence. However, if they did not encounter a violation mid sentence, they should maintain attentive search for one until the very last word of the sentence. This reasoning would explain why participants in all three groups started reading the ungrammatical condition significantly faster than the grammatical counterpart immediately after they had encountered the violation (i.e. at the

spillover regions), with the exception of the L1 English group in Experiment 1. Further, this is not the first occasion on which such effects have been observed. Coughlin and Tremblay (2011) used a self-paced reading task with acceptability judgments to investigate whether adult English learners at mid and high L2 French proficiency were sensitive to violations of number agreement between a clefted noun phrase and its subsequent clitic pronoun (e.g. Ce fruit Marie le/*les mangera, *This fruit Mary it/them will-eat,* 'This fruit, Mary will eat'). They found that native French speakers as well as mid- and high-proficiency L2 French learners slowed down in the ungrammatical condition at the critical region. Importantly for their focus, this slowdown was significant for high-proficiency L2 French speakers but not for mid-proficiency L2 French speakers. Furthermore, the three groups sped up at the post-critical region, with high-proficiency L2 speakers showing a larger effect than mid-proficiency L2 speakers, who in this region did show a significant effect. The authors explained this reversal of the typical reading pattern in the post-critical region as an effect of the task: participants focused on the form of the sentence rather than on the meaning, so that as soon as they detected a clear ungrammaticality they started to speed up in order to make their judgment at the end of the sentence. Additionally, they argued that high-proficiency L2 French speakers showed increased sensitivity compared to mid-proficiency L2 French speakers because they already showed significant differences at the critical region, while mid-proficiency L2 French speakers only showed sensitivity in their speed-up at the post-critical region.

The next relevant finding concerns the potential differences among La German speakers in their sensitivity to word order violations. One of the main research questions of this experiment asked whether differences in how La speakers' L1 instantiates the target word order affect their judgments and reading patterns (see predictions in page 89).

If L1 constraints affected their sensitivity to violations, Spanish native speakers should show fewer target-like responses than L1 English speakers, and they should show less sensitivity in their reading times in critical and spillover regions, because the German word order was similar to English but dissimilar to Spanish. Results showed that English and Spanish native

speakers did not differ significantly in their judgments: they both rated pre-verbal object pronouns in main clauses as ungrammatical to the same extent. However, there was a difference between the two groups in their reading patterns: Spanish native speakers, like German native speakers, started reading ungrammatical items significantly faster than the grammatical counterpart immediately after the region of interest (at the spillover regions). The L1 English group, however, showed no differences in reading times between conditions in the word immediately after the violation (Spillover 1), and only started to show differences in the following word (Spillover 2). The accounts that expected La group differences (*L1 effect, L2 effect, constraint similarity*) predicted that the La group with more sensitivity would show significantly larger RT differences between conditions than the La group with reduced sensitivity, with slower RTs for ungrammatical items compared to grammatical items. The results do not match any of the predictions, but rather show faster RTs to ungrammatical items once the violation has been encountered. Following Coughlin and Tremblay (2011), the fact that participants started to speed up in their reading of ungrammatical items compared to grammatical items immediately after encountering a violation could be interpreted as a sign of their certainty in their judgment. L1 Spanish speakers would be more certain of their judgment at the first spillover region than L1 English speakers, deciding to speed up to the end-of-sentence judgment immediately after encountering the violation. The question that follows is why L1 English speakers were less certain of their judgment than L1 Spanish speakers. One possibility is that L1 English speakers became sensitive to the violation later than L1 Spanish speakers. A second possibility is that L1 English speakers did not adopt a speeding strategy once they encountered a violation. However, considering the speed up effects observed in their reading in Experiments 2 and 3, this hypothesis is less convincing. A third possibility is that the absence of a speed up reflects processing difficulty for L1 English speakers, which had been initially assumed to reflect sensitivity to the constraint. Considering the lack of differences in the La speakers' judgments, it is unfortunately not possible to empirically distinguish between these three hypotheses. Hence, it can be concluded that the L1

constraints did not affect La speakers' metalinguistic judgments but might have had an effect on their processing.

The second research question asked whether La German speakers' L2 proficiency modulated their sensitivity to the target constraints. If L2 proficiency facilitates La speakers' sensitivity when it aligns with the target word order, then L1 Spanish speakers should increase in correct acceptances and correct rejections as their L2 English proficiency increases. If L2 proficiency has non-facilitative effects on La speakers' sensitivity when the L2 does not align with the target word order, then L1 English speakers should show a reduction of correct acceptances and correct rejections as their L2 Spanish proficiency increases. The results confirmed one of these predictions: L1 Spanish speakers' judgments were more target-like as their L2 English proficiency increased. However, L1 English speakers showed no effect of their L2 Spanish proficiency. As for the role of L2 proficiency in participants' reading patterns, no effects were found.

These finding are more complex than the predictions that were offered. They suggest that L1 constraints do not affect the outcome of metalinguistic processing, i.e. the judgments, but they do affect how La speakers process violations. Furthermore, they suggest that higher levels of proficiency in an L2 that aligns with the target word order can facilitate the rejection of ungrammatical word orders, but an L2 that does not align with the target word order does not have an effect on La speakers. Hence, while L1 constraints seem to affect reading patterns, L2 constraints can have an effect on the outcome of metalinguistic processing, but not on the processing itself. This is further explored in the study's general discussion along with the findings of Experiment 2 and 3.

Finally, the findings of Experiment 1 contrast with the results that Falk and Bardel (2011) obtained from their two intermediate trilingual groups (L1/L2 French, L1/L2 English, La German). Participants in their study were tested on the placement of object pronouns in German main clauses with an untimed grammaticality judgment correction task, and found that L1 French/L2 English speakers accepted more grammatical items and fewer ungrammatical items than L1 English/L2 French speakers (for a more detailed account of this study, see 3.3). Falk and Bardel suggested that L2

English facilitated the correct judgments of L1 French speakers, while L2 French hindered the correct judgments of L1 English speakers. The current study found only facilitation by L2 proficiency for L1 Spanish – L2 English speakers, and no non-facilitative effects. Crucially, these effects were found within the L1 Spanish group, there were no differences between the judgments of the two La groups in this study. These differences between the studies must be interpreted with caution, as there are important differences in design and methods between the two studies. Falk and Bardel used an untimed task, while the current study tested participants while they were reading sentences under processing pressure. While Falk and Bardel's participants could reread all sentences, participants in this study saw sentences word-by-word, which required them to parse the sentence as it unfolded, and to retain information in their working memory, making a fast judgment at the end of the sentence. Another important difference between the studies is the level of proficiency in the L2: while Falk and Bardel aimed to test participants whose L2 proficiency was similarly advanced, this study investigated how different degrees of L2 proficiency modulated participants' performance. Therefore, Falk and Bardel's study is a relevant reference for how intermediate La German speakers with L1/L2 French and L1/L2 English judge object pronoun placement in main clauses when given enough time, but not an indication of how participants in our study should perform during processing.

The implications of these findings are discussed with Experiments 2 and 3 in the General discussion (section 3.5).

3.4.2.2. Experiment 2: Object personal pronoun in subordinate clause

The mean percentage of expected responses in the untimed acceptability judgment correction task was 95% (SD 8) for L1 English speakers (n = 20), 94% (SD 8) for Spanish speakers (n = 19), and 99% (SD 5) for German native speakers (n = 24). Non-native speakers did not differ in their accuracy in the task (*L1 English*: 75%; *L1 Spanish*: 94%, Wilcoxon signed-rank test, W = 203, p-value = 0.66), which suggests that they were aware of the word order constraint to the same extent.

3.4.2.2.1. Self-paced reading judgments

Participants in the three groups showed high accuracy in their judgments, with at least 82% correct answers (Table 3.8).

Table 3.8. Mean percentage of responses marked as 'correct' in the SPR task by group and condition for Experiment 2. Standard deviation in brackets.

	English		Spanish		German	
Grammatical	83	(17)	86	(14)	93	(12)
Ungrammatical	20	(21)	17	(22)	2	(5)
Total correct answers	82	(14)	84	(14)	96	(6)

The three groups accepted grammatical items more often than ungrammatical items, which was confirmed by a main effect of condition (ß -5.16, SE = 0.32, z = -15.97, p = .00). However, non-native speakers accepted fewer grammatical items and more ungrammatical items than German native speakers, as confirmed by an interaction of group (*native/non-native*) by condition (*grammatical/ungrammatical*): ß = 3.43, SE = 0.60, z = 5.74, p = .00.

English and Spanish native speakers did not show large differences, and no significant effect of group or interaction of group (*English/Spanish*) by condition (*grammatical/ungrammatical*) was found. Similarly, no effect of L2 proficiency was found for either group.

3.4.2.2.2. Reading times

The critical region (CR) was computed as the mean RTs of the two words contained in the manipulation (e.g. (3.39) “ihn mochte”). The two subsequent words were analyzed as the spillover region (“aber” and “schüchtern”). The raw means of the correctly answered trials are presented below (Table 3.9), but analyses were conducted on the reciprocal-transformed RTs (see analyses in 3.4.1.9.).

(3.39) a. Alex meinte, dass die Kollegin ihn mochte, aber schüchtern war.

b. *Alex meinte, dass die Kollegin mochte ihn, aber schüchtern war.

Table 3.9. Mean reading times for Experiment 2 per word position, and collapsed mean reading time for the critical region (P6 and P7). P8 shows the mean RTs for Spillover 1, P8 shows the mean RTs for Spillover 2.

	P6		P7		Critical		P8		P9	
English										
Grammatical	712	(280)	973	(450)	906	(390)	693	(274)	730	(345)
Ungrammatical	979	(344)	939	(413)	1005	(369)	699	(338)	597	(178)
Spanish										
Grammatical	854	(400)	1008	(275)	1008	(401)	654	(208)	666	(178)
Ungrammatical	1172	(393)	974	(399)	1156	(422)	588	(245)	580	(167)
German										
Grammatical	426	(84)	483	(126)	454	(100)	456	(97)	465	(112)
Ungrammatical	583	(182)	481	(90)	531	(123)	379	(73)	401	(94)

As expected, native speakers showed consistently faster RTs than non-native speakers across regions and conditions. This was confirmed in the analyses by a main effect of group (*native/non-native*) in the critical region: ß = -.91, SE = .14, t = -6.49, p = .00, Spillover 1: ß = -.51, SE = .13, t = -3.97, p = .00, and Spillover 2: ß = -.56, SE = .14, t = -4.07, p = .00. The table with the group effects is in Appendix A.10.

Critical region. The three groups read ungrammatical items slower than grammatical items, which the statistical analyses confirmed in a main effect of condition (ß = -0.24, SE = 0.03, t = -8.71, p = .00). The differences in RTs in each condition for native and La German speakers was also observed in a significant interaction of Group (native/non-native) by Condition (grammatical/ungrammatical): ß = .11, SE = .05, t = 1.95, p = .05.

As for differences between L1 English and L1 Spanish speakers, both groups showed very similar reading times in both conditions, which was reflected in an absence of effect of Language group (EnglishL1/SpanishL1) and the absence of an interaction of Language group (EnglishL1/SpanishL1) by Condition (grammatical/ungrammatical).

L2 proficiency had an effect on the RTs of the L1 Spanish group, as reflected by the interaction between L2 Proficiency and Condition (ß= 0.17, SE = 0.05, t = 3.57, p = .00). An increase in the groups' L2 English

proficiency brought about a steeper increase in speed for the ungrammatical condition (red line, bold) than for the grammatical condition (blue line, dotted, Figure 3.3 below). Follow-up tests showed a significant effect of L2 proficiency in the ungrammatical condition (ß= 0.24, SE = 0.11, t = 2.12, p = 0.05) but no effect of L2 proficiency in the grammatical condition. No L2 proficiency effects were found for the L1 English group (Figure 3.4).

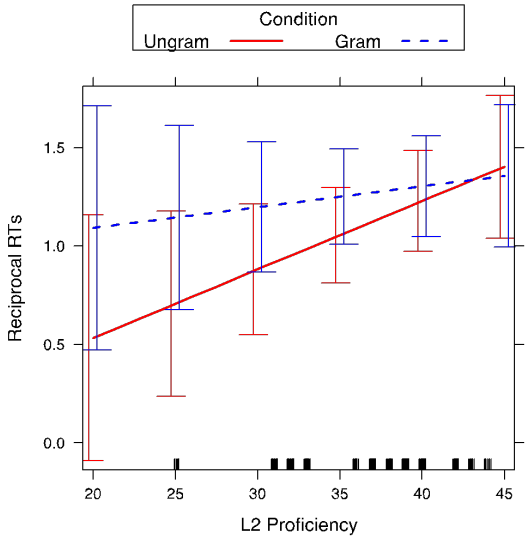

Figure 3.3. Effect of L2 proficiency on the transformed RTs of the L1 Spanish group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 2. The x-axis shows the level of L2 proficiency from lower (left end) to higher (right end), the y-axis shows the transformed reading times.

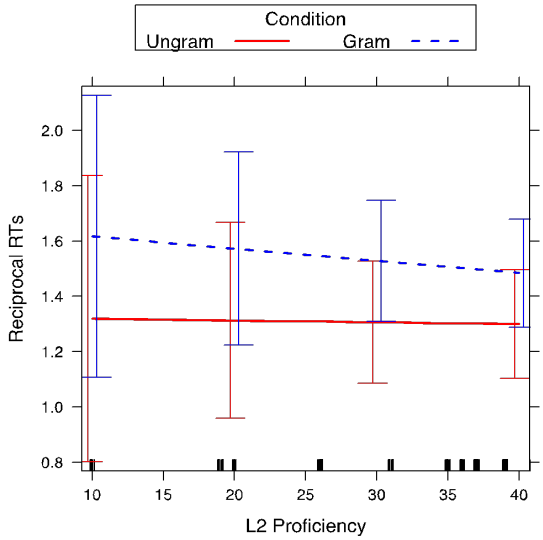

Figure 3.4. Effect of L2 proficiency on the transformed RTs of the L1 English group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 2.

Spillover region. Speakers showed overall faster reading times for the ungrammatical condition than for the grammatical condition in both spillover regions, reflected in a main effect of Condition in the statistical analyses (Spillover 1: ß = 0.38, SE = 0.04, t = 8.62, p = .00, Spillover 2: ß = .43, SE = .05, t = 8.97, p = .00). The differences between native and La German speakers in the RTs to both conditions was also observed in a significant interaction of Group (native/non-native) by Condition (Spillover 1: ß = -.18, SE = .09, t = -2.02, p = .04; Spillover 2: ß = -.26, SE = .10, t = -2.66, p = .01).

A closer look at the La speakers reveals that L1 English speakers had smaller differences in speed between conditions and were overall slower than L1 Spanish speakers. The speed difference in both regions was confirmed by a main effect of Language Group (Spillover 1: ß = 0.32, SE = 0.12, t = 2.62, p = .01; Spillover 2: ß = .30, SE = .13, t = 2.28, p = .03). However, there was no interaction of Language group (L1English/L1Spanish) by Condition (grammatical/ungrammatical) in either region, which suggests that both groups read ungrammatical items faster than grammatical items to a similar extent, despite the observed differences.

Finally, neither La German group showed an effect of L2 proficiency.

3.4.2.2.3. Summary of the results

The three groups showed sensitivity to the violations of pronoun placement in subordinate clauses, accepting grammatical items significantly more often than ungrammatical items. Furthermore, all groups showed an increase in RTs at the critical region in the ungrammatical condition when compared to the grammatical condition. After the violation, however, the three groups showed faster RTs for the ungrammatical condition than for the grammatical condition.

There were no differences in judgment rates between the L1 Spanish speakers and the L1 English speakers. However, the RTs showed that Spanish speakers were faster overall reading the spillover regions than L1 English speakers. No other differences were found between the non-native groups.

As for L2 proficiency, it was a significant predictor of the L1 Spanish speakers' reading times in the critical region: an increase in L2 English proficiency led to an increase in speed reading the ungrammatical condition.

3.4.2.2.4. Preliminary discussion

Contrary to findings in Experiment 1, both judgments and reading times in the current experiment revealed participants' sensitivity to object placement violations in subordinate clauses. All groups accepted grammatical items more often than ungrammatical items, and they all slowed down when reading the violation at the critical region, suggesting they had difficulties processing the violation. Further, as observed in Experiment 1, participants sped up their reading of ungrammatical items at the spillover regions, which could reflect the certainty of their grammaticality judgment (for a discussion of the speed up effect, see the preliminary discussion of Experiment 1).

Regarding potential differences between the non-native groups, it was hypothesized that, if L1 word constraints affected their processing and judgment of object placement in subordinate clauses, then L1 English speakers should accept fewer grammatical items and reject fewer ungrammatical items than L1 Spanish speakers, as target object placement

is similar between German and Spanish but dissimilar to English. Equally, L1 English speakers should show reduced sensitivity to the violation at the critical and spillover regions when compared to L1 Spanish speakers.

The judgment data showed that La groups did not differ in their ratings: both English and L1 Spanish speakers accepted grammatical items and rejected ungrammatical items consistently and to the same degree (with a total of 82% and 84% for L1 English and L1 Spanish speakers respectively). Similarly, the groups did not differ in their reading patterns for the critical and spillover regions. However, L1 Spanish speakers were overall faster in the spillover regions compared to L1 English speakers. This difference in speed at the spillover regions regardless of the presence of a violation might suggest that L1 Spanish speakers encountered overall fewer processing difficulties when reading subordinate clauses than L1 English speakers. This could be due to the fact that Spanish requires pre-verbal clitic placement, but also allows post-verbal pronoun placement as long as it is accompanied by a pre-verbal clitic (see section 3.2 for a linguistic description of this phenomenon). Hence, the greater flexibility of Spanish in object placement compared to English might have rendered the reading of this sentence type less demanding for L1 Spanish speakers than for L1 English speakers. Nevertheless, these are post-hoc speculations that cannot be empirically addressed with the current data. Further research on object placement in native Spanish and English La German speakers would be useful to address this question.

As for the role of L2 proficiency in the modulation of participants' performance, it was hypothesized that, if increased proficiency in an L2 that aligns with the target word order has a facilitative effect on participants' sensitivity, then L1 English speakers should show increased target responses as their L2 Spanish proficiency increases. If proficiency in an L2 that does not align with the target word order has a non-facilitative effect, then L1 Spanish speakers should show decreased target responses as their L2 English proficiency increases. Results show that L2 proficiency was not a significant factor for the judgments of either group. However, it affected L1 Spanish speakers' reading patterns: the higher their L2 English proficiency, the faster they read the critical region in the ungrammatical condition. This

suggests that L1 Spanish speakers' slow down was reduced as their proficiency in L2 English increased. If a reduced slow-down is taken to indicate a reduction in sensitivity, then an increase in L2 English proficiency reduced L1 Spanish speakers' sensitivity to the violation. Interestingly, this proficiency effect did not continue into the spillover region.

These findings contrast with Falk and Bardel's (2011) findings, who tested the placement of object pronouns in German subordinate clauses with two populations of La speakers (L1/L2 French, L1/L2 English, La German). French, like Spanish, places unmarked object clitics between the subject and the finite verb. Like Spanish, these cannot be placed post-verbally. In their untimed grammaticality judgment correction task they found that L1 French-L2 English speakers accepted ungrammatical items more often than L1 English-L2 French speakers. They suggested that L1 French-L2 English speakers were suffering non-facilitative influence from their L2 English, while the L1 English-L2 French group was showing a facilitative influence of their L2 French knowledge. Our study found no differences between the La groups in their judgments, but did find an effect of L2 English proficiency in L1 Spanish speakers' processing, suggesting that it reduced their sensitivity to the violation at the site of the ungrammaticality.

A direct comparison between the findings of Falk and Bardel's study and the current study should be made with caution due to the numerous differences in method, design and populations. Nevertheless, it is relevant to note that both studies found an effect of L2 constraints on participants' performance, albeit to different degrees.

Taken together, the findings in this experiment suggest that participants' L1 and L2 constraints had no effects on the outcome of their metalinguistic processing under time and processing pressure. La speakers were generally slower in their reading times and overall less target-like in their judgments than native speakers, which supports a general learner effect. Nonetheless, it was found that L1 Spanish speakers were less sensitive to the violations at the critical region as their L2 English proficiency increased. This suggests that higher levels of proficiency in an L2 that does not align with the target word order might have a negative effect on how participants read the

violation. The implications of these findings are discussed in detail along with the findings of Experiments 1 and 3 in the general discussion (section 3.5).

3.4.2.3. Experiment 3: Object in verbal group

The mean percentage of expected responses in the untimed acceptability judgment correction task was 95% (SD 8) for L1 English speakers (n = 19), 99% (SD 4) for Spanish speakers (n = 21), and 97% (SD 7) for German native speakers (n = 24). L1 Spanish speakers were significantly more accurate than L1 English speakers (*L1 English*: 95%; *L1 Spanish*: 99%, Wilcoxon signed-rank test, W = 146, p-value = .02). Nonetheless, it can be inferred that all speakers were aware of the word order constraint to a similar extent.

3.4.2.3.1. Self-paced reading judgments

The three groups showed high accuracy in their judgments, with at least 86% correct answers (Table 3.10).

Table 3.10. Mean percentage of responses marked as 'correct' in the SPR task by group and condition in Experiment 3. Standard deviation in brackets.

	English		Spanish		German	
Grammatical	87	(16)	91	(12)	95	(9)
Ungrammatical	16	(19)	11	(14)	2	(6)
Correct answers	86	(15)	90	(10)	96	(6)

Participants in the three groups accepted the grammatical items more often than the ungrammatical items. This was reflected in a main effect of Condition (ß = -5.86, SE = 0.37, z = -15.91, p = .00). However, non-native speakers accepted more ungrammatical items and fewer grammatical items than native speakers. This difference in the size of the Condition effect was confirmed in a significant interaction of Language group (*native/non-native*) by Condition (ß= 2.78, SE = 0.62, z = 4.52, p = .00).

As for La group differences, L1 English and L1 Spanish speakers did not differ greatly in their acceptance rates between the conditions: 87% vs. 91% in the grammatical condition and 16% vs. 11% in the ungrammatical condition. The lack of differences was reflected in the statistical analyses, which showed no significant effect of Language Group (L1English/L1Spanish), nor an interaction with Condition (grammatical/ungrammatical).

As for L2 proficiency, it was a significant predictor of the responses of the L1 Spanish group in a significant interaction of L2 proficiency by Condition: ß = -1.04, SE = 0.35, z = -2.94, p = .00. Follow-up tests showed that L2 proficiency significantly reduced the amount of responses marked as 'acceptable' in the ungrammatical condition: ß = -0.82, SE = 0.25, z = -3.22, p = .00, while it had no significant effect on the responses to the grammatical condition (Figure 3.5). The L1 English group showed no effect of L2 proficiency (Figure 3.6).

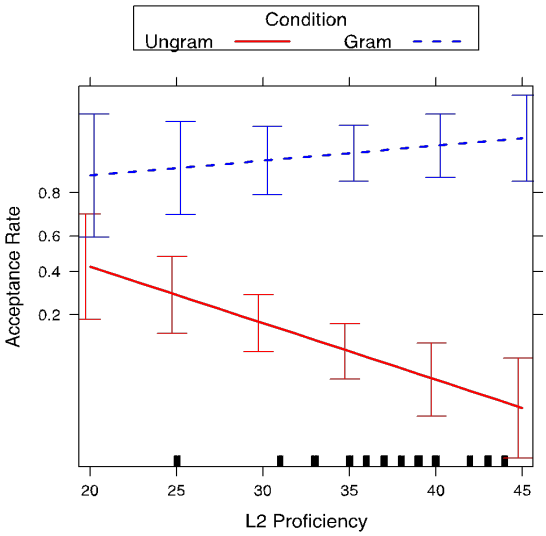

Figure 3.5. Effect of L2 proficiency on the grammaticality judgments of the L1 Spanish group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 3.

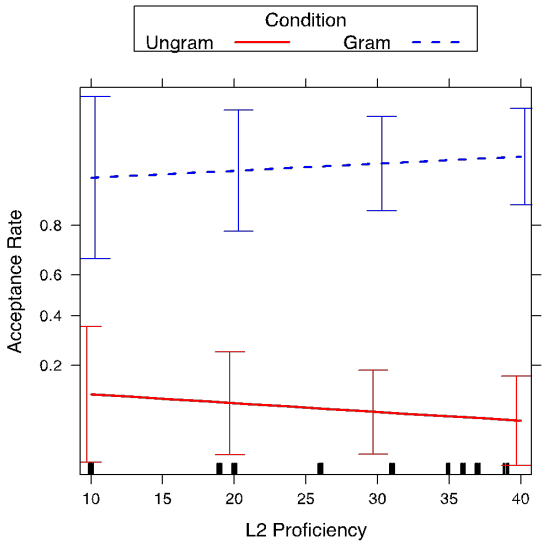

Figure 3.6. Effect of L2 proficiency on the grammaticality judgments of the L1 English group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 3.

3.4.2.3.2. Reading times

The critical region consisted of the mean RTs of the two words that contained the manipulation (e.g. (3.40) "Ruinen entdecken"). The two subsequent words were analyzed as the spillover regions (e.g. "und" and "einige") to capture any spillover effects. The raw means of the correctly responded trials are presented below (Table 3.11), but analyses were conducted on the reciprocal-transformed RTs (see Appendix A.9.3 for all reading time values).

(3.40) a. Der Archäologe wollte Ruinen entdecken und einige Mysterien aufklären.

b. *Der Archäologe wollte entdecken Ruinen und einige Mysterien aufklären.

Table 3.11. Mean reading times for Experiment 3 per word position, and collapsed mean reading time for the critical region (P4 and P5). P6 shows the mean RTs for Spillover 1, P7 shows the mean RTs for Spillover 2. Standard deviation in brackets.

	P4		P5		Critical		P6		P7	
English										
Grammatical	887	(303)	1023	(420)	960	(349)	588	(218)	628	(224)
Ungrammatical	934	(406)	1083	(487)	1072	(497)	587	(308)	502	(224)
Spanish										
Grammatical	1096	(375)	1174	(401)	1156	(359)	683	(225)	624	(172)
Ungrammatical	1192	(378)	1224	(415)	1267	(383)	653	(279)	513	(195)
German										
Grammatical	525	(144)	518	(128)	521	(132)	443	(109)	414	(88)
Ungrammatical	507	(147)	549	(137)	528	(132)	416	(83)	383	(98)

Native speakers showed consistently faster RTs than non-native speakers across regions and conditions, as expected. This was confirmed in the analyses by a main effect of group (native/non-native) at the critical region (ß = -.89, SE =.13, t = -6.62, p = .00) and the spillover regions (Spillover 1: ß = -.41, SE = .12, t = -3.27, p = .00, Spillover 2: ß = -.41, SE = .16, t = -2.54, p = .01).

Critical region. The differences between conditions show that all participants read the violation slower than the grammatical condition, which was supported by a main effect of Condition: ß = -0.06, SE = 0.03, t = -2.55, p = .01. Although German native speakers seem to have a small difference in their raw reading times compared to the La German speakers, this was not reflected in a significant interaction of Language Group (native/non-native) by Condition (grammatical/ungrammatical).

As for La German group differences, L1 English and L1 Spanish speakers did not show different trends in their RTs, which was reflected in the absence of a Language Group effect (L1English/L1Spanish) and its interaction with Condition (grammatical/ungrammatical).

Finally, L2 proficiency did not significantly modulate La German speakers' RTs.

Spillover region. Contrary to the RTs for the critical region, participants showed faster RTs for the ungrammatical condition than for the grammatical condition in the spillover region. This was confirmed by a main effect of Condition (Spillover 1: ß = .26, SE = .04, t = 6.16, p = .00, Spillover 2: ß = .66, SE = .06, t = 11.8, p = .00). The RTs differences between conditions also differed in size for native compared to La German speakers, which was confirmed in a significant interaction of Group (native/non-native) by Condition (Spillover 1: ß = -.41, SE = .12, t = -3.27, p = .00; Spillover 2: ß = -.41; SE = .16, t = -2.54, p = .01).

Although the speed up effect was more visible for the L1 Spanish speakers than for the L1 English speakers in both regions, they did not show any significant differences in the statistical analyses for either spillover region. There was no main effect of Language Group (L1English/ L1Spanish) or interaction with Condition (grammatical/ungrammatical).

L2 proficiency was not a significant predictor of the L1 English speakers' RTs in either region (Figure 3.8), but it was a significant predictor of the L1 Spanish speakers' RTs in Spillover 2, as shown by a significant interaction of Condition by L2 proficiency: ß = .21, SE = .10, t = 2.02, p = .04 (see Figure 3.7).

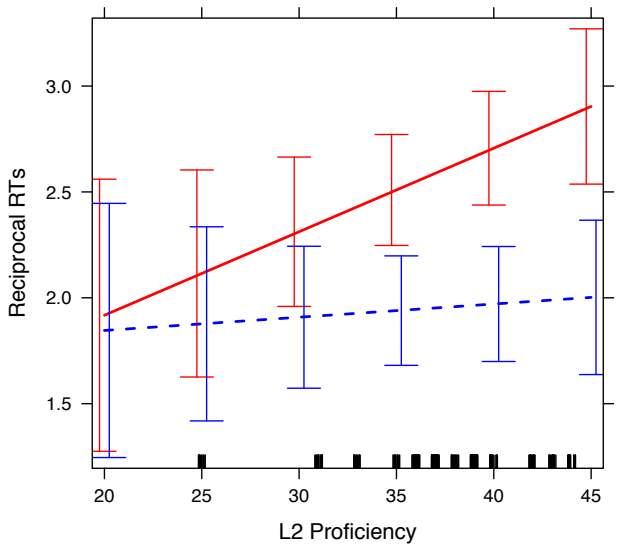

Figure 3.7. Effect of L2 proficiency on the transformed RTs of the L1 Spanish group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 3.

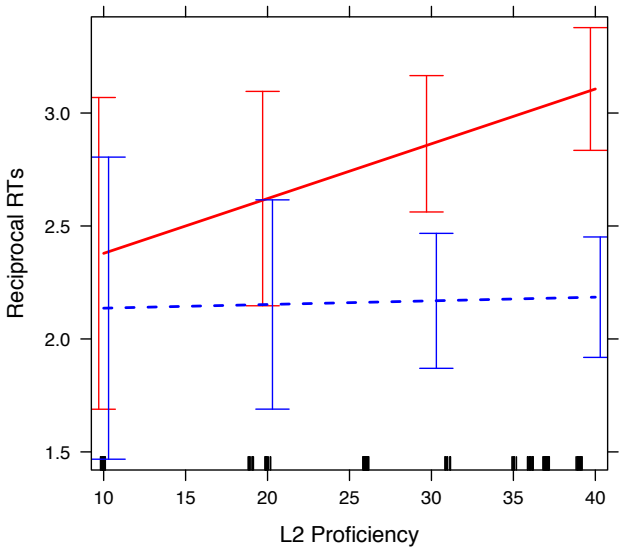

Figure 3.8. Effect of L2 proficiency on the transformed RTs of the L1 English group for grammatical (blue, dotted) and ungrammatical (red, bold) items in Experiment 3.

3.4.2.3.3. Summary of the results

Participants in the three groups showed sensitivity to violations of object placement in a verbal group, accepting grammatical items significantly more often than ungrammatical items. Further, a slow-down effect was found at the critical region followed by a speed up effect in the spillover region.

Regarding native/non-native differences, as expected, La German speakers accepted fewer grammatical items and more ungrammatical items, and were slower overall compared to German native speakers.

Crucially, the two groups of non-native speakers did not differ in their judgments or in their RTs for either region. However, L1 Spanish speakers' judgments and RTs for Spillover 2 were modulated by their L2 English proficiency: the higher their L2 English proficiency, the more ungrammatical items they correctly rejected, and the faster they read Spillover 2 in the ungrammatical condition.

3.4.2.3.4. Preliminary discussion

As expected, all participants were sensitive to the violations of object placement in verb groups, as shown by their judgment rates and reading times: they all accepted grammatical items more often than ungrammatical items, and they slowed down their reading of the violation at the critical region. Furthermore, as observed in Experiments 1 and 2, participants in the three groups sped up their reading of ungrammatical items in the spillover region, which could be interpreted as a sign of certainty of their grammaticality judgment (see the first paragraph of section 3.4.2.1.4. Preliminary discussion for a discussion of this effect).

Importantly, L1 Spanish and L1 English speakers did not differ in their judgment rates or in their reading patterns. This was an expected result given that the word order under investigation was instantiated in German, but not in English and Spanish. Therefore, L1 constraints should not affect the two groups differently.

Surprisingly, however, L2 proficiency was a significant predictor of L1 Spanish speakers' judgments: the higher their L2 English proficiency, the more ungrammatical items they correctly rejected. L1 Spanish also showed faster RTs for the ungrammatical condition of Spillover 2 as their L2 English proficiency increased. As English does not align with the target word order, this facilitation cannot be attributed to alignment between English and German word order, as was the case for the L2 proficiency effect in Experiment 1. However, a recent L2 processing study suggests that lexical similarity between an L1 and L2 may facilitate processing of complex L2 structures (Hopp, 2014, 2016). This account claims that lexical access is a key step for structure building in comprehension, and that the orthographically closer the L2 words are to L1 translation equivalents, the faster the lexical access will be, depleting fewer processing resources, and allowing for these to be dedicated to syntactic processing. In the current study, English is closer lexically to German than Spanish (for lexical similarities between German and English as compared to Spanish, see Schepens, Dijkstra, & Grootjen, 2012; Schepens, Dijkstra, Grootjen, & van Heuven, 2013).

If Hopp's account is extended to L2 effects during La processing, it could explain why L1 Spanish speakers were more accurate at detecting ungrammaticality the higher their L2 English proficiency. Additionally, it would explain why L1 Spanish speakers had higher correct rejections in Experiment 1 too. However, this facilitation account was formulated to address lexical facilitation from a native language to a non-native language, which is contrary to the scenario encountered in this experiment. Further, the use of this account to explain the current results encounters several problems. Firstly, if lexical closeness between a native and a non-native language facilitates real-time, syntactic processing in the non-native language, then L1 English speakers should have overall facilitation from their L1 lexicon when judging all items in this study compared to L1 Spanish speakers. This was not the case in any of the experiments of this study, as no differences were found between English and L1 Spanish speakers. Alternatively, if this account applies only to the ease of processing and not to the metalinguistic judgments during processing, it would predict that L1 English speakers read with more ease and hence faster than L1 Spanish speakers. A look at L1 English and L1 Spanish speakers' raw reading times per word shows that L1 Spanish speakers were overall slightly slower than L1 English speakers in Experiment 3, which partly supports this claim. However, this was not a statistically significant difference in any of the relevant regions in Experiment 3, or in Experiments 1 and 2.

Hence, although lexical facilitation from L2 English to German La is an interesting account for the findings of L2 proficiency in L1 Spanish speakers' judgments, it does not come without problems. The implications of these findings for an account of La grammatical use under processing pressure are discussed with the findings of Experiments 1 and 2 in the general discussion.

3.4.2.4. Summary of the results of Study 1

A common finding across the three experiments was that, as expected, La German speakers were overall less accurate and slower than German native speakers. Regarding differences between the La participants in their

sensitivity to surface word order constraints, the findings in the experiments differed (Table 3.12).

In Experiment 1 on object pronoun placement in main clauses, all participants were significantly sensitive to the violations in their self-paced reading judgments: they accepted grammatical items more often than ungrammatical items. However, neither the L1 German nor the La German speakers showed a slow-down at the critical region. Instead, there was a general speed-up effect for ungrammatical items in the spillover region. Crucially, La German speakers did not show any differences in their end-of-trial judgments, but they did show differences in their reading patterns: while L1 Spanish speakers followed the general speed up trend in the spillover region, L1 English speakers showed no differences in reading times between conditions. As for L2 proficiency, it was a significant predictor of L1 Spanish speakers' self-paced reading judgments: the higher the L2 proficiency, the more often they correctly accepted grammatical items and rejected ungrammatical items.

In Experiment 2 on object pronoun placement in subordinate clauses, all participants were significantly sensitive to the violations as shown in their judgments and reading times: they accepted grammatical items more often than ungrammatical items, and showed a slow-down at the region of the violation, followed by a speed-up at the spillover region. As in Experiment 1, La German speakers did not differ significantly in their SPR judgments. However, Spanish native speakers were overall faster reading the spillover regions compared to English native speakers, in both conditions. Regarding L2 proficiency, it was a significant predictor of L1 Spanish speakers' reading times in the critical region: the higher the L2 English proficiency, the faster they read ungrammatical items.

Finally, Experiment 3 on the placement of objects within a verbal group showed that participants were significantly sensitive to the word order violation in both their judgments and reading times: all participants accepted grammatical items more often than ungrammatical items, and they read the ungrammatical critical region slower than the grammatical counterpart, followed by a speed-up effect in the spillover region. Further, as expected, La German speakers did not differ in their judgments or in their reading

patterns. Surprisingly, however, L2 proficiency modulated L1 Spanish native speakers' judgments and RTs: the higher their L2 English proficiency, the more often they rejected ungrammatical items, and the faster they read the ungrammatical condition of Spillover 2.

Table 3.12. Overview of L1 effects and L2 effects in La groups' judgments and reading times in the word order study.

	L1 effects	
	Judgments	Time measures
Exp. 1	No differences between La groups.	L1 English sped up later than L1 Spanish after encountering the violation.
Exp. 2	No differences between La groups.	L1 Spanish speakers read the spillover region faster than L1 English speakers.
Exp. 3	No differences between La groups.	No differences between La groups.
	L2 effects	
	Judgments	Time measures
Exp. 1	L1 Spanish showed increased correct responses as their L2 English proficiency increased.	No effects of L2 proficiency for either La group.
Exp. 2	No effects of L2 proficiency for either La group.	L1 Spanish showed faster reading times in the critical region as their L2 English proficiency increased.
Exp. 3	L1 Spanish showed increased correct responses as their L2 English proficiency increased.	L1 Spanish showed faster reading times in the second spillover region as their L2 English proficiency increased.

3.5. General discussion

The goal of the current study was to investigate whether the native and non-native constraints of a multilingual speaker affect their sensitivity to word order violations in an additional language when they are put under processing pressure. In order to address this question, two groups of learners of German as an additional language were tested on their sensitivity to German word order violations with a self-paced reading task that included end-of-sentence grammaticality questions. The non-native participants had mirror L1/L2 distributions (L1 Spanish-L2 English and L1 English-L2 Spanish) and shared an intermediate level of La German, while the word order constraints differed in how they were represented in Spanish, English and German.

Based on findings in the field of acquisition of an additional language, a series of predictions were derived from competing accounts. These predicted four possible outcomes regarding how native and non-native constraints would affect the sensitivity of the non-native participants: that the native constraints would have a greater effect on participants' sensitivity (*L1 effect account*); that the non-native constraints would have the greater effect (*L2 effect account*); that both native and non-native constraints should have an effect as long as they show similarity to the target word order (*constraint similarity account*); or that prior constraints would not affect participants (*no transfer account*).

The findings of the three experiments showed that native constraints did not affect La participants' end-of-sentence judgments, but selectively affected their processing (in Experiment 1, but not in Experiments 2 and 3). Moreover, effects of L2 proficiency were found in all three experiments. Taken together, these findings indicate that there is an effect of prior constraints in the use of grammatical knowledge under processing pressure, but that these effects are more complex than those predicted based on earlier findings concerning La acquisition.

In the following paragraphs, the general judgment and reading profiles are discussed to set the background for how native and non-native participants performed in the task. Then follows a discussion of the native and non-native effects, and what the implications of these findings are for

intermediate La speakers' use of grammatical knowledge under processing pressure.

3.5.1. Judgment and reading of word order violations

Participants in the three groups were generally highly sensitive to the word order constraints tested in this study, with above 80% total correct answers in the three experiments.

This sensitivity was confirmed in Experiments 2 and 3 by the reading profiles, in the form of increased reading times for the ungrammatical condition compared to the grammatical condition at the region of the violation, suggesting that participants encountered processing difficulties upon reading the violation. Additionally, given the task requirements, the sensitivity was also observable in the form of faster reading times for the ungrammatical condition compared to the grammatical condition in the spillover regions (i.e. regions immediately after the violation) in all three experiments, which was interpreted as evidence that participants took the violation as a clear cue of ungrammaticality, initiating a speeding strategy to make their judgment as fast as possible at the end of the sentence.

Considering the high degree of participants' sensitivity to violations in Experiment 1, the absence of a slow-down in Experiment 1 was an unexpected finding. Several explanations could account for this absence compared to the slow-downs observed in the other two experiments.

(3.41) Olivers alte Oma betrachtete ihn täglich durch das Fenster.
*Olivers alte Oma ihn betrachtete täglich durch das Fenster.

(3.42) Peter sagte, dass die Kollegin ihn mochte aber schüchtern war.
*Peter sagte, dass die Kollegin mochte ihn aber schüchtern war.

(3.43) Das Mädchen hatte Geschenke bekommen aber noch nicht ausgepackt.
*Das Mädchen hatte bekommen Geschenke aber noch nicht ausgepackt.

One possibility is that participants found the processing of object-verb word order (Experiment 2 (3.42) and 3 (3.43)) more difficult than verb-

object word order (Experiment 1 (3.41)). This has been observed in previous processing and acquisition studies that focused on the placement of the subject, object and verb in German. Studies of native German speakers have shown that processing object-verb (OV) word order elicited longer reading times than verb-object (VO) word order, even in contexts where OV was required (Weyerts, Penke, Münte, Heinze, & Clahsen, 2002). Acquisition studies have also observed that adult L2 learners successfully produce VO sentences before they learn to correctly produce OV sentences in German L2 (see Clahsen & Muysken, 1986, 1989 for a review). Therefore, although this was not the main manipulation of the current study, the preference for the placement of the object after the verb for native speakers of German, English and Spanish could have facilitated the detection of verb-object pronoun violations in Experiment 1, leading to fewer processing difficulties at the moment the violation was encountered. This explanation seems to partly fit the differences in the self-paced judgments between experiments 1 and 2 (Table 3.13): participants accepted grammatical items and rejected ungrammatical items more often in Experiment 1 (VO) than in Experiment 2 (OV), although this was especially the case for the non-native participants. However, the judgment rates in Experiment 3 (OV) render this explanation questionable, as they are not lower than the judgment rates in Experiment 1 (VO).

Table 3.13. Amount of responses marked as 'correct' per group, experiment and condition, and amount of total correct responses in Study 1. Standard deviation in brackets.

		English	Spanish	German
Exp.1	Grammatical	84 (18)	84 (13)	95 (9)
	Ungrammatical	10 (16)	10 (17)	01 (5)
	Total correct	87 (13)	87 (12)	97 (6)
Exp. 2	Grammatical	83 (17)	86 (14)	93 (12)
	Ungrammatical	20 (21)	17 (22)	02 (5)
	Total correct	82 (14)	84 (14)	96 (6)
Exp. 3	Grammatical	87 (16)	91 (12)	95 (9)
	Ungrammatical	16 (19)	11 (14)	02 (6)
	Total correct	86 (15)	90 (10)	96 (6)

Crucially, participants in the three groups were sensitive to the violations in all three experiments, as indicated by the end-of-sentence judgments as well as by the speed up effects in the region immediately after the violation. As for differences between native and La German speakers, these conformed to the pattern observed in prior research: La German speakers had significantly fewer target answers, and significantly slower reading times than German native speakers.

Taken together, the judgment and reading measures in this study suggest that word order violations involving the placement of object and object pronouns relative to the main verb seem to be easily detectable for native and non-native speakers.

3.5.2. Effects of prior grammatical knowledge

Crucially for the research questions of this thesis, the judgments and reading patterns of La German speakers showed effects of prior linguistic knowledge (Table 3.14). As mentioned at the beginning of this section, four main outcomes regarding the effect of prior constraints were predicted based on the main accounts that have been offered in the field of La acquisition:

L1 effect account. If only participants' native constraints affect their use of grammatical knowledge under processing pressure, then participants whose L1 word order constraints are similar to the target German constraints should be more sensitive to the violations than participants whose L1 word order constraints are dissimilar to the target German word order.

L2 effect account. If only participants' L2 affects their use of grammatical knowledge under processing pressure, then participants whose L2 word order constraints are similar to the target German constraints should be more sensitive to the violations than participants whose L2 word order constraints are dissimilar to the target German word order.

Constraint similarity account. If both native and non-native constraints can simultaneously affect sensitivity to word order constraints in a cumulative manner as long as they align with the La constraint, then both La groups should show similar degrees of sensitivity to the word order constraints, as both groups speak English and Spanish. This sensitivity should be modulated by proficiency in the language that aligns with the La: participants should show an effect of the L1 constraints as well as the L2 constraints when they align with the target word order.

No transfer account. If neither the L1 nor the L2 affect the degree of sensitivity to the constraint, the La groups should not show different degrees of sensitivity to the constraints.

Native constraints did not affect the judgment of the non-native groups, as shown by the absence of significant differences in their end-of-sentence judgments. However, native constraints did affect how they read the sentences that they had correctly judged, or in other words, how they arrived at the correct judgment. Furthermore, L2 English proficiency affected L1 Spanish speakers' judgments in Experiments 1 and 3, which showed a word order disallowed in Spanish. However, no effects of L2 Spanish proficiency were observed for the L1 English group in Experiment 2 (which showed a target word order licit in Spanish but illicit in English) or in any of the

experiments. Further, L2 English proficiency also affected the overall speed at which L1 Spanish participants read the region of the violation in Experiment 2, and the region after in Experiment 3.

These findings do not correspond exactly to any of the four predictions: L1 differences in reading profiles could potentially fit the first prediction based on transfer of native constraints; but the presence of the facilitative effect of L2 English proficiency on the judgments suggests that native constraints are not the only factor affecting the use of grammatical knowledge in an additional non-native tongue under processing pressure. The combined L1 and L2 effects point to a partial match for the third prediction based on findings of cumulative, facilitative transfer. However, whether the results fit this prediction depends on how the effect of L2 English proficiency in the reading times of Experiment 2 is interpreted. Given the complex picture of the results, the discussion is divided into the role of native constraints and the role of non-native constraints in the following text.

Table 3.14. Overview of the L1 and L2 proficiency effects predicted by each La transfer account for Study 1. A tick indicates the predictions that were supported by the effects in Study 1, a cross those that were not.

	L1 effect: L1 group differences	L2 effect: L2 proficiency differences
L1 effect account	✗ Experiment 1 shows that L1 Spanish have decreased sensitivity compared to L1 English speakers. ✗ Experiment 2 shows that L1 English have decreased sensitivity compared to L1 Spanish speakers.	✗ L2 proficiency does not affect La groups in Experiments 1 and 2.
L2 effect account	✗ Experiment 1 shows that L1 Spanish have increased sensitivity compared to L1 English speakers. ✗ Experiment 2 shows that L1 English have increased sensitivity compared to L1 Spanish speakers.	✗ L2 proficiency does not affect La groups in Experiments 1 and 2.
Constraint similarity account	✗ Experiment 1 shows that L1 Spanish have decreased sensitivity compared to L1 English speakers. ✗ Experiment 2 shows that L1 English have decreased sensitivity compared to L1 Spanish speakers.	✓ Experiment 1 shows L1 Spanish have increased sensitivity as their L2 English proficiency increases. ✗ Experiment 2 shows L1 English speakers have increased sensitivity as their L2 Spanish increases.
No transfer account	✓ Observed in Experiment 3: No differences between speakers in any of the three experiments. La speakers show reduced sensitivity compared to native speakers.	✓ Observed in Experiment 3: There is no effect of L2 proficiency in any of the three experiments.

3.5.2.1. The role of native constraints

One of the main findings of Study 1 is that the native constraints of the non-native speakers did not affect their end-of-sentence judgments, as they showed no differences in their acceptance and rejections of the three types of word order violations. This indicates that once La speakers have acquired the target word order and are capable of detecting and correcting its violations in an untimed judgment task, their judgments are not affected by how their L1 instantiates this word order. Crucially, this also applies to their judgments under reading conditions that put them under processing pressure.

However, non-native speakers did differ in how they implemented grammatical knowledge in real time in Experiments 1 and 2. In Experiment 1, L1 Spanish speakers showed a speed-up effect in the ungrammatical condition immediately after the violation, while L1 English speakers showed no significant differences in their reading times between the two conditions. As discussed in the preliminary discussion of Experiment 1 (section 3.4.2.1.4. Preliminary discussion), the point at which participants start speeding up could signal ungrammaticality detection and how soon they were confident of their judgment. Given this assumption, L1 Spanish speakers were confident sooner than L1 English speakers about the violation of verbal object pronoun placement in German main clauses. L1 English speakers also showed overall slower reading times than L1 Spanish speakers in the spillover regions in Experiment 2. Although this was not a difference in the general reading patterns of the two La groups, it might indicate that L1 English speakers had overall more difficulty than L1 Spanish speakers processing word orders that depart from their L1 constraints. This would account for their delay in speeding up immediately after the violation in Experiment 1, which presented an ungrammatical pre-verbal object pronoun, disallowed in German as well as in English, and could also explain why they were overall slower than L1 Spanish speakers in Experiment 2 after reading pre-verbal object pronouns (which departs from their English post-verbal pronoun placement). Prior literature on word order violations has observed that L1 English adults have difficulties processing word orders that depart from the word order licensed in English (Marijuan, Lago, &

Sanz, 2016; Montrul, 2010; Sanz & Morgan-Short, 2004; VanPatten, 1984; VanPatten & Borst, 2012; VanPatten & Houston, 1998). However, this account also predicts that L1 English speakers should be slower than L1 Spanish speakers when reading the violation itself and not just the spillover region, which was not the case. Furthermore, L1 English speakers showed no differences from L1 Spanish speakers in Experiment 3, which also presented a word order disallowed in English.

An alternative explanation that could account for the L1 differences in the reading times of Experiments 1 and 2 and the absence of differences in Experiment 3 is that L1 Spanish speakers had an advantage over L1 English speakers in both object pronoun experiments, but not in Experiment 3. Unlike English, Spanish has two possible forms of expressing object pronouns: with the canonical clitic form (unmarked and weak form, equivalent to German and English weak object pronouns), and the less canonical and more marked double clitic form, used for focus (see section 2 for more details). The unmarked clitics, equivalent to the weak German (and English) pronouns used for the experimental items in this study, are placed before the main verb (e.g. 'Yo lo miro', *I him look,* I look at him), whereas the double clitic structure requires the weak clitic to be placed before the main verb and a strong pronoun preceded by a preposition to be placed after the main verb (e.g. 'Yo lo miro a él', *I him look at HIM, '*I look at **HIM'**). Although not a one-to-one correspondence with the target German (and English) word order in Experiment 1, L1 Spanish speakers might not have experienced processing difficulties when encountering a post-verbal pronoun, given that this is a licensed possibility in Spanish too. In other words, L1 Spanish speakers could have an advantage over L1 English speakers for both post- and pre-verbal object pronouns (Experiments 1 and 2), given that Spanish allows both, while English allows only the post-verbal placement. Unlike Experiments 1 and 2, Experiment 3 tested the placement of non-pronominal objects between two elements of a verb group (e.g. Der Archäologe wollte *Ruinen entdecken*/**entdecken Ruinen*', The archeologist wanted to *discover ruins*/**ruins discover*), a word order that neither English nor Spanish allows. This would explain why there were no differences between the non-native groups in their reading profiles for

Experiment 3, whereas L1 Spanish read faster than L1 English speakers following the violation of word order in Experiments 1 and 2.

Given the absence of L1 differences in the judgments, these accounts are only speculative. What can be taken from these findings is that the processes by which La speakers reach their judgments is modulated by how the word order is represented in their native tongue.

3.5.2.2. The role of proficiency in a non-native language

3.5.2.2.1. L2 effects on judgments

The pattern of L2 effects also presents a complex picture (see Table 3.15). L2 English proficiency was found to facilitate L1 Spanish speakers' correct judgments. However, contrary to prior findings of L2 facilitation in the La acquisition literature, an increase in correct responses as L2 proficiency measures increased was not only observable in the cases in which the L2 word order aligned with the target word order (Experiment 1), but also when neither the L2 nor the L1 of the speaker aligned with the La (Experiment 3). Further, the facilitation was restricted to one participant group and therefore one language: there was no facilitation of L2 Spanish proficiency for L1 English speakers' judgments in Experiment 2, in which Spanish aligned with the target word order and English did not.

Table 3.15. Overview of L2 effects on La groups' judgments in Study 1. An increase in L2 English proficiency resulted in the following effects for the L1 Spanish group.

		Judgments	Time measures
L2 effects	Exp. 1	L1 Spanish show increased correct responses	-
	Exp. 2	-	L1 Spanish show faster reading times on the critical region
	Exp. 3	L1 Spanish show increased correct responses	L1 Spanish show faster reading times on the second spillover region

The language selectivity of L2 facilitation could be explained by accounts that consider the lexical similarity of English and German and their dissimilarity from Spanish, and the specific word order similarities. As mentioned earlier, recent studies investigating the effect of L1-L2 lexical similarities on L2 syntactic processing have suggested that lexical access becomes faster when the L2 and L1 share orthographically similar translation equivalents, depleting fewer processing resources, and allowing for these to be dedicated to syntactic processing. It is possible that L1 Spanish speakers with higher levels of L2 English proficiency had faster access to the German lexical items due to their closeness to the English equivalent translations, and could therefore dedicate more processing time and resources to detecting the violation of word order in cases in which the target structure differed from their native word order constraints. This facilitation of the L2 could not apply to the L1 English speaker group, as Spanish could not facilitate the lexical retrieval of German words. Nonetheless, this account is only speculative, as the original claim concerns the effects of the native lexemes affecting non-native processing, while in the case of the current study, the accounts asserts that retrieval of German words is facilitated by another non-native language. Further, if Hopp's (2014, 2016) claims were fully applied to the current study, they would

predict that L1 English speakers perform overall more accurately than L1 Spanish speakers due to the facilitating effect of their native language on the retrieval of German words. However, there were no significant differences in reading speed or in judgment rates between the two La groups, which renders this account of the L2 effects questionable.

The similarities between German and English productive compounding might be another potential explanation for the facilitating effect of L2 English proficiency in Experiment 3 (e.g. Der Archäologe wollte *Ruinen entdecken, The archeologist wanted to ruins discover,* 'The archeologist wanted to discover ruins'). While not a grammatical word order in English or Spanish, 'Ruinen entdecken' (*ruins discover*) is a compoundable word order in both German and English: e.g. ruin-discoverer. Both Germanic languages have productive N(oun)V(erb) compounding (e.g. can-opener, firefighter, storyteller). Spanish, however, applies the opposite lemma order in productive compounding, with the verb preceding the noun (e.g. abrelatas, *opencans,* 'can opener'). It is possible that proficiency in an L2 that follows a NV word order for compounding may increase acceptance of NV non-finite noun phrases in an additional language. Additionally, the lexical similarity between English and German might be necessary for the effect to take place: note that L2 Spanish, with fewer lexical similarities to German (Schepens et al., 2013), did not facilitate L1 English speakers' judgments in Experiment 2, although Spanish and German instantiated the same word order.

Although these are plausible explanations, they cannot be corroborated with the current data. Further research on phenomena that are more restricted in their cross-linguistic similarity might be enlightening for research on L2 proficiency. Study 2 takes up this challenge by looking at agreement rather than word order phenomena, selecting specific morphosyntactic constraints that are either present or absent in the speakers' L1 and/or L2.

3.5.2.2.2. L2 effects on reading times

Adding to the complex picture of L2 proficiency effects on judgments, L1 Spanish speakers showed a significant increase in speed modulated by their

L2 English proficiency when reading the violation in Experiment 2, and after the violation in Experiment 3. Following traditional psycholinguistic assumptions, the reduction of L1 Spanish speakers' slow-down effect at the violation should be evidence of reduced sensitivity to the constraint (Just et al., 1982), which would suggest that increased proficiency in an L2 that does not align with the target may reduce immediate sensitivity to the violation, but does not affect the final judgment. However, this interpretation is not unequivocal. Traditional self-paced reading research has usually employed comprehension questions rather than metalinguistic questions. The nature of the task in this study could have had an impact on what slow-downs and speed-ups reflect. The analyses in this study were conducted on the reading times of correctly responded items, so the fact that participants' reading times to correctly-responded items did not show a significant slow-down at the violation compared to the grammatical condition is not an unequivocal sign of reduced sensitivity to the violation. It was generally observed that all groups read ungrammatical items faster than grammatical items in the spillover regions of all experiments, a finding interpreted as a task effect: once participants had detected the violation at the critical region and felt certain about their detection, they sped up to the judgment at the end of the sentence. Therefore, the increase in speed in the RTs to ungrammatical items at the violation and after led by an increase in L2 English proficiency cannot be conclusively interpreted as a reduction in sensitivity (as psycholinguistic assumptions on RTs to comprehension questions would suggest), or as an increase of certainty of the judgment (as this task was not originally design to test the certainty factor). Further research with self-paced reading and grammaticality questions would help determine the nature of these effects.

3.5.3. Theoretical implications

The three main findings in this study do not entirely match either of the initial predictions. Further, these findings suggest that the obtained L1 and L2 effects are of a different nature, and that they might co-exist in La speakers' use of La grammatical knowledge under processing pressure.

The first crucial finding regards the role of native constraints: although they did not affect end-of-sentence judgments, they did affect how participants read violations of word order. L1 English speakers required more time to read a word order that was illicit in their mother tongue than L1 Spanish speakers. This finding only partly matches the *L1 effect account* regarding the strong effect of native constraints on La grammatical use.

A second crucial finding is the facilitating effect of L2 English knowledge on L1 Spanish speakers' sensitivity, increasing their rejection of ungrammatical word orders that would have been licit in Spanish (Experiment 1 and 3). This does not match the *L2 effect account* of the effect of non-native constraints, which predicts that La groups will differ according to their L2 similarity to the La constraint, rather than according to within group L2 proficiency effects. The findings rather suggest that proficiency in an L2 can have facilitatory effects on the rejection of word order violations in an additional non-native language, but that this effect may be selective. This selectiveness may depend on different factors, such as on the lexical similarity of the L2-La, on La speakers' proficiency in the L2, and/or on the degree of similarity between L2-La word order.

A third finding concerns the nature of the effects of prior languages. While L2 effects on the judgments were unequivocally facilitative, as they increased the amount of correct responses, the nature of the L2 effects on the reading patterns could not be categorically classified into facilitative/non-facilitative. This was partly due to the difficulties in determining whether the speed-up and slow-down effects were indicative of increased or reduced sensitivity during processing, or indicative of faster or slower detection of violations during processing.

Putting together the three main findings, it becomes clear that neither L1 constraints alone (*L1 effect account*) nor L2 constraints alone (*L2 effect account*) shape the use of grammatical knowledge in an additional non-native language. Rather, native and non-native grammars seem to have an impact, aligning with the *constraint similarity account*.

These findings further reveal a co-existence of L1 and L2 effects that may be of a different nature. Although it is not possible to draw strong conclusions about the nature of each effect, it is reasonable to speculate

about different possibilities. Native constraints played a role during the process of reading each consecutive word as it appeared and disappeared again, when participants had to build the sentence structure and meaning as it unfolded, a task that put strain on their working memory and depleted their processing resources. The time limitation and the impossibility of re-reading the input, added to the inherent difficulties associated with processing a non-native language (Clahsen & Felser, 2006a), are potentially the reason why L1 grammatical mechanisms were activated during the reading of the sentences, as native mechanisms should be more available for sequential learners than non-native mechanisms, due to their frequency and length of use. Nevertheless, this explanation is tentative, as the evidence of L1 effect was not unambiguous. More explicit were the effects of L2 proficiency on participants' judgments. One possibility is that L2 constraints came into play at the time of making the judgment, once participants had read the sentence, increasing the likelihood of making the correct judgment when the L1 constraint did not align with the target. This presupposes that participants with high proficiency in the L2 had time to check their intuitive answer against their L2 knowledge. Another possibility is that L2 grammatical mechanisms were active during the reading of the sentence, prior to the judgment, but were less active than the potentially more proceduralized L1 mechanisms. The higher the L2 proficiency of the speaker, however, the more activation L2 constraints would receive over L1 constraints when processing word orders that did not align with the L1.

As mentioned in this discussion, it is not possible to determine which of the hypotheses offered account for the current results. This study addressed a gap in La research: it attempted to measure the effects of L1 and L2 constraints during real-time comprehension and metalinguistic judgments. Due to the novelty of the study, several design choices rendered the interpretation of the results unexpectedly complicated. Study 2, presented in the next chapter, attempted to reduce the amount of complexity in the interpretation of the results by selecting a method that gave all participants the same amount of time to read and make a metalinguistic judgment: a speeded acceptability judgment task. The goal was to limit the possible ways in which L1/L2 effects could be observed. Furthermore, Study 2 tested

specific morphosyntactic constraints that were present or absent in English and/or Spanish, and that contrary to word order constraints, should not be confoundable with other factors such as optionality in object placement, base word order, or compounding order preferences.

3.6. Summary and conclusion

This study investigated whether intermediate La German speakers were affected by their native and non-native grammars when reading word order violations in a self-paced reading task. Most studies of initial-stage La acquisition have suggested that only one of the prior languages has an effect on the acquisition process, either the L1 or the L2, or whichever prior language is typologically closer to the target. This study showed that effects of prior grammars are more complex in the case of La grammatical use during real-time comprehension at later stages of La proficiency. While La speakers' native constraints affected their reading profiles, non-native constraints affected their judgments. These effects were selective, suggesting that both prior grammars in a trilingual speaker may have an effect on their grammatical processing of the additional language, and that the nature of each effect differs.

Chapter 4

Agreement in a third language

4.1.Introduction

This chapter presents a study of the sensitivity of La German learners to violations of four agreement phenomena. As in the study of word order errors, two groups of intermediate La German learners with mirror L1/L2 languages were tested: a group of L1 English – L2 Spanish speakers, and a group of L1 Spanish – L2 English speakers. The German agreement constraints tested were either similar or dissimilar to the Spanish and English equivalent constraints. Results indicate that the L1 constraints played an important role in participants' degree of sensitivity to La constraints in a task that posed high processing demands. Furthermore, L2 proficiency showed a facilitatory effect on sensitivity to La structures, above and beyond the influence of the L1. These results are discussed in the context of La transfer hypotheses.

4.2. Linguistic description of agreement phenomena in German, English and Spanish

The main question addressed in this second study is whether sensitivity to agreement violations in an La is affected by how these agreement constraints are instantiated in the native language (L1) and the other non-native language (L2) of the speaker. An untimed acceptability judgment correction task and a speeded acceptability judgment task were used to test four agreement phenomena in four experiments. Experiment 4 tested gender agreement between the 3rd person possessive pronoun and the possessor, while Experiment 5 tested number agreement between the 3rd person possessive pronoun and the possessee. While gender agreement with the possessor is required in German and English but is absent in Spanish (see examples in Table 4.1), number agreement with the possessee is required in German and Spanish, but is absent in English. Experiment 6 tested the

concord constraints in predicative adjectives, which require null inflectional marking in German and English, but overt inflectional marking in Spanish. Finally, experiment 7 tested subject-verb agreement, a constraint existent in all three languages. This latter experiment was conducted as a baseline for the other three experiments.

The following sections provide a more detailed description of the relevant linguistic characteristics of each of these phenomena, and what L2 and La research has so far discovered about the roles of prior grammars in their acquisition and processing.

Table 4.1. Overview of the German agreement phenomena and the equivalent translations in English and Spanish tested in Study 1. The experimental manipulation is boldfaced.

Experiment	Language	Example sentences
Exp. 4 Possessor Agreement	German	Herr Wolf rettete **seine/*ihre Patientin**
	English	Mr Wolf saved **his/*her patient**.
	Spanish	El Sr Wolf salvó a **su paciente**.
	Agreement is present in German and English, absent in Spanish.	
Exp. 5 Possessee Agreement	German	Herr Boch zeigte **seine/*sein Werke**.
	English	Mr. Boch showed **his works**.
	Spanish	El Sr. Boch mostró **sus/*su obras**.
	Agreement is present in German and Spanish, absent in English.	
Exp. 6 Predicative Adjective	German	Das Kleid aus Indien war **schön**.
	English	The dress from India was **pretty**.
	Spanish	El vestido de India era **bonito/*bonita/*bonit-Ø.**
	Agreement absent in German and English, present in Spanish.	
Exp. 7 Subject-verb Agreement	German	[...] dass die Eltern viel getanzt **haben/*hat**.
	English	[...] that the parents **have/*has** danced a lot.
	Spanish	[...] que los padres **han/*ha** bailado mucho.
	Agreement is present in German, English and Spanish.	

4.2.1. Possessive pronoun agreement

Possessive pronouns in German agree simultaneously with the possessor (i.e. the entity that possesses, *Herr Wolf* - 'Mr. Wolf' in (4.1)), and the possessee (i.e. the entity that is possessed, *Mutter* - 'mother' in (4.1)). The possessive pronoun's root agrees in person and number with the possessor

(*mein, dein, sein/ihr, unser, euer, ihr* – my, your, his/her, our, your, their). In the case of the 3rd person singular, it also agrees in gender: the pronoun's root is *sein* (his) for masculine possessors, and *ihr* (her) for feminine possessors (4.1).

(4.1) a. Herr Wolf liebt seine Mutter.
Mr.$_{\text{3rd.SG.MASC}}$ Wolf loves his.$_{\text{3rd.SG.MASC}}$ mother.
'Mr. Wolf loves his mother.'
b. Frau Wolf liebt ihre Mutter.
Ms.$_{\text{3rd.SG.FEM}}$ Wolf loves her.$_{\text{3rd.SG.FEM}}$ mother.
'Ms. Wolf loves her mother.'

Similarly, English and Spanish possessive pronouns show root agreement in number and person with the possessor, but only English requires gender agreement with the possessor in the 3rd person singular (4.2, 4.3).

(4.2) Peter$_{\text{SG.MASC}}$ found his$_{\text{SG.MASC}}$ key while Mary$_{\text{SG.FEM}}$ looked for her$_{\text{SG.FEM}}$ purse.

(4.3) Peter encontró su llave mientras Mary buscaba su bolso.
Peter$_{\text{3rd}}$ found his$_{\text{3rd}}$ key while Mary$_{\text{3rd}}$ looked-for her$_{\text{3rd}}$ purse.
'Peter found his key while Mary looked for her purse.'

Therefore, English and German require gender agreement between the root of the pronoun and the possessor for the 3rd person singular, while gender agreement with the possessor is absent in Spanish. However, German also requires agreement between the pronoun and the possessee, which is marked in the suffix of the pronoun through inflection (see 4.4a, 4.4b).

(4.4) a. Herr Wolf liebt seine Mutter.
Mr. Wolf loves his-$_{\text{SG.FEM.ACC}}$ mother.$_{\text{SG.FEM.ACC}}$.
'Mr. Wolf loves his mother.'

b. Herr Wolf liebt seinen Vater.
Mr. Wolf loves his-$_{SG.MASC.ACC}$ father.$_{SG.MASC.ACC}$.
'Mr. Wolf loves his father.'

Spanish, like German, also requires inflectional marking of agreement between the possessive pronoun and the possessee in number and in gender.[1] English, however, does not show inflectional agreement between the pronoun and the possessee. In this case, therefore, German and Spanish show similar inflectional requirements for possessee agreement, while English lacks inflectional agreement in the pronoun altogether (see (4.5)).

(4.5) a. Nuestra casa y nuestros coches tienen seguro.
Our.$_{FEM.SG}$ house.$_{FEM.SG}$ and our.$_{MASC.PL}$ cars.$_{MASC.PL}$ have insurance.
'Our house and our cars are insured.'
b. Our house and our cars are insured.
Our house and our cars.$_{PL}$ are insured.

To sum up, the three languages show differences in their agreement requirements for possessive pronouns. While gender agreement with the possessor is only required in English and German, and not in Spanish, number agreement with the possessee exists only in Spanish and German, but not in English.

Experiment 4 in this thesis looked at participants' sensitivity to gender agreement violations between the pronoun and the possessor in German, while Experiment 5 looked at participants' sensitivity to number agreement violations between the pronoun and the possessee (Table 4.1).

[1] Gender agreement is overtly marked in the 1st and 2nd person of the plural. The remaining person and number combinations do not overtly mark gender agreement with the possessee, a morphological loss rather than lack of syntactic agreement (Antón-Méndez, 2011; Lago, Stutter Garcia, & Felser, 2019).

4.2.2. Predicative Adjective Concord

Adjectives in German take inflectional agreement depending on their position and grammatical function. Attributive adjectives,[2] which modify the noun without the mediation of copulative verbs, mark concord overtly with the noun in gender, number and case (4.6). However, predicative adjectives,[3] which follow a copulative verb and modify the noun that is the subject of this verb, show no overt concord marking at all (4.6).

(4.6) a. Das schwarz**e** Handy gehört Jan.
The.$_{\text{NEUT.SG.NOM}}$ black.$_{\text{NEUT.SG.NOM}}$ phone.$_{\text{NEUT.SG.NOM}}$ belongs-to Jan.
'The black phone belongs to Jan.'

b. Jans Handy ist schwarz.
Jan's phone.$_{\text{NEUT.SG.NOM}}$ is black.
'Jan's phone is black.'

In contrast to German, English has no adjectival inflection at all, regardless of the position. Spanish, however, requires overt number and gender concord in both attributive and predicative adjectives (4.1).

(4.7) a. El móvil negro es de Jan.
The.$_{\text{MASC.SG}}$ phone.$_{\text{MASC.SG}}$ black.$_{\text{MASC.SG}}$ is of Jan.
'The black phone is Jan's.'

b. El móvil de Jan es negro.
The.$_{\text{MASC.SG}}$ phone.$_{\text{MASC.SG}}$ of Jan is black.$_{\text{MASC.SG.}}$
'Jan's phone is black.'

Therefore, German attributive adjectives and Spanish attributive and predicative adjectives require overt concord, whilst German predicative

[2] An attributive adjective modifies the noun without the mediation of a copulative verb. It is a direct modifier of a noun, e.g.: the blue car.
[3] A predicative adjective follows a copulative verb and modifies the noun that is the subject of this verb, e.g.: the car is blue.

adjectives and English attributive and predicative adjectives have no overt concord.

Experiment 6 in this study tested whether sensitivity to violations of the null overt concord constraint in German predicative adjectives was affected by knowledge of a language with no adjectival concord at all (i.e. English) or by knowledge of a language with adjectival concord in attributive and predicative adjectives (i.e. Spanish).

4.2.3. Subject-verb Agreement

German shows agreement in person and number between the subject of a clause and its finite verb. Person and number agreement is carried out by a suffix attached to the root of the finite verb. Each person in the verbal inflection has its respective suffixal marking (4.8).

(4.8) Ich spiele zuerst, dann spielt er.
I.$_{1st.SG}$ play$_{1st.SG}$ first, then play$_{3rd.SG}$ he.$_{3rd.SG}$.
'I play first, then he plays.'

Likewise, Spanish and English require agreement between the subject of a clause and the finite verb in number and person (4.9, 4.10). In the same manner as German, they mark this agreement by way of a suffix attached to the root of the verb.

(4.9) I play first, then he plays.
I.$_{1st.SG}$ play$_{1st.SG}$ first, then he.$_{3rd.SG}$ play$_{3rd.SG}$

(4.10) Yo juego primero, después juega él.
I.$_{1st.SG}$ play-$_{1st.SG}$ first, then play$_{3rd.SG}$ he.$_{3rd.SG}$.

Therefore, all three languages require agreement between the subject and verb of a finite clause. Experiment 7 tested the sensitivity to subject-verb agreement in number for the 3rd person plural and singular in German (Table 4.1).

4.3.Review of La acquisition and processing of agreement phenomena

4.3.1. Agreement in possessive pronouns

Two main areas of research have investigated the acquisition and use of possessive pronoun constraints: L2 acquisition research (Lightbown & Spada, 2000; Martens, 1988; Muñoz Lahoz, 1994; White, Muñoz, & Collins, 2007; Zobl, 1985) and La acquisition research (Imaz Agirre & García Mayo, 2013). Only recently has one study investigated possessive pronoun constraints during comprehension from a processing perspective (Lago, Stutter Garcia, & Felser, 2019).[4]

Studies of L2 acquisition of possessive pronouns have looked at the developmental stages of acquisition in classroom settings, and have repeatedly found that native speakers of Romance languages have difficulties in successfully acquiring the 3rd person singular possessive pronouns of Germanic languages (Lightbown & Spada, 2000; Martens, 1988; Muñoz Lahoz, 1994; White, Muñoz, & Collins, 2007; Zobl, 1985). Later studies that have focused on the psycholinguistic mechanisms behind this phenomenon using production and comprehension tasks with L2 and La learners with different L1s have confirmed Romance speakers' difficulty with Germanic possessor gender agreement (Antón-Méndez, 2011; Imaz Agirre & García Mayo, 2013; Pozzan & Antón-Méndez, 2017). Finally, Lago et al. (2019) observed differences between L1 Spanish and L1 English speakers' comprehension of La German possessive pronouns in a self-paced reading task. The following paragraphs present relevant studies from each of these three research fields.

Several studies have looked at the production of English possessive pronouns in an L2 instructed setting in order to observe the developmental stages involved in their acquisition (e.g. French native speakers in Martens, 1988; French and Catalan/Spanish bilingual speakers in White et al., 2007).

[4] Lago et al. (2019) and the study discussed in this dissertation differ in the focus of their research questions, the design choices and the results. These are described in more detail in the last paragraph of this section, in page 150.

These studies have generally used elicited production tasks such as picture interpretation, and classified the learners' development of possessive pronoun production into different stages, summarized as pre-emergence, emergence and post-emergence. It has generally been observed that the first stages are characterized by avoidance of the possessive form and use of the form 'your' for all persons, genders and numbers. At the emergence stages, the forms *his* and *her* start to be produced, with a tendency to overuse one of the forms. At the final, post-emergence stages, participants gradually distinguish *his* and *her* (J. White & Ranta, 2002).

Other L2 studies have investigated the phenomenon outside of instructed settings. Antón-Méndez (2011) looked at the production of the 3rd person pronoun 'his' and 'her' in lower-advanced L2 English by native speakers of Italian (n = 24), Spanish (n = 18) and Dutch (n = 20). Dutch and English require agreement in gender between the possessor and the pronoun's root, but Italian and Spanish do not. However, Italian and Spanish do require inflectional agreement in gender with the possessee (Italian in all persons and numbers, Spanish only in the 1st and 2nd person of the plural) (Table 4.2). By testing these different L2 English learners, Antón-Mendez aimed to find out whether target-like production of gender agreement between the possessor and the pronoun is affected by the native constraints of the speakers. If it is, L1 Italian and L1 Spanish speakers should show fewer target responses than L1 Dutch speakers.

Table 4.2. Examples of 3rd person possessive phrases in the four languages for a female possessor antecedent (Antón-Méndez, 2011: 319)

	English	Dutch	Italian	Spanish
AN	her-F father-M	haar-F vader-C	suo-M padre-M	su-ø padre-M
AN	her-F mother-F	haar-F moeder-C	sua-F madre-F	su-ø madre-F
IN	her-F dream-ø	haar-F droom-C	suo-M sogno-M	su-ø sueño-M
IN	her-F house-ø	haar-F huis-N	sua-F casa-F	su-ø casa-F

AN = animate possessum; IN = inanimate possessum; F = feminine, M = masculine, C = common gender, N = neuter, ø = no gender

Participants had to produce sentences containing the 3rd person possessive pronoun. This was achieved by presenting a photograph of a male or female person, along with a sentence written in the first person singular, such as '*My father gets a new position at another department'*. Participants were asked to report what the person in the picture had said, therefore changing the 1st person singular possessive pronoun into a 3rd person singular possessive pronoun with gender agreement with the sex of the person in the picture (e.g '*His/her father got a new position at another department*'). There were a total of 64 experimental items in a 2x2 design: gender match between possessor and possessee (match/mismatch) x animacy of the possessee (animate/inanimate) ((4.11)a-d, Antón-Méndez, 2011: 322). As English does not instantiate grammatical gender,[5] the inanimate objects were selected so that half of them had a feminine translation in Spanish and Italian ((4.11)c), and the other half a masculine translation ((4.11)d).

(4.11) Example items from Antón-Méndez, 2011: 322.

a. My mother accompanies the teacher to the school. (animate – fem. translation)
b. My father gets a new position at another department. (animate – masc. translation)
c. My shirt shrinks after being machine-washed. (inanimate – fem. translation)
d. My glass leaves a round mark on the table. (inanimate – masc translation)

The animacy and gender mismatch manipulations were devised in order to determine the point at which the three learner groups had problems with

[5] Some languages such as Spanish, Italian or German have grammatical gender, which divides all nouns into different classes, e.g. masculine and feminine in Spanish and Italian, masculine, feminine and neuter in German. These languages use this classification in agreement with other words such as adjectives or determiners. English lacks grammatical gender, and only instantiates natural gender (e.g. mother (feminine), father (masculine)).

possessive pronouns. If all three groups made errors in the animate condition, the author would interpret this as semantic interference from the biological gender of the possessee. However, if L1 Italian and L1 Spanish speakers produced more errors than L1 Dutch speakers for the inanimate condition, Antón-Mendez hypothesized the following: if the production errors were caused by a gender mismatch effect with the possessor, the Spanish/Italian speakers could be suffering from the interference of L1 grammatical gender features, and therefore end up using L1 syntactic processes. If these two Romance groups still produced more errors than the L1 Dutch group in the inanimate condition, but the production errors were independent of the gender mismatch manipulation, Antón-Méndez hypothesized that they should be applying L1 syntactic process independently of the presence of specific gender features (p. 320). The results showed that the Spanish and Italian native speakers made more production errors for the 3rd person singular possessive pronoun than the Dutch native speakers when the gender of the possessor mismatched the gender of an animate possessee. However, the three learner groups did not differ for items that showed an inanimate possessee, or items in which the possessee matched in gender with the possessor, regardless of the animacy of the former. Antón-Méndez attributed the difference between Romance and Dutch speakers in the gender mismatch animate condition to L1 transfer: the biological gender of the animate possessee in L2 English triggered the agreement mechanism of L1 Romance speakers with the possessee in gender. Dutch native speakers, however, did not suffer from interference by the possessee's biological gender because their Dutch possessive pronouns do not require gender agreement with the possessee. As for the absence of a difference between the Romance and the Dutch groups in the inanimate condition, Antón-Méndez attributed it to the fact that Romance and Germanic language speakers processed the possessive pronouns identically at the semantic level, matching the pronouns with the necessary features of the antecedents, including the gender feature with the possessor. However, at later stages of processing, Romance learners

suffered from L1 transfer when the possessee had biological gender in the target L2 English (e.g. *father*), which was not the case for the inanimate condition, as English has no grammatical gender.

In a later study, Pozzan & Antón-Méndez (2017) tested the production and comprehension of possessive pronouns by a group of L1 Chinese L2 English speakers and a group of child L1 acquirers. Their goal was to find out whether the observed problems in L2 production of possessive pronouns in contexts of possessee – possessor gender mismatch were due to L1 transfer, as suggested by previous studies, or rather due to a tendency to establish agreement locally (NP; "*[Mary$_i$ [VP loves [NP his$_i$ brother]]", Pozzan & Antón-Méndez, 2017). Given that Chinese does not mark agreement with the possessee or the possessor,[6] and child learners have no other L1, any production errors caused by mismatching gender between possessor and possessee could not be attributed to L1 transfer. In the production task, participants were prompted by the experimenter to produce sentences in which the gender of the possessor and possessee matched or mismatched (e.g. '*Katie* gave a present to her *sister*' vs. '*Katie* gave a present to her *brother*'). The researchers found that both groups produced similar patterns of errors, with a significant increase of errors in the gender mismatch condition. From this they concluded that prior mismatch effects observed in L1 Italian and L1 Spanish speakers and now in L1 Chinese are affected by a general trend to establish agreement locally rather than the sole product of transfer from the L1 constraints. In order to test whether this effect was restricted to production, they tested their two groups with an act-out comprehension task. Participants had to act out instructions such as 'Give the apple to his little sister' by moving the object shown on a computer screen with the mouse on to the target possessee while their eye

[6] The orthographical form of the possessive pronoun's root does change depending on the gender of the 3rd person singular, but the change is homophonic.

movements were tracked.[7] In order to investigate whether participants also established gender agreement locally, they measured whether participants' gaze started to direct towards a gender-matching possessee upon hearing the possessive pronoun. They found that this was not the case for either of the groups, from which they deduced that the tendency to establish local agreement is restricted to production. Nonetheless, given that the study did not include a group whose L1 established agreement with the possessee (such as Romance languages), it is possible that such a group could have more difficulties than the L1 Chinese group in the same task due to L1 transfer.

As for acquisition of gender agreement between possessor and the pronoun's root in an additional language, only one published study has addressed this (to my knowledge), namely Imaz Agirre & García Mayo (2013). They conducted a production study of intermediate and advanced learners of English L3 who were balanced bilingual speakers of Basque and Spanish (n = 34). They aimed to find out whether participants' proficiency in English affected their production of the correct form, and whether differences in the agreement constraints in Basque and Spanish compared to English modulated participants' performance. While English requires agreement between the pronoun and the possessor in gender, number and person (4.12), Basque and Spanish require agreement between the pronoun and the possessor in number and person, but not in gender (4.13, 4.14). Further, while Spanish instantiates grammatical gender, Basque and English do not. This affects agreement in possessive pronouns: Spanish requires gender agreement between the pronoun and the possessee (4.15), while neither English nor Basque mark agreement in gender (or number) between the pronoun and the possessee.

(4.12) His book is here, her book is there. (English)

(4.13) Ber-e liburu-a. (Basque)

[7] Children conducted the task with real objects on an inclined podium, because of their inability to use the computer mouse to move the characters around the screen.

DEM-GEN book-DET.

'His/her book.'

(4.14) Su libro. (Spanish)

DEM-GEN book.

'His/her book.'

(4.15) Él juega con sus hermanos. (Spanish)

He plays with his-PL brothers-PL.

Participants had to complete two oral tasks that elicited 3rd person singular possessive pronouns (*his* and *her*): an elicitation task and a picture narration task. In the elicitation task, participants saw coloured images (24 for target items, 24 for fillers) that aimed to elicit sentences, in a 2 x 2 x 2 design: structure (simple/complex) x gender match (match/mismatch) x possessee animacy (animate/inanimate). Participants were expected to produce 'simple' structures for half of the pictures (4.16), and 'complex' structures that involved an intermediary adjective (4.17) for the other half. Furthermore, half of the items aimed to elicit sentences with a match in the gender of the Spanish equivalent translation between the possessor and the possessee (4.16), while the other half elicited items with a mismatch in gender of the Spanish equivalent translation (4.17).

(4.16) a. He (m) is doing his (m) homework (m).

b. She (f) is washing her (f) hands (f, pl).

(4.17) a. Grandpa (m) is listening to his (m) old radio (f).

b. She (f) is wearing her (f) old ring (m).

In the picture narration task, participants were given a picture depicting the family of Susan, one of the characters in the picture. They were asked to describe each of the relatives (ten in total, five male and five female). Their performance in the task was then compared to a control group of English native speakers (n = 17). The results from both tasks showed that the complexity of the structure did not have an effect on the accuracy of the participants' output. However, the authors found a significant effect of

gender mismatch and of animacy: L3 participants made significantly more errors when the gender of the possessor and the possessee were different, and also when the possessee was an animate entity as opposed to an inanimate one. As for the effect of proficiency, it was shown to affect the overall number of errors made, with participants in the intermediate group making more errors than participants in the advanced group. The authors concluded that Basque/Spanish bilinguals had problems producing the correct gender agreement between the possessor and the pronoun in L3 English, especially when the possessee was an animate entity, and when there was a mismatch between the gender of the possessor and the gender of the Spanish equivalent translation of the possessee. They attributed this difficulty to an effect of Spanish syntax: participants attempted to compute gender agreement with the possessee instead of the possessor.

Finally, Lago et al. (2019) investigated whether prior grammars differentially affected La speakers' sensitivity to possessive pronoun gender agreement during processing. For this purpose, they tested two different intermediate La German speaker groups with a speeded acceptability judgment task (SAJ) and a self-paced reading task (SPR). Participants were either L1 English - L2 Spanish speakers, or L1 Spanish – L2 English speakers. While German and English require gender agreement between the root of the pronoun and the 3rd person singular possessor, Spanish does not. Considering prior L2 acquisition research on possessive pronouns, Lago and colleagues hypothesized that Spanish native speakers would be less sensitive to the constraint than English native speakers. They further considered La acquisition research on transfer, and hypothesized that if participants were influenced by their L2 agreement constraints, L2 proficiency might further modulate their sensitivity to the constraint, whereas if participants were influenced by the grammar typologically closest to German (English), regardless of its status as native or non-native language, the La German groups might not differ, as they should both be able to apply English agreement constraints. The authors tested the

constraint in both tasks by manipulating gender agreement between the pronoun and the possessor noun phrase (4.18):

(4.18) a. Felicitous match

Frau Schmidt küsste ihre Mutter bei dem letzten Familientreffen.

Ms. Schmidt kissed her mother at the last family reunion.

b. Felicitous mismatch

Herr Schmidt küsste seine Mutter bei dem letzten Familientreffen.

Ms. Schmidt ... his mother ...

c. Infelicitous match

#Frau Schmidt küsste seine Mutter bei dem letzten Familientreffen. Ms. Schmidt ... his mother ...

d. Infelicitous mismatch

#Herr Schmidt küsste ihre Mutter bei dem letzten Familientreffen. Ms. Schmidt ... her mother ...

Results from the SAJ task showed differences in the La groups' sensitivity to the constraint: although both groups had similar rates of acceptance of felicitous and infelicitous items, L1 Spanish speakers showed significantly slower response times to the infelicitous items than L1 English speakers, which the authors took to indicate that L1 Spanish speakers had more difficulties than L1 English speakers in judging possessor violations in processing measures. Additionally, in a post-hoc analysis, Lago and colleagues found that L1 Spanish speakers with higher L2 English proficiency were more likely to reject infelicitous sentences than L1 Spanish speakers with lower L2 English proficiency. The authors suggest that L2 grammar may play a role in La processing when L2 and La grammars align.

The SPR task with comprehension questions examined whether La speakers were sensitive to the constraint without metalinguistic judgments. Lago and colleagues conducted the experiment using the same sentences as in the SAJ task, with different La participants that had the same language profile as in the SAJ task (La German speakers of L1 English - L2 Spanish,

and L1 Spanish – L2 English). The results showed that L1 English speakers had larger reading disruptions than L1 Spanish speakers after reading the pronoun in the infelicitous condition, which showed a mismatch in gender between the pronoun root and the possessor. This suggests that they were more sensitive to the mismatch of gender between the pronoun root and the possessor than L1 Spanish speakers. However, no effect of L2 proficiency was observed.

The authors suggest that L1 Spanish speakers' reduced sensitivity in the SAJ and SPR tasks confirms the role of L1 influence during the processing of possessive pronouns. They argue that the processing pressure applied by task demands, which also applies to naturalistic language processing, might have encouraged reliance on L1 processing mechanisms, which they suggest may be more available than L2 mechanisms due to L1 early acquisition and frequency of use. Regarding the selective appearance of L2 effects in the SAJ task, Lago and colleagues suggest an L2 may further impact La processing in tasks that allow the conscious invoking of L2 grammar, such as grammatical tests.

Taken together, the results from the studies discussed above suggest that the acquisition of the gender agreement constraint for 3rd person singular possessive pronouns in English and German may be problematic for L2 and La speakers whose L1 does not instantiate the constraint (Antón-Méndez, 2011; Imaz Agirre & García Mayo, 2013). Pozzan & Antón-Méndez (2017), however, attributed the general difficulty in the production of possessive pronoun gender agreement to a general L2 preference for computing agreement locally, a claim that nevertheless does not challenge the view that Romance speakers have more problems with Germanic possessive pronouns than learners with a Germanic L1. Finally, processing evidence shows that both L1 and L2 may influence La German speakers' sensitivity to the constraint (Lago et al., 2019).

Interestingly, although the vast majority of this research has taken advantage of the Romance languages' instantiation of gender and number agreement between the possessive pronoun and the possessee to test

potential interference effects of this agreement as opposed to possessor – pronoun gender agreement, no study, to my knowledge, has focused on investigating whether Romance L1 speakers have an advantage over Germanic L1 speakers in acquiring and processing pronoun-possessee inflectional agreement in a language such as German, which instantiates both possessor and possessee gender and number agreement. Experiment 4 in the study conducted in this thesis takes advantage of the differences in English, German and Spanish possessive pronoun agreement constraints to investigate to what extent participants are affected by the constraints of their prior languages when comprehending an La. It also overcomes design weaknesses in Lago et al. (2019), which differed from the study in the current dissertation in its focus, experimental design and results. Lago and colleagues focused on whether the reported difficulties in the acquisition and processing of possessive pronoun gender agreement arise from a universal tendency towards local agreement computations or from L1 influence. Their complex design contained the factors of acceptability and gender match between the possessor and possessee, while the manipulation was placed in the middle of the sentence. Although important for their research question, these design choices were inadequate for the focus of the study in this dissertation (i.e. the effects of prior languages across four different agreement phenomena under processing pressure) and might have had an impact in the lack of differences between the La groups in their speeded acceptability tasked. The study in this dissertation overcame these drawbacks by including only the factor of acceptability and ensuring that the manipulation was at the end of the sentence. These differences replicated the design of the other experiments in this dissertation and ensured participants had very little time to reflect on their judgments, which is the main the purpose of the task chosen. Contrary to Lago and colleagues, the results of this experiment showed significant differences between the La groups.

4.3.2. Agreement between adjectives and nouns

Given the absence of published studies that investigate La acquisition and processing of possessive pronoun – possessee agreement, tested in Experiment 5 of this study, this section presents studies that have looked at the role of prior grammars in the La acquisition of agreement between attributive adjectives and nouns in La German (Jaensch, 2011) and La French (Dewaele & Véronique, 2001), which present similar agreement constraints to German for possessive pronoun agreement with the possessee. Further, these studies are relevant for the phenomenon tested in Experiment 6 of this study, predicative adjective concord in German, which has not received attention in La and L2 research either, to my knowledge. While Jaensch (2011) found that only La proficiency affected the acquisition of La German adjectival agreement in production, Dewaele & Véronique (2001) found that frequency of use was the only significant predictor for the correct production of adjective inflection in La French. The specifics of each study are presented in what follows.

Jaensch (2011) tested L3 German learners who were L1 Japanese - L2 English speakers. Neither English nor Japanese share the attributive adjectival concord properties of German: they do not mark adjectives for number, gender or case. However, English, unlike Japanese, does instantiate grammatical number, and both English and Japanese instantiate grammatical case of different kinds (English realizes case distinctions in pronouns, e.g. 'he/him/his', while Japanese counts with the same cases as German and a fifth case for topic, all of which are marked by a nominal affix). Jaensch aimed to test the extent to which L2 English, which instantiates grammatical number, could facilitate the correct production of number adjectival inflection in L3 German, as compared to gender adjectival inflection, absent in the learners' L1 and L2. Her goal was to test the L2 status factor (Falk & Bardel, 2011), which predicted facilitation and non-facilitation of the L2, and the Cumulative Enhancement Model (Suzanne Flynn, Foley, & Vinnitskaya, 2004), which predicted only facilitation of the L2 constraints. Participants completed three tasks: a gap-filling task, and two oral tasks.

The gap-filling task consisted of a story in which attributive adjectives had been stripped of their inflectional affix. Participants were given five choices of inflectional affixes for each gap and were asked to choose the grammatically appropriate one. This choice would depend on case, gender and number agreement. In the two oral tasks, participants were asked to describe a series of pictures to their interlocutor, who had to guess which of several pictures with similar characteristics the participant was describing. They had to use adjectives and nouns to narrow down the specific picture they were describing, which required appropriate case, gender and number agreement (e.g. 'Do you have the white house with the red window?'). Jaensch analysed to what extent L2 English proficiency correlated with the production of correct or incorrect inflection in each task. She found no correlation with performance in either task. Only proficiency in the L3 correlated significantly with the degree of accurate adjectival inflection in the written and oral task. With these findings, Jaensch concluded that knowledge of an L2 does not affect the acquisition of adjectival inflection.

Dewaele & Véronique (2001) also conducted a study of trilingual speakers' production of adjectival inflection in French. Participants were Dutch L1 speakers with advanced knowledge of French and English. They were divided into two groups according to the chronological order of language acquisition: a group of L2 French–L3 English speakers (n = 20), and a group of L2 English–L3 French speakers (n = 7). The goal of the study was to investigate gender errors in L2 French speakers, and whether these were caused by Dutch L1 constraints or by individual variation. The role of the additional non-native language (English) was not investigated. Participants were recorded during individual oral interviews with the teacher in French, and their production of adjectives was analysed for errors of gender agreement. The analyses showed over 88% accuracy in the production of gender agreement between nouns and determiners and adjectives, although participants were more accurate for determiner agreement than for adjective agreement. Furthermore, the frequency of target language use had an effect on the correct production of inflection for

both determiners and adjectives: the more frequently participants spoke French, the higher their accuracy in the production of gender agreement. The instantiation of Dutch L1 inflection was not considered a main factor shaping participants' performance.

Taking these findings together, target-like production of La adjectival inflection seems to be dependent on proficiency and frequency of use of the target L3 (Dewaele & Véronique, 2001; Jaensch, 2011), and is not affected by prior grammatical knowledge. The question that follows is whether this is also the case for predicative adjective inflection in an La with different constraints for attributive and predicative adjectives, and for possessive pronoun-possessee agreement in an La that also requires possessor agreement, and whether the effects observed in these production studies also apply to comprehension. Several studies on L2 comprehension have investigated how L2 learners process adjectival concord. Their findings have generally indicated that L2 learners are overall sensitive to violations of adjectival inflection regardless of whether the constraint is instantiated in their L1 or not (Foucart & Frenck-Mestre, 2011; Keating, 2009; Sagarra & Herschensohn, 2010, 2011), but that the extent to which different groups of L2 learners show sensitivity is modulated by whether the L1 instantiates a similar constraint or not (Gillon Dowens, Vergara, Barber, & Carreiras, 2010; Sabourin & Stowe, 2008), with native speakers of a language with a similar lexicon and gender system (e.g. L1 Dutch learners of German) showing more sensitivity than speakers of a distant language (e.g. L1 Spanish learners of German).

The findings from the current study should contribute to filling the current gap in La research regarding sensitivity to possessive pronoun–possessee agreement and adjectival inflection agreement in comprehension. Considering the findings from La and L2 studies, participants in Experiments 5 and 6 should be sensitive to violations during comprehension, but they might differ in the degree of sensitivity depending on whether their L1 instantiates the target constraint or not, and potentially on whether the lexicon of the languages and the agreement system are

similar. Finally, whether knowledge of an L2 modulates participants' performance is also an open question. La production evidence suggests that L2 does not have an effect, while L2 comprehension studies have not used a design and population appropriate for answering this question.

4.3.3. Subject-verb Agreement

Two La studies have investigated the acquisition of subject-verb agreement constraints. Garcia Mayo & Villarreal Olaizola (2011) investigated the acquisition of subject-verb agreement in the production of L3 English, while Sanz, Park, & Lado (2015) tested whether L4 Latin beginner learners could use subject-verb agreement during comprehension to identify the agents of the sentence. Both studies found that participants could make use of subject-verb agreement as their proficiency increased.

Garcia Mayo & Villarreal Olaizola (2011) investigated the acquisition of L3 subject-verb agreement in an instructional setting with bilingual Spanish/Basque children. Participants were acquiring English through two types of instruction: content and language integrated teaching (CLIL)[8] or traditional language teaching. The authors' goal was to observe whether the type of instruction had an effect on the amount of correct inflection participants produced, and therefore the role of the participants' prior grammars was not addressed. The analysis of the participants' inflection errors (omission or wrong inflection) showed that the amount of instructional hours modulated the amount of errors made, decreasing incorrect responses as hours of instruction increased, as expected, while the type of instruction did not have an effect on the correct production of inflection.

Contrary to Garcia Mayo and Villareal Olaziola, Sanz and colleagues (2015) aimed to observe the role of prior languages (L1 and L2) in the initial state and the development of an L3. In this study, the authors looked

[8]Content and Language Integrated Learning is an instructional practice that consists of the teaching of a core subject (e.g. History or Biology) in a foreign language (English as a second language) in a primary or secondary teaching institution (Coyle, Hood, & Marsh, 2010).

at the strategies used by initial-state learners of L3 Latin to assign thematic roles in two different testing sessions: at the first encounter with Latin, and after increased exposure. Although they did not directly test the acquisition of subject-verb agreement, it was a crucial component of the design. They manipulated three cues for thematic role assignment: case morphology, subject-verb agreement, and word order. Their participants were native speakers of English who had learned as an L2 either Japanese or Spanish. While Japanese relies more on case for thematic role assignment, Spanish relies more on subject-verb agreement, and English relies on word order. Latin relies heavily on case morphology. The goal of the researchers was to determine whether participants would be influenced by their L1 and L2 cue hierarchy during the comprehension of initial-stage L3 Latin and after training in the L3. Participants had to read a sentence in Latin and then decide which of two pictures better represented the thematic roles portrayed in the sentence. The sentences were in one of three conditions: sentences in which SVO and case agreement were informative (4.19), sentences in which case and verb agreement were informative (4.20), and sentences in which only case agreement was informative (4.21).

(4.19) POTENTISSIMI SALUTANT STULTUM.
king.NOM.PL greet.3RD PL fool.ACC.SING
"The kings greet the fool."

(4.20) STULTUM SALUTANT POTENTISSIMI.
fool.ACC.SING greet.3RD PL king.NOM.PL
"The kings greet the fool."

(4.21) STULTUM POTENTISSIMUS SALUTAT.
fool.ACC.SING king.NOM.SING greet.3RD SING
"The king greets the fool."

Therefore, the correct response could always be determined by making adequate use of case agreement, but in two conditions either word order or verb agreement were informative too. Their analyses showed that all

participants, regardless of their L2, were more accurate when word order was informative, therefore relying on the cue hierarchy of their native tongue, L1 English, as the preferred strategy to determine thematic roles. However, as exposure to L3 input increased, reliance on case and subject-verb agreement cues also increased. As for the role of L2 cues, they found that experience in an L2 that relies in case morphology (Japanese), or subject-verb agreement (Spanish) had no effect on the degree of reliance on either cue.

These two La studies looked at subject-verb agreement in an La as a secondary question to a research question unrelated to the role of prior grammars in the acquisition or comprehension of subject-verb agreement, and therefore their findings cannot speak directly to Experiment 7 in this study. Although L2 processing studies cannot speak directly to Experiment 7 either, they contain relevant information as to whether L2 learners can acquire and process subject-verb agreement in a non-native language. Multiple L2 processing studies have addressed this focus using different paradigms, ranging from behavioural metalinguistic judgments to neurophysiological measures, testing speakers whose L1 does not instantiate subject-verb agreement (Jiang, 2004; Shibuya & Wakabayashi, 2008; Wakabayashi, 1997) to speakers of L1s that do instantiate subject-verb agreement (e.g. English, Dutch and Russian in Hopp, 2010; L1 English in Osterhout et al., 2008; Tokowicz & MacWhinney, 2005). The richness of methods and populations explains why there are mixed results regarding the degree of sensitivity that participants display during the processing of the L2. Studies that investigated L1 speakers of Chinese or Japanese learning L2 English (Jiang, 2004; Sato & Felser, 2010; Shibuya & Wakabayashi, 2008; Wakabayashi, 1997) found reduced degrees of sensitivity to subject-verb agreement inflection. However, especially relevant for Experiment 7 are findings of studies that tested speakers of L1s that do instantiate subject-verb agreement using tasks that elicited explicit metalinguistic responses (Hopp, 2010; Osterhout et al., 2008; Sato & Felser, 2010; Tokowicz & MacWhinney, 2005). These studies showed that the L2 speakers whose L1

instantiates subject-verb agreement showed sensitivity to subject-verb agreement violations in both metalinguistic judgments and neurophysiological measures, although this sensitivity was reduced compared to their sensitivity to other types of agreement constraints (e.g. L1 German speakers detected 93% of infelicitous subject-verb agreement items vs. 97% for case agreement in Sato & Felser, 2010). This suggests that L2 learners can develop sensitivity to violations of subject-verb number agreement when they are required to focus on the form of the sentence, even if this sensitivity is reduced when compared to other types of agreement constraints.

4.3.4. Summary of previous findings

The four phenomena tested in this study show cross-linguistic differences in German, English, and Spanish that render them useful testing cases for the effects of native and non-native grammars when using an additional language. The amount of prior studies that have investigated these same phenomena in La speakers is however small, which is understandable given the specific population and language combinations, and considering the recency of research interest in the role of prior grammars in the acquisition and use of La morphosyntax.

Nonetheless, there are findings in studies unrelated to the current focus that could be relevant to the current study. Regarding the use of gender agreement between the possessor and the 3rd person singular possessive pronoun in La German, there is abundant evidence in the field of L2 acquisition, and some supporting evidence in La acquisition, that the production of the pronoun root in Germanic L2s such as English and German is a source of frequent errors for L2 learners, and particularly for L2 learners whose native tongue is Romance (e.g. Antón-Méndez, 2011; Imaz Agirre & García Mayo, 2013). Little is known about how these errors emerge in comprehension and under time pressure in intermediate La populations whose L1 is Romance and L2 is Germanic or vice versa, such as the L1 Spanish – L2 English and L1 English- L2 Spanish speakers of La

German in this study. Considering the L2 and La untimed evidence, there are several potential outcomes: either the La German groups tested in the current study can apply their metalinguistic knowledge of the constraint during speeded comprehension or not, and either they are differentially affected by how their L1 and L2 (Spanish and English and vice versa) constraints instantiate possessor gender agreement, or they are not. These possibilities are explored in Experiment 4 in this study.

Regarding the role of prior grammars in the use of agreement constraints between the possessive pronoun's inflectional suffix and the upcoming possessee, there are fewer published studies that can be used to derive predictions for possessee number agreement in Experiment 5 in the current study. The only information available to my knowledge comes from studies investigating La speakers' use of adjective concord in La German (Jaensch, 2011) and La French (Dewaele & Véronique, 2001), which can be informative regarding La speakers' use of the inflection required between the adjective and the noun, a constraint required in possessive-pronoun – possessee agreement. These studies found that only the degree of proficiency and frequency of use of the La have an impact on La learners' performance, finding no effects of their prior grammars. This is also valuable information for the third phenomenon tested in this study: predicative adjectives in German (Experiment 6). Whether only proficiency and frequency of use, or also L1 and L2 constraints, affect comprehension of possessee number agreement and predicative adjective concord in La German is investigated in Experiments 5 and 6 of this study.

Finally, no study to my knowledge has investigated subject-verb agreement in La speakers. Importantly, however, L2 studies on the acquisition and processing of subject-verb agreement show that participants whose L1 instantiates the constraint display sensitivity in their judgments and processing measures when tested with tasks that elicit metalinguistic judgments (Osterhout et al., 2008; Tokowicz & MacWhinney, 2005).[9] It is

[9] Note that some studies that have used tasks that put L2 learners under processing pressure without demanding metalinguistic judgments have

reasonable to expect that speakers with intermediate proficiency in La German and with L1 and L2 that instantiate subject-verb agreement should have high sensitivity to the constraint even in speeded conditions. Whether this is the case or not is tested in Experiment 7 of this study.

4.4. Study 2: the role of prior grammars in sensitivity to La agreement

The goal of this study was to observe whether native and non-native constraints in multilingual speakers affect their sensitivity to constraints in an additional language. This overarching question was previously addressed in Study 1, Chapter 3, by investigating La German speakers' reading patterns and judgments of violations of word order. The findings showed that participants' L1 did not affect their metalinguistic judgments, but their L2 did. Further, reading patterns differed between the La German groups, hinting at a potential effect of L1 constraints on the way participants processed violations. In the current study, this question is further investigated using four agreement phenomena in La German that show clear cross-linguistic differences between German, Spanish and English. Previous studies of these phenomena are scarce and in many cases they have looked at these constraints as a by-product of a focus unrelated to the current study (see the above discussion). It is therefore an open question whether intermediate La speakers of German are capable of using these constraints in real-time comprehension, and whether their performance is affected by how the target constraint is instantiated in their native and non-native grammars.

Instead of a self-paced reading paradigm as used in Study 1, the current study used a speeded acceptability judgment task (SAJT), which limits participants' time for metalinguistic reflection before they are asked to provide an acceptability judgment. The goal of the speeded task was to test whether the native and non-native constraints of the speakers affected their

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found no sensitivity to the constraint, e.g. Hopp, 2010. These paradigms however do not reflect the processes the current study investigates, as the current study demands metalinguistic judgments and therefore attention to the form of the sentences.

sensitivity to the La constraint when their processing resources were taxed by task demands. In order to ensure that only participants with mature knowledge of the target constraints were included, an untimed grammaticality correction task tested each constraint. Participants who had less than 75% accuracy in the untimed task for each corresponding constraint were excluded from the analyses. Two La German populations with mirror L1/L2 were tested (L1 English – L2 Spanish speakers and L1 Spanish – L2 English speakers), along with a control group of German native speakers. These three groups had not participated in Study 1.

The first two experiments tested agreement constraints in possessive pronouns. Experiment 4 on possessor agreement looked at gender agreement between the possessor and the pronoun, while Experiment 5 looked at number agreement between the pronoun and the possessee. Experiment 6 looked at the concord constraints of predicative adjectives. Finally, Experiment 7 investigated number agreement between the subject and the verb of a main clause (Table 4.1). Whereas the phenomena in Experiments 4 (possessor agreement) and 6 (predicative adjective concord) show constraints that are similar between German and English, but are dissimilar in Spanish, Experiment 5 on possessee agreement shows constraints that are similar between German and Spanish, and dissimilar in English. Experiment 4.7 on subject-verb agreement shows a constraint existent in all three languages.

With this combination of participant language background and agreement phenomena with cross-linguistic differences, the following research questions were addressed:

1) Do participants differ in their degree of sensitivity to an La agreement constraint depending on how this constraint is instantiated in their L1, when tested under processing pressure?

2) Do La speakers differ in their degree of sensitivity to an La agreement constraint depending on how this constraint is instantiated in their L2, when tested under processing pressure?

The answers to these questions should show which account of La Acquisition better explains La grammatical use under processing pressure: the *L1 effect account*, the *L2 effect account*, the *constraint similarity account* or the *no transfer account*.

4.4.1. Method

A web-based study consisting of a speeded acceptability judgment task and an untimed acceptability judgment correction task was conducted with the Ibex Farm software (Drummond, 2013) on two different groups of La German learners, and on a group of native German speakers. To ensure that whatever effects found in participants' ratings during the speeded acceptability task, which is known to elicit a high number of errors in participants due to its fast pace (e.g. Hopp, 2010), were not due to a lack of knowledge of the constraint itself, only participants that showed mature knowledge of the constraint in the untimed acceptability correction task with at least 75% accuracy were included in the analyses. The speeded acceptability task presented sentences rapidly word by word (500 s.o.a.), with the location of the manipulation of acceptability on the last two words of the sentence. Participants had three seconds after a sentence ended to decide whether it was acceptable or not. These task demands should show whether native (L1) or non-native (L2) constraints have an effect on the participants' use of the target constraint in an additional language (La) under processing pressure.

4.4.1.1.Participants

Three groups of speakers of German were tested: a group of native German speakers that served as a control, and two groups of non-native speakers of German as an additional language (La). The two non-native groups were matched for proficiency in German, and differed in their native language (L1) and other non-native language (L2). While one group consisted of English native speakers who spoke Spanish as a non-native language, the

other group were Spanish native speakers with English as a non-native language.

The La German speakers were drawn from a pool of participants tested for the current study (an original pool of 44 L1 Spanish speakers and 51 L1 English speakers). Participants left out of the analyses either did not speak all the languages required (see language requirements in section 4.4.1.9), performed below chance level in the filler items included in the speeded acceptability task, or did not have the minimum level of intermediate German as indicated by a minimum score of 15 out of 30 in the German Einstufungstest (Goethe Institut, 2010). Table 4.3 presents the demographic data of the participants that did match the requirements and were therefore included in the analyses (see Appendix B.1 for information on the original pool of participants).

Table 4.3. La participant demographic and linguistic information. Ranges in brackets.

	L1 English (n = 30)	L1 Spanish (n = 31)
Age	27 (19 - 56)	29 (21 - 46)
Goethe score (%)	73 (50 - 90)	70 (57 - 90)
Self-rated proficiency La (%)	70 (27 - 97)	80 (55 - 97)
AoA La	18 (11 - 34)	20 (5 - 40)
Length LaA (years)	7 (0.6 - 41)	6 (0.1 - 16)
L2	Spanish	English
Self-rated proficiency L2 (%)	60 (15 - 87)	80 (50 - 100)
AoA L2	15 (6 - 29)	8 (3 - 16)
Length L2A (years)	6 (0.4 - 20)	10 (0.1 - 24)

*Goethe score ranges from 0 -30 (A0 – C2 proficiency), it has been transformed into percentages for sake of clarity.

4.4.1.1.1. Native speakers of English

Participants were 30 native speakers of English (age 27, 19 - 56), who had learned German and Spanish as second languages. The majority had resided in a German-speaking country for at least a month at some point of their

adult life (mean number of months 20, range 0 - 63). They were contacted through social media posts and through language academies. Their proficiency in German was determined through two measures: a self-assessment of their four skills (speaking, writing, listening and reading) on a scale of 0-10, in which they had an average of 7 when the four skills were averaged, and through the Goethe Einstufungstest (Goethe Institut, 2010), in which they showed an intermediate level with 21 points out of 30 (these scores are transformed into percentages in table 2.3 for clarity of presentation). In both measures, therefore, they showed an intermediate proficiency in German according to the CEFR (see Appendix B.1 for the list of participants' information). Their proficiency in L2 Spanish was determined by the same kind of self-assessment rating, in which they rated themselves an average of 6/10. Participants had above-chance accuracy in the fillers of both tasks, and hence were considered proficient enough to complete the experiment.

Despite an effort to recruit participants that only spoke German, Spanish and English, 22 of the 30 participants spoke other foreign languages in addition these three. However most of them claimed to have learned only up to a beginner level of the language. A total of eight participants claimed to have above beginner proficiency in the additional language. The information regarding the amount of additional languages and the order in which participants learned their non-native languages was taken into account in the analyses (see Appendix B.1 for more detailed information of the additional languages) and did not have a significant effect on participants' performance in the experimental tasks.

4.4.1.1.2. Native speakers of Spanish

Participants were 31 native speakers of Spanish (age: 29, 21-46) who had learned German and English as second languages. The group was recruited in the same fashion as the native speakers of English, via social media posts and internal contact in language academies. They had lived in a German-speaking country for a mean of 43 months (1-192). Their proficiency in

German was measured with the same tasks as the L1 English group: a self-assessment in which they rated themselves 7.7 out of 10, and the Goethe Einstufungstest (Goethe Institut, 2010), in which they scored a mean of 21 points out of 30, equivalent to the intermediate level of proficiency according to the CEFR. Their self-rated proficiency in L2 English was 8 out of 10 (5-10), which indicates that they considered themselves as upper-intermediate/advanced users of the language. Like the L1 English group, all participants in the Spanish native group showed above-chance accuracy in the fillers of the untimed and the speeded task, and were therefore considered proficient enough to complete the experiment.

Out of the 31 participants in the L1 Spanish group, 21 spoke additional languages besides German and English, of which nine had an above beginner level of proficiency. Four of these nine participants claimed to use the language 'hardly ever', while the rest had varied degrees of use. The remaining 12 participants who claimed to know additional languages spoke them only up to a beginner level. The information regarding the amount of additional languages and the order in which participants learned their non-native languages was taken into account in the analyses (see Appendix B.1 for more detailed information of the additional languages) and did not have a significant effect on participants' performance in the experimental tasks.

4.4.1.1.3. Native speakers of German

An original pool of 50 native speakers of German were tested, of which only 30 were randomly picked and included in the analyses to keep the number of participants across groups similar. The mean age of the selected participants was 29 (range: 18 - 51), and they were taken as a baseline for all four experiments. Although an effort was made to test participants with little knowledge of foreign languages so that their performance could not be ascribed to the influence of these, all of the participants had some knowledge of English. Germany requires school students to learn a foreign language, English being the foreign language which is taught most often (see Appendix B.1 for more detailed participant information). The mean age

of acquisition of English was 12 (range 5 – 13), and the mean length of acquisition was 7 years (range 0 – 12). Their self-rated proficiency in English was 6 out of 10 (2 – 9.5). Other than English, the majority of participants spoke no other foreign language, and if they had learned a foreign language, they rated its use as 'hardly ever' on a scale of *daily – weekly – monthly – yearly – hardly ever – never*.

4.4.1.2.Design of the materials

The four experiments had a 2x3 design, with the factors condition (acceptable/unacceptable) and group (L1 English/L1 Spanish/L1 German). All four experiments were presented in a single web-based testing session, first in a speeded acceptability judgment task, and then in an untimed acceptability judgment correction task.

4.4.1.2.1. Speeded acceptability judgments

The software used to programme the experiments was Ibex Farm (Drummond, 2013), an online platform for the programming and implementation of linguistic experiments. This enabled remote participation and therefore higher chances of recruiting candidates: participants could complete the experiment from any computer and location of their choice. They were instructed to look for a quiet environment, with special attention to avoiding all possible distractions during the time of the experiment (see Appendix B.4 for the full instructions). Each participant saw a total of 80 experimental items (20 per experiment, by four experiments) in two conditions (acceptable/unacceptable), and 40 fillers. The platform Ibex Farm randomized all 120 items for each participant, and distributed each of them in one of two lists following a Latin Square design. All items in this task were shown rapidly word by word, with each word appearing in the middle of the screen for 500ms. Once the entire sentence had been shown in this fashion, the participant was prompted to make a quick judgment by the appearance of the question *Ist der Satz akzeptabel?* (Is the sentence acceptable?) in the middle of the screen, with a 3000ms timeout. The

participant was presented the two options *Ja* (Yes) or *Nein* (No) below the prompt question along with a reminder of what key should be pressed for each answer.

In the instructions participants were asked to press the F key on their keyboard for *Ja* (yes), and the J for *Nein* (no),[10] and to keep their fingers over the keys during the whole experiment so that they could respond as fast as possible. After participants pressed the answer key, or failed to give an answer within the three second timeout, the following message would appear on the screen *Bitte drücken Sie irgendeine Taste, um fortzufahren*. ('Please press any key to continue.'). While this message was on screen, participants could either take a short break, or press any key immediately to carry on.

Special care was taken to create sentences that presented no kind of grammatical, semantic, or pragmatic irregularities, so that they could all be considered acceptable by the native speaker baseline group, except for the cases in which the acceptability or grammaticality was experimentally manipulated (4.22).

(4.22) a. Herr Jung zeigte gern seine Werke.
Mr. Jung showed gladly his$_{.PL}$ works$_{.PL}$.
'Mr. Jung gladly showed his works.'

b. *Herr Jung zeigte gern sein Werke.
*Mr. Jung showed gladly his$_{.SG}$ works$_{.PL}$.
'Mr. Jung gladly showed his works.'

The number of words per item was kept equal within each experiment, with the manipulation of acceptability located at the end of the items (4.22). The vocabulary was selected from the Goethe Zertifikat B1 vocabulary book (Glaboniat, Perlmann-Balme, & Studer, 2012) to match a B1 level of

[10] These two keys in the keyboard have a dent that makes them easier to locate, and represent the usual index finger position for each hand.

German, and hence avoid comprehension difficulties in the non-native groups. Likewise, the length of the words in the critical regions (i.e. where the acceptability manipulation took place) was kept similar within each experiment, whilst the length of the remaining regions was kept short as often as possible, again to facilitate comprehension for the non-native groups (see Appendix B.2 for the full list of items).

4.4.1.2.2. Untimed acceptability judgments

The untimed acceptability judgment correction task tested the same constraints as the speeded acceptability task. The conditions were the same as the speeded task (i.e. acceptable/unacceptable). The total number of items in this untimed task was 60, each experiment containing ten experimental items (five acceptable, five unacceptable) interspersed among 20 fillers. All 60 items were randomized and presented in one single list (see Appendix B.3 for the full list of materials).

The instructions for the task asked participants to mark the 60 sentences as *acceptable* or *unacceptable*, and to provide a version of an acceptable sentence for those sentences they had marked as unacceptable. This added correction task was included to ensure that the reason why an item had been marked as unacceptable was due to the experimental manipulation. The following responses were included for statistical analyses:

a. Grammatical items correctly judged as grammatical.
b. Ungrammatical items correctly marked as ungrammatical with the appropriate correction.
c. Grammatical items incorrectly judged ungrammatical.
d. Ungrammatical items incorrectly judged as grammatical.

Items excluded were:

a. Ungrammatical items correctly marked as ungrammatical with no correction or a wrong correction.

These latter were excluded given that they cannot entirely be considered as evidence against knowledge of the phenomena tested. To reduce the time required by the testing session, the sentences in this task were kept short. The vocabulary was again mostly limited to a B1 level according to the CEFR, as found in the Goethe Zertifikat B1 vocabulary book (Glaboniat et al., 2012).

4.4.1.3.Experiment 4: Possessor Agreement

The items in this experiment were designed to investigate participants' sensitivity to violations of gender agreement between a possessor and the possessive pronoun. Both German and English require gender agreement between the possessor (*Herr Wolf* in example (4.23) below, note that '#' represents non-canonicity as opposed to *, which represents ungrammaticality) and the root of the 3rd person possessive pronoun (*sein* in (4.23)), while Spanish does not instantiate gender agreement between these two (see Section 4.2.1 for more details).

(4.23) a. Herr Wolf rettete gestern seine Patientin.
Mr.MASC Wolf saved yesterday his.MASC patient.
'Mr. Wolf saved yesterday his patient.'

b. #Herr Wolf rettete gestern ihre Patientin.
Mr.MASC Wolf saved yesterday her.FEM patient.
'Mr. Wolf saved yesterday her patient.'

All 20 items in the experiment consisted of a six-word main clause in two conditions: acceptable and unacceptable (see Appendix B.2.1 for the full list of items). The two first words of the main clause formed the subject noun phrase, which contained the marker for biological gender *Herr* ('Mr.') or *Frau* ('Ms.'), and a proper name (e.g. Wolf in (4.23)). These surnames were assigned to a male or a female subject, while ensuring that any possible semantic interpretation of the surname did not pose any

contradictions with the real gender of the subject (e.g. Neumann contains the word "Mann", which means *man* in German, hence this surname was only assigned to male subjects). The next word was the verb phrase, which consisted of a transitive, regular verb in the simple past,[11] followed by a temporal adverb. The last two words in the item composed the direct object noun phrase, which consisted of the possessive pronoun determiner (seine/seinen/ihre/ihren), and a noun that made reference to a male or a female person (e.g. *Patientin* – 'female patient', (4.23)). The length of the noun (i.e. the possessee) was controlled across the different conditions of the experiment (mean number of letters = 7, range = 5-9).

Note that the items did not present an ungrammatical sequence per se, but an ambiguous one: *Herr Wolf rettete ihre Patientin* 'Mister Wolf saved her patient'. In this example, the possessive pronoun 'her' requires a third person, singular, feminine antecedent. This sentence would be ungrammatical if 'her' referred to 'Mister Wolf', a third person singular masculine antecedent, but grammatical if it referred to an extra-sentential, third person, singular, feminine antecedent. Participants were explicitly asked to interpret the items based on the context given in the sentence and to refrain from using information external to the provided sentence, so as to prevent participants from looking for an external antecedent,[12] which was not a significant concern, given that previous studies have shown that readers attempt to establish coreference with antecedents within the sentence (Chow et al., 2014; Lamers et al., 2006; Nieuwland, 2014; Osterhout and Mobley, 1995). The goal was to have participants assign the role of the possessor to the subject of the sentence (e.g. *Herr Wolf* in (4.23)), which was clearly gender-marked with Herr/Frau to avoid potential ambiguities created by proper names (e.g. *Andrea* or *Sascha* may be a male or a female name depending on the L1 of the speaker).

[11] Only one of the 20 verbs was irregular: 'fand", but highly frequent and known by B1 learners.

[12] The example given to the participants in the instructions was as follows: "Anna hat gearbeitet und dann ist sie nach Hause gegangen" vs "Anna hat viel gearbeitet und dann ist er nach Hause gegangen". (see Appendix B.4)

Of the 20 experimental items, half contained a masculine subject and its respective sentence-internal possessive pronoun (*Herr – sein*; 'Mister' – 'his'), and the other half a feminine subject and its respective sentence-internal possessive pronoun (*Frau – ihr*; 'Ms.' – 'her'). Masculine subjects had feminine objects (the possessee), and feminine subjects had masculine objects (4.24). Note that the possessive pronoun's inflection agreed in gender (as well as in case and number) with the following possessee (4.24).

(4.24) a. Herr Wolf rettete gestern seine Patientin.
Mr.$_{MASC}$ Wolf saved yesterday his.$_{MASC\text{-}FEM}$ patient.$_{FEM}$.
'Mr. Wolf saved his patient yesterday.'

b. Frau Braun hörte ständig ihren Nachbarn.
Ms.$_{FEM}$ Braun heard constantly her.$_{FEM\text{-}MASC}$ neighbour.$_{MASC}$
'Ms. Braun heard her neighbour constantly.'

The manipulation of acceptability took place by modifying the gender of the root of the possessive pronoun, and substituting it for a root that mismatched the sentence-internal subject and intended antecedent in gender. Hence, items such as "Herr Fischer [. . .] seine Tochter" (Mr Fischer [. . .] his daughter) were turned into "#Herr Fischer [. . .] ihre Tochter" (Mr Fischer [. . .] her daughter). Considering that participants had been asked to interpret the items based on the context given, and to refrain from looking for external antecedents, the presence of a possessive pronoun that mismatched the gender of the sentence-internal antecedent should be considered unacceptable.

The materials for the untimed acceptability correction task were created following the same criteria as the materials for the speeded acceptability task. The only two differences concerned the number of items (in the untimed task only ten items were used, five grammatical and five ungrammatical), and the length of the items (the adverbial phrase was

eliminated in the untimed task to make the experiment shorter and less tiring for the participants).

(4.25) a. Herr Wolf besuchte seine Tante.
Mr.$_{MASC}$ Wolf visited his.$_{MASC.e}$ aunt.
'Mr. Wolf visited his aunt.'

b. # Herr Wolf besuchte ihre Tante.
Mr.$_{MASC}$ Wolf visited her.$_{FEM.e}$ aunt.
'Mr. Wolf visited her aunt.'

4.4.1.4.Experiment 5: Possessum Agreement

This experiment investigated the participants' detection of number agreement violations between the possessive pronoun and the possessee (4.26). German and Spanish require number agreement between the possessive pronoun and its possessee, while English does not require any type of overt agreement between these two elements. Therefore, as opposed to Experiment 4, where English and German showed similar agreement constraints and differed from Spanish, in Experiment 5 it was Spanish and German that showed similar agreement constraints and differed from English.

(4.26) a. Herr Jung zeigte gern seine Werke.
Mr. Jung liked showing his.PL works.PL.
'Mr. Jung liked showing his works.'

b. *Herr Jung zeigte gern sein Werke.
Mr. Jung liked showing his.SG works.PL.
'Mr. Jung liked showing his work.'

The 20 items of this experiment resembled items in Experiment 4: they were six-word-long main clauses that contained a noun phrase with a gender

marker (*Herr*/*Frau* - Mr./Ms.) and a surname, followed by the verb phrase with a regular simple past form, an adverb, the possessive pronoun and the possessed direct object. In contrast to Experiment 4, however, the possessee was a neuter noun in the overtly marked plural form (see Appendix B.2.2 for the full list of items). A total of nine neuter words contained an "-e" plural marking (e.g. Boot - Boote), two displayed the "(a¨/o¨/u¨)-er" plural marking (e.g. Buch-Bücher), four the "-er" marking (e.g. Bild - Bilder), three the "-en" marking (e.g. Hemd – Hemden), and two contained the "-s" marking (e.g. Auto - Autos).

The manipulation of grammaticality took place at the inflection of the possessive pronoun: the acceptable condition contained the inflection that denoted [+plural] (*sein-e*.PL), which correctly agreed with the following plural, accusative, neuter possessee (*Werk-e*.PL). The unacceptable condition presented a mismatch between the two elements by displaying a pronoun with no overt inflection (*sein*), [-plural], which mismatched the subsequent plural-marked neuter noun (e.g. *Werke*). The [+- plural] inflection was not counterbalanced across the conditions, as it was critical that the neuter noun remained plural throughout the experiment. The uninflected pronoun *sein* may reflect singular masculine and singular neuter nominative, in the accusative case it can only be interpreted as singular and neuter. All items in the experiments followed an SVO word order, which is the canonical word order for German main clauses. Given that the possessive pronoun appeared at the end of the sentence after a potential sentence-initial subject and matching verb, participants should interpret the possessive pronoun as a direct object and hence assign it the accusative case. Given that the neuter noun was marked for plural across the conditions and that its gender was given at the beginning of the sentence, it was unlikely that participants' errors in the detection of the agreement constraint were due to insensitivity to case or gender inflection rather than insensitivity to the plural inflection.

As in Experiment 4, the gender of the subject of the sentence was counterbalanced, with ten items containing a female subject and its

respective female possessive pronoun (e.g. *Frau Braun – ihre*; 'Ms. Braun' – 'her') and ten containing a male subject and its respective male possessive pronoun (e.g. *Herr Fischer – seine*; 'Mr. Fischer' – 'his'). The possible gender bias of the surname was controlled to avoid confusion, so that there would be no contradictions between the gender marker (Herr/Frau) and the following surname. The length of words was kept similar across items, and the sentence-final neuter nouns were strictly controlled: they were bi-syllabic, and either five letters long (ten items) or six letters long (ten items).

As for the items in the untimed acceptability task (4.27), the same measures were applied as for the speeded acceptability items. The only differences between the tasks concerned the number of items (in the untimed task only 10 items were used, five grammatical and five ungrammatical) and the length of the items (the adverbial phrase was left out of the untimed items to save time).

(4.27) a. Herr Fischer vermietete seine Autos.
Mr. Fischer rented his.$_{PL}$ cars.$_{PL}$.
'Mr. Fischer rented his cars.'

b. *Herr Schäfer übte sein Lieder.
Mr. Schäfer practised his.$_{SG}$ songs.$_{PL}$.
'Mr. Schäfer practised his songs.'

4.4.1.5.Experiment 6: Predicative adjective concord

In Experiment 6, the focus was on German predicative adjectives. Predicative adjectives in German and English do not show overt concord marking, unlike Spanish, which requires overt marking (4.28).

(4.28) a. Das Kleid aus Indien war schön.
The dress.$_{NEUT}$ from India was pretty.
'The dress from India was pretty.'

b. *Das Kleid aus Indien war schönes.
The dress.$_{NEUT}$ from India was pretty-$_{NEUT}$.
'The dress from India was pretty.'

The 20 items of the experiment were six-word-long main clauses made up of a noun phrase, a prepositional phrase, and the verb phrase containing *sein* (to be) in the simple past, followed by a monosyllabic predicative adjective.

All sentence-initial noun phrases displayed the neuter definite determiner "das", followed by a monosyllabic (in 17 cases) or bi-syllabic (in three cases) neuter, singular, nominative noun (see the Appendix B.2.3 for the full list of items). The overt marking of neuter gender at the determiner ensured that participants were fully aware of the gender of the subject of the clause, which is crucial for attributive adjective concord, although irrelevant for predicative adjective concord. The manipulation of acceptability was carried out by adding a suffixal inflection to the predicative adjective, which agreed in case, gender and number with the subject of the clause, to which it made reference. In attributive position, this overt inflection would have been required in German and hence grammatical. However, in the current predicative position, the overt inflection is strictly disallowed, hence creating an unacceptable (and ungrammatical) condition.

The ten items of the untimed acceptability correction task differed from the materials of the speeded acceptability task in the number of words per item, which was shortened to five by substituting the two-word prepositional phrase with a single adverb. This was done to shorten the time required by the task, while still maintaining an acceptable length for each item. Additionally, the sentence-final words included words with three syllables, while the adverbs varied in length, ranging between one and three syllables (4.29), as word length was not a concern in the untimed judgment task.

(4.29) a. Das Spiel war ganz spannend.
The game.$_{NEUT}$ was quite exciting.ø.
'The game was quite exciting.'

b. *Das Spiel war ganz spannendes.
The game.$_{NEUT}$ was quite exciting.$_{NEUT}$.
'The game was quite exciting.'

4.4.1.6.Experiment 7: Subject-verb Agreement

All twenty items in this experiment included a subordinate clause that allowed the conjugated verb to appear at the end of the item, where the grammaticality manipulation took place in all four experiments (4.30).

(4.30) a. Daniel sagt, dass die Gäste schon genug gegessen
Daniel says that the guests.$_{3rd.PL}$ already enough eaten
haben.
have.$_{3rd.PL}$.
'Daniel says that the guests have already eaten enough.'

b. *Daniel sagt, dass die Gäste schon genug gegessen hat.
Daniel says that the guests.$_{3rd.PL}$ already enough eaten
has.$_{3rd.SG}$.
'Daniel says that the guests has already eaten enough.'

Items started with a main clause, which contained a proper noun as the subject, followed by a verb that introduced a complement clause, which in turn presented a noun phrase, a prepositional phrase, and a sentence-final verb phrase. The noun phrase contained in the complement clause was the clause-internal subject. In half of the items, the subject consisted of a plural noun (*Gäste,* 'guests') with its respective plural definite determiner (*die*), and in the other of half a masculine singular noun (e.g. *Student,* 'student') with its respective singular masculine nominative definite determiner

(*der*).[13] Therefore, the sentence-final verb phrase agreed in ten sentences with a third person, singular subject; and in the other ten sentences with a third person, plural subject. All verbs were in the perfect present, a verb group made of a finite form of the auxiliary verb *haben* (in ten of the items) or *sein* (in the other ten items), and the non-finite form of the main verb in participial form.[14]

In the unacceptable condition, the subordinate clauses with a singular subject presented an unacceptable third person plural inflection at the sentence-final finite verb, whereas the subordinate clauses with a plural subject presented an unacceptable third person singular inflection.

In the untimed task of Experiment 7, the following modifications to the structure were made: all items consisted of a main clause instead of a subordinate clause (given that an untimed task does not require the manipulation to be located at the sentence-final position), and the number of items was reduced to ten in order to reduce the time required by the task (4.31).

(4.31) a. Anna hat heute intensiv gelernt.
Anna.$_{3rd.SG}$ has.$_{3rd.SG}$ today intensively studied.
'Anna has studied intensively today.'

b. *Anna haben heute intensiv gelernt.
*Anna.$_{3rd.SG}$ have$_{.3rd.PL}$ today intensively studied.
'Anna have studied intensively today.'

[13] The choice of only masculine words for the noun phrase was intended to avoid the ambiguity of feminine definite determiners in the nominative and accusative case (*die*, which is also the form used for all nominative and accusative plural definite determiners), and to introduce variation from the neuter words used in both experiments 5 and 6.

[14] In German, the choice of the auxiliary verb depends on a series of criteria that some verbs fulfil, such as regularity and transitivity. For instance, most regular verbs take the auxiliary 'haben', while irregular verbs and movement verbs such as drive, walk, swim take the auxiliary 'sein'.

The manipulation of acceptability was carried out in the same way as in the speeded acceptability task by creating a mismatch in number agreement between the subject and the verb. In half of the cases, the finite verb matched the third person singular or plural subject (acceptable condition), and in the other half it mismatched the subject number (unacceptable condition).

4.4.1.7.Fillers

4.4.1.7.1. Speeded acceptability task fillers

The speeded acceptability judgment task contained 16 fillers with the sole purpose of distraction from the experimental manipulation, and 20 pseudo-fillers, the purpose of which was to distract participants from the experimental manipulation by showing different types of violations and locations of the violation, as well as to test possible confounds of the experimental items.

Half of the pseudo-fillers (n=10) tested whether the word order Subject-Verb-Adverb-Object presented in Experiment 4 and 5 was a disadvantage for the English native speakers, given that this is a word order disallowed in their mother tongue, contrary to German and Spanish. Likewise, it tested whether this could be a disadvantage for the Spanish native group, given that they had an advanced level of English as an L2. All ten sentences presented a main clause in which the adverb was placed between the verb and the direct object. Half of these items were acceptable while the other half contained a violation of gender or number agreement at the initial noun phrase or verb, a manipulation unrelated to word order ((4.32), see Appendix B.2.6 for full list).

(4.32) a. Fleißige Studenten bestehen erfolgreich die Prüfungen.
Hard-working students pass successfully the tests.
'Hard-working students pass successfully the tests.'

b.*Der Vogel fressen immer kleine Insekten.
*The bird.$_{MAS.SG.NOM}$ eat.$_{PL}$ always small insects.
'The bird eat always small insects.'

The second type of pseudo-fillers (n = 10) tested overt concord of attributive adjectives. Experiment 6 had included an acceptable condition that contained no overt inflection in the critical word, while the unacceptable condition contained an overt inflection that made the sentence ungrammatical. In order to check whether the non-native participants also correctly judged items in which the acceptable adjective inflection is overt, ten fillers were created in which an overtly inflected adjective was necessary. Half of these fillers presented the required inflection and were therefore acceptable (4.33) and the other half were made unacceptable by excluding the obligatory overt marking in the second pre-nominal adjective (4.33).

(4.33) a. Martins jetzige Freundin ist eine bekannte Schauspielerin.
Martin's current girlfriend is a.$_{F.SG}$ known.$_{FEM.SG}$ actress.$_{F.SG}$
'Martin's current girlfriend is a known actress.'

b.*Timos jüngster Sohn war ein talentiert Sänger.
*Timo's youngest son was a.$_{MASC.SG.NOM}$ talented$_{ø}$ singer.$_{M.SG}$.
'Timo's youngest son was a talented singer.'

Finally, the remaining 16 fillers consisted of main clauses of different lengths that were either acceptable (ten items) or unacceptable (ten items). Unacceptable items showed a violation of agreement of gender between a determiner and a noun, which was placed within the first half of the sentence. The aim of this measure was to offer variation from the sentence-final grammaticality manipulation of the experimental items (4.34).

(4.34) a. Junge Kinder leiden mehr unter der starken Hitze.
Young children suffer more with the strong heat.
'Young children suffer more with the strong heat.'

b. *Ein schwere Erkältung kann gefährlich sein.
*A.MASC/NEU strong.FEM cold.FEM can dangerous be.
'A strong cold can be dangerous.'

4.4.1.7.2. Untimed acceptability task fillers

The untimed acceptability correction task included 10 pseudo-fillers and 10 fillers unrelated to the phenomena under study. The pseudo-fillers were designed to test whether participants were aware of the plural form in neuter accusative nouns, as this was critical for the manipulation of the plural inflection in Experiment 6. In the unacceptable items, the violation of grammaticality took place in the noun (n = 5), which was lacking the plural inflection marking (4.35). Acceptable items showed the correct plural inflection on the noun (4.35).

(4.35) a. Gestern haben wir zwei kleine Augen in der Dunkelheit
Yesterday have we two small.PL eyes.PL in the darkness
gesehen.
seen.
'Yesterday we saw two small eyes in the darkness.'

b. *Die Diebe haben zehn berühmte Werk gestohlen.
*The thieves have ten famous.PL work.SG stolen.
'The thieves stole ten famous works.'

The remaining fillers (n = 10) contained temporal subordinate clauses, five of which were acceptable, and the other five unacceptable. The unacceptability manipulation was created by removing the subject pronoun in the subordinate clause, an illicit structure in German (4.36).

(4.36) a. Bevor Laura den Marathon lief, hatte sie hart trainiert.
Before Laura the marathon ran, had she hard trained.
'Before Laura ran the marathon, she had trained hard.'

b.*Nachdem Melanie das Bier ausgetrunken hatte, ging (pro) wieder tanzen.
*After Melanie the beer finished had, went (pro) again dance.
'After Melanie had finished the beer, (pro) went to dance again.'

4.4.1.8.Proficiency tests and vocabulary checklists

4.4.1.8.1. Proficiency test and self-ratings

Two measures of proficiency in German were taken: a self-rating and a proficiency placement score. The proficiency placement score was obtained with the Goethe-Institut Einstufungstest. Participants have to select the correct answer out of the three or four options provided. The minimum score to take part in the experiment was 15, which is equivalent to an intermediate level of proficiency (between B1 and B2 according to the CEFR).

Participants were also asked to rate their self-perceived proficiency in their L2 and La German. They were given a scale from 1 (low proficiency) to 10 (high proficiency) for each of the following skills: speaking, listening, writing and reading. This measure permitted the comparison of proficiency in the two languages, and was the only measure of L2 proficiency that could be provided remotely for Study 2.

4.4.1.8.2. Vocabulary checklist

Participants were given a vocabulary list that contained the nouns and verbs that were critical for the manipulation of grammaticality (Experiments 5-7) and felicitousness (Experiment 4) as well as for the general comprehension of the experimental items. Participants had to mark whether they knew the

word or not, and were instructed that "knowing" a word meant being aware of its meaning and being capable of using it in the appropriate sentence context (see the Appendix B.5 for the list of words and the instructions).

The purpose of this checklist was to exclude from the analyses items whose critical words had been marked as unknown by the participant. This would ensure that the items analysed did not contain responses to sentences that were incomprehensible to the participant.

4.4.1.9.Procedure

All four experiments in the speeded and untimed form were completed by each participant in one single web-based testing session. Items of all four experiments appeared in the single testing session along with fillers and pseudo-filler items. Participants first received an email from the laboratory or saw an advertisement for the study in a social network informing of its purpose, time, and reward. If they decided to take part in the study, they could click on a provided link that redirected them to the Ibex Farm website (Drummond, 2013) where the experiment was conducted. The exact sequence of the experimental session once participants clicked on the link was as follows:

1. Greeting
2. Participant background information form and consent form
3. Precise instructions for the speeded acceptability judgment task, examples and explanations
4. Speeded acceptability judgment task
5. Untimed acceptability judgment correction task
6. German Goethe Einstufungstest (Proficiency Test)
7. Vocabulary Checklists
8. Feedback from participants
9. Congratulations and steps to receive compensation for their participation

First, participants were greeted and briefly explained the goal of the experiment, the requirements for participation, the number of tasks, and the reward for participation. Afterwards, they were asked to complete the background information form and to confirm their consent to participate in the study. At this point, participants were also asked to rate their own level of proficiency in each of the four language skills (listening, speaking, reading and writing) on a scale of 1 (low proficiency) to 10 (high proficiency) for each of their two non-native languages (German and English for the native speakers of Spanish; German and Spanish for the native speakers of English). Once these introductory steps had been completed, they were given precise instructions for the experimental parts of the study. These instructions explained what the speeded acceptability judgment task would consist of, and they provided three examples of acceptable and unacceptable items along with an explanation of why they should be considered acceptable or unacceptable (see Appendix B.4 for all documents). After the instructions, the practice items for the speeded acceptability judgment task began (n = 3). Participants were asked to stay concentrated, to keep one finger on each response key, and to answer as fast as possible (they had only three seconds to provide a judgment). After these practice items, the experimental items appeared. After each trial, the message "press any key to continue" appeared on the screen, which was an opportunity for the participants to take small breaks, if needed. The duration of this task was approximately ten minutes. After this task, they were presented with the untimed acceptability judgment correction task, in which they had to select one of two possible judgments: acceptable or unacceptable. Participants had to click on one of the two possible response boxes, and provide the acceptable version of those sentences they had marked as unacceptable (Figure 4.1).

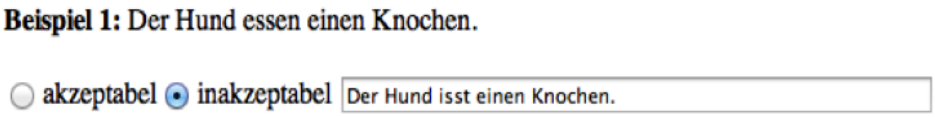

Figure 4.1. Example of an item in the untimed acceptability task.

Once this task was completed, they were informed that the experimental part of the study had finished. The native German group's participation ended here, while the non-native groups had to complete the German proficiency test and the vocabulary checklists. Upon completion of all the experimental and post-experimental tasks, participants were congratulated and asked for feedback regarding the experiment. Finally, they were provided precise instructions for claiming their reward, and were thanked for their participation. The entire testing session lasted approximately 70 minutes for the non-native groups, and 40 minutes for the German native groups. Participants were rewarded with 5 Euros for their participation in the study.

4.4.1.10. Data analysis

4.4.1.10.1. Judgment data

Three main analyses were conducted on participants' acceptability judgments. Each analysis consisted of a general linear mixed effects model with the response variable coded as 1 when the participants rated an item as *acceptable*, and 0 when the item was rated as *unacceptable*.

Analyses were carried out using R, an open source programming language and environment for statistical computing (R Development Core Team 2014). The *glmer* function from the *lme4* package in R (Bates, Maechler, Bolker, & Walker, 2014) was used for all judgment analyses.

The first analysis examined whether the two non-native groups differed from each other. This was done to assess the role that their native and non-native constraints played in their acceptability judgments in the additional language. The model consisted of the fixed effects of native Language

Group (*English/Spanish*), Condition (*felicitous/infelicitous*) and their interaction, as well as a fixed effect of German proficiency, which was coded as a continuous variable and ranged from 1 (low proficiency) to 10 (high proficiency). The random effects structure of the model contained random intercepts for subjects and items. Random slopes were omitted because models failed to converge when they were included in the analyses. This applies to all analyses conducted.

The predictions for these analyses were as follows: if native or non-native constraints (L1-L2) had an effect on the acceptability judgments, there should be a significant interaction between Language Group and Condition. Specifically, if participants' L1 affected their accuracy more than their L2 (*L1 effect account*), then participants whose L1 had similar agreement constraints to the German target structure should show a larger difference in their acceptability ratings between the two conditions by accepting more felicitous and fewer infelicitous items than the participants whose L1's agreement constraints differ from those in German. However, if participants' L2 played a larger role than their L1 (*L2 effect account*), the group whose L2 grammatical constraints were similar to the German constraints should show larger differences in their acceptability ratings between the conditions by accepting more felicitous and fewer infelicitous items than the participants whose L2 constraints differ from German. However, if La speakers were affected by the similarity of the constraint to the La (*constraint similarity account*), and this was modulated by proficiency in the language aligning with the La constraint, then participants whose L1 aligns with the target constraint should display larger differences in their judgments to infelicitous and felicitous items than participants whose L1 does not align with the constraint, while the latter group should show an increase in judgment differences as their L2 proficiency increases (see next analysis), as this language aligns with the La constraint. Lastly, if the combination of background languages had no effect on the acceptability judgments of the non-native groups (*no transfer account*), the interaction of Language Group by Condition should not be significant.

The second analysis investigated whether, and in what way, proficiency in a non-native language influenced participants' acceptability ratings in their additional language. To investigate this question, each non-native group was analysed separately using fixed effects of Condition (*felicitous/infelicitous*), L2 proficiency, their interaction, and La German Proficiency. L2 and La proficiency were coded as continuous variables and ranged from 1 (low proficiency) to 10 (high proficiency). The random effects structure of the model contained random intercepts for subjects and items. If participants' L2 proficiency affected their acceptability judgments, then the interaction of Condition by L2 Proficiency should be significant. If L2 proficiency had a facilitatory effect for those speakers whose L2 constraints are similar to the target structure's constraints, these participants should show an increase in correct acceptance and in correct rejection of the sentences as their L2 proficiency increases. If L2 proficiency had a detrimental effect for those participants whose L2 constraints are dissimilar to the constraints of the target structure, these participants should show a decrease in correct acceptance and correct rejection of the sentences as their L2 proficiency increases. If L2 proficiency does not impact the use of La constraints, no effects should be observed.

A third analysis investigated whether there was a difference between native speakers (the control group), and non-native speakers of German in their acceptability judgments. This information was necessary to test the prediction of the *no transfer account*, and to observe the performance of the control group of native speakers in the tasks. The model contained fixed effects of Language Group (*native/non-native*), Condition (*felicitous/infelicitous*) and their interaction. The random effects structure contained random intercepts for subjects and items. A significant interaction of Language Group by Condition should indicate that the non-native speakers behaved differently from native speakers in their acceptability judgments. Specifically, German native speakers were expected to show greater differences in their ratings between the acceptable and unacceptable conditions, as compared to the non-native speakers. In other words, they

were expected to accept more felicitous and fewer infelicitous items than the non-native speakers.

4.4.1.10.2. Response time data

Psycholinguistic research assumes that, for correctly responded items in SPR and RSVP paradigms, processing difficulty is reflected in slower response times, which may also be accompanied by overall general low accuracy rates for the phenomenon that elicited slow RTs (Blackwell, Bates & Fisher, 1996; McElree & Griffith, 1995; Meng & Bader, 2000; Sato & Felser, 2010). Therefore, in this study, participants' RTs to infelicitous items were predicted to be longer than for felicitous items, as violations of acceptability (Experiment 4) and grammaticality (Experiment 5, 6, 7) have been found to elicit greater processing costs than felicitous and grammatical items (Blackwell, Bates & Fisher, 1996; McElree & Griffith, 1995; Meng & Bader, 2000; Sato & Felser, 2010). Importantly, however, as only correctly responded items were analysed, the size of the difference in RTs between conditions should reflect the size of participants' difficulty in correctly judging items, with increased RT differences (with longer RTs for infelicitous items than for felicitous items) suggesting increased difficulty and decreased automaticity in employing the target agreement mechanism. Therefore, although all groups were expected to show longer RTs for infelicitous items, the size of the difference between conditions in RTs should be smaller for native German speakers than for La German speakers, as the former should be faster in applying the target agreement mechanism than the La German speakers, who are non-native speakers and hence are assumed to have less automatized agreement mechanisms. Furthermore, if La speakers' native and non-native grammars differently affect their sensitivity to agreement violations, the two La groups should show different response patterns to infelicitous items.

Two analyses were carried out on the response times (RTs) for items that had received the correct (Experiments 5, 6 and 7) or expected (Experiment 4) response (Dussias & Piñar, 2010; Juffs, 2005; Omaki & Schulz, 2011; L.

White & Juffs, 1998) to observe whether participants differed in the time they required to reach a correct judgment. Linear mixed effect models were run with R using the *lmer* function from the *lme4* package in R (Bates et al., 2014). RTs were transformed into logarithmic values following the Box-Cox procedure (Box & Cox, 1964).

The first analysis investigated whether the two non-native groups differed in their RT patterns. This analysis was restricted to the two non-native groups, with the fixed effects of native Language Group (*English/Spanish*), Condition (*felicitous/infelicitous*) and their interaction, as well as a fixed effect of German proficiency, coded as a continuous variable and ranging from 1 (low proficiency) to 10 (high proficiency). Again, the random effects structure of the model contained random intercepts for subjects and items. If the combination of background languages (L1-L2) has an effect on how long it takes for each group to make a correct judgment, there should be a significant interaction between Language Group and Condition. If the interaction between Language Group and Condition was significant, a further analysis was planned to look for differences between the two La groups in each condition separately. This model included the fixed effects of native Language Group (*English/Spanish*) and La proficiency as a continuous variable. If the combination of language background does not have an effect on participants' response speed in correctly judging infelicitous items, the interaction of Language Group by Condition should not be significant.

The predictions for these analyses were as follows: if La speakers are only affected by their native grammars (*L1 effect account*), participants whose L1 aligns with the target constraint should display smaller differences in their RTs to infelicitous and felicitous items than participants whose L1 does not align with the constraint, as the latter should experience greater processing costs between the detection of the violation and the decision than the former. If La speakers are only affected by their L2 grammar (*L2 effect account*), then the same pattern should apply to participants whose L2 constraint aligns with the target as compared to

participants whose L2 does not align with the target constraint. However, if La speakers are affected by constraint similarity (*constraint similarity account*), and this is modulated by proficiency in the language that aligns with the La constraint, then participants whose L1 aligns with the target constraint should display smaller differences in their RTs to infelicitous and felicitous items than participants whose L1 does not align with the constraint, as their use of the agreement mechanism should be more automatic than for the latter. However, the latter group should show a decrease in RT differences as their L2 proficiency increases (see next analysis), as this language should align with the La constraint. Finally, if prior grammars have no impact in La speakers' sensitivity (*no transfer account*), no differences between the groups should be observed (see Table 4.4 for a full set of predictions).

The second analysis investigated whether participants' L2 proficiency affected their RTs in their additional language. Each non-native group was analysed separately using fixed effects of Condition (*felicitous/infelicitous*), L2 proficiency, their interaction, and La Proficiency. As usual, L2 and La proficiency were coded as continuous variables that ranged from 1 (low proficiency) to 10 (high proficiency). The random effects structure of the model contained random intercepts for subjects and items. If participants' L2 proficiency affected their RTs, then the interaction of Condition by L2 Proficiency should be significant, leading to further analysis with the fixed effect of L2 Proficiency for each condition. If participants' L2 proficiency did not affect their RTs, then the interaction should not be significant. Specifically, if L2 proficiency had a facilitatory effect for those speakers whose L2 constraints are similar to the target structure's constraints, these participants should show a decrease in RTs as their L2 proficiency increases, because the facilitation should decrease processing costs in correctly judging items. If L2 proficiency had a detrimental effect for those participants whose L2 constraints are dissimilar to the constraints of the target structure, these participants should show an increase in RTs as their

L2 proficiency increases. If L2 proficiency does not impact the use of La constraints, no effects should be observed.

The third analysis addressed the question of whether non-native speakers differed in their RT patterns from the German control group, to test the prediction of the *no transfer account*. The fixed effects in the model were Language Group (*native*/*non-native*), Condition (*felicitous*/*infelicitous*) and their interaction. The random effects structure contained random intercepts for subjects and items. A significant interaction of Language Group by Condition would mean that the non-native speakers behaved differently from native speakers in their RT patterns.

Table 4.4. Predictions for judgment and RT data in Study 2 based on each of the La transfer accounts (by column), broken down by expected La group differences and expected L2 proficiency effects.

	L1 effect	L2 effect	Constraint similarity	No transfer
Judgments 1. La group differences 2. L2 proficiency effects	1. La speakers whose L1 aligns with La constraint accept significantly more felicitous and fewer infelicitous items than participants whose L1 does not align with La. 2. No L2 proficiency effects.	1. La speakers whose L2 aligns with La constraint accept significantly more felicitous and fewer infelicitous items than participants whose L2 does not align with La. 2. No L2 proficiency effects.	1. Same prediction as L1 effect account. 2. La speakers whose L2 aligns with La constraint accept significantly more felicitous and fewer infelicitous items as L2 proficiency increases.	1. No differences. 2. No effects.
RTs 1. La group differences 2. L2 proficiency effects	1. La speakers whose L1 aligns with La constraint show smaller RT differences between conditions than participants whose L1 does not align with La. 2. No L2 proficiency effects.	1. La speakers whose L2 aligns with La constraint show smaller RT differences between conditions than participants whose L2 does not align with La. 2. No L2 proficiency effects.	1. Same prediction as L1 effect account 2. La speakers whose L2 aligns with La constraint show reduced RT differences between conditions as L2 proficiency increases.	1. No differences. 2. No effects.

4.4.2. Results

4.4.2.1. Accuracy in the fillers and pseudo-fillers of the speeded acceptability judgments

These filler items tested whether participants were capable of completing the acceptability task under speeded conditions, and whether there were differences between the non-native groups in their capacity to complete the task. Non-native groups were expected to show no differences in their accuracy to the filler items, as they were matched for proficiency in German and age of acquisition. However, non-native groups were expected to differ from the native control group, given their difference in proficiency in the language. This was confirmed in the total correct responses of each group (Table 4.5): L1 English speakers showed 72% accuracy to the filler items (SD = 16), L1 Spanish speakers 71% (SD = 16), and German speakers 98% (SD=7). This finding was supported by the statistical analyses: German native speakers showed more accuracy in the fillers than the two non-native groups in a significant effect of group (ß= -1.70, SE = 0.54, z= -3.18, p= .00). Crucially, the two non-native groups did not differ from each other in their accuracy as indicated by a lack of group effect and the absence of an interaction of condition and L1 group. This indicates that the non-native participants were equally capable of coping with the task demands.

Table 4.5. Response times to the correctly-responded filler items in the SAJT. Standard deviation in brackets.

	English (n = 30)		Spanish (n = 31)		German (n = 31)	
Felicitous	1032	(361)	1100	(286)	530	(208)
Infelicitous	848	(317)	903	(315)	576	(270)

The RTs showed no differences between the non-native groups (Table 4.10), which was supported by the statistical analyses, with the absence of a main effect of group and the absence of an interaction of group (*English/Spanish*) by condition (*felicitous/infelicitous*). However, non-native speakers showed slower response times to the felicitous condition

than to the infelicitous condition, which was confirmed in an effect of condition (ß = -0.22, SE = 0.10, t = -2.27, p = .03). In the comparison of native and non-native speakers, the latter were overall slower to respond to both conditions than German native speakers (ß = 0.74, SE = 0.09, t = 8.45, p = .00), and they showed greater differences in their RTs to each condition than the German native speakers, as confirmed in the interaction of group (*native/non-native)* by condition (ß = -0.20, SE = 0.07, t = -2.94, p = .00). Altogether, this confirms that non-native speakers were similar in their sensitivity to infelicitousness in the task, and that they were overall less accurate and less fast than native speakers of German, as expected.

A set of ten pseudo-fillers in the speeded acceptability task were designed to test whether non-native participants differentially judged word-order disallowed in English (S-V-Adv-O). This word order was present in all items of Experiment 4 and 5, and a difference in the non-native groups would render the results in Experiments 4 and 5 confounded. No differences between the groups in these pseudo-fillers would indicate that they were not differently affected by word order in these experiments. L1 English speakers showed a 76% accuracy rate (SD= 16), L1 Spanish speakers showed 77% (SD = 16) and German native speakers showed 94% (SD= 10), which indicates that English and L1 Spanish speakers were not differently disturbed by the word order of the sentences. The statistical analyses confirmed the absence of differences between the non-native groups (see Appendix B.7 for the full analysis). As expected, non-native speakers were overall less accurate than German native speakers (ß = -1.03, SE = 0.52, z = -2.00, p = .05). Equally, the response times to these pseudo-fillers showed no differences between the non-native groups, but significant differences from the native German group, who were overall faster (ß = 0.74, SE = 0.09, t = 8.45, p = .00) and showed a reduced effect of condition, as indicated by the interaction of group (native/non-native) and condition: (ß = -0.20, SE = 0.07, t = -2.94, p = .00).

Another set of 10 pseudo-fillers tested whether participants were differently aware of the overt concord constraint in attributive adjectives, as opposed to the absence of overt concord in predicative adjectives, the main experimental manipulation in Experiment 6. L1 English speakers showed

86% accuracy in these pseudo-fillers (SD = 13), L1 Spanish speakers showed 77% accuracy (SD = 16), and German L1 speakers 95% (SD = 10).

L1 Spanish speakers' reduced accuracy compared to L1 English speakers was confirmed by the statistical analyses in a significant interaction of language group (English/Spanish) by condition (felicitous/infelicitous) (ß = 1.76, SE = 0.51, z = 3.46, p = .00). The follow-up pairwise comparison reached significance for the ungrammatical condition (ß = 1.17, SE = 0.48, z = 2.43, p = .01), L1 Spanish speakers accepted significantly more infelicitous items than L1 English speakers. This was not the case for the felicitous condition (ß = -0.74, SE = 0.47, z = -1.58, p = .11). The RTs, however, showed no differences between the non-native groups (ß = -0.01 SE = 0.10, t = -0.12, p = .9), and confirmed the expected time differences between the non-native and native speakers (ß = 0.54, SE = 0.10, t = 5.51, p = .00). These results indicate that L1 Spanish speakers were less sensitive to the overt concord constraint in attributive adjectives, a finding that will be discussed in relation to the results of Experiment 6 on predicative adjective concord (section 4.4.2.4).

4.4.2.2.Experiment 4: Possessor agreement

Participants who did not obtain a minimum of 75% correct answers in the untimed acceptability judgment correction task were excluded from the analyses of the speeded acceptability judgment task. This led to the removal of 8 L1 English speakers, 10 L1 Spanish speakers, and 1 L1 German speaker. The items that contained a word marked as "unknown" by the participant in the vocabulary list were further excluded to eliminate items that might not have been comprehensible to participants, resulting in a further exclusion of 4.09% of the data-points.

Participants' mean percentage of expected responses in the untimed acceptability judgment correction task was 96% (SD 7) in the L1 English group (n= 22), 96% (SD 6) in the L1 Spanish group (n= 21), and 99% (SD 3) in the German native group (n= 29). The non-native speakers included in the analyses did not differ in their judgments in the untimed task (*L1 English*: 96% (SD 7); *L1 Spanish*: 96% (SD 6); Wilcoxon signed-rank test,

W = 241, p-value = .78), which suggests that they were aware of the possessor gender agreement constraint to a similar extent.

4.4.2.2.1. Speeded judgments

Table 4.6 presents the mean percentage of responses that participants marked as 'acceptable' for each condition, as well as the mean percentage of expected responses for each group. Note that the sentences in the infelicitous condition were not ungrammatical but non-canonical (e.g. Herr Müller rettete gestern #ihre Patientin – 'Mr. Müller saved #her patient yesterday'). If participants were sensitive to the constraint, they should mark close to all felicitous sentences acceptable (100%) and mark close to all infelicitous sentences (0%) as unacceptable.

Table 4.6. Mean percentage of items that each participant group marked as 'Acceptable' in the felicitous and in the infelicitous condition of the speeded task in Experiment 4. Standard deviation in brackets.

	English		Spanish		German	
Felicitous	85	(16)	85	(14)	98	(4)
Infelicitous	27	(22)	54	(27)	14	(18)
Expected responses	79	(15)	66	(16)	92	(9)

The three groups accepted most of the felicitous items (between 85% and 98% of the felicitous items), as expected, and accepted few infelicitous items (between 14% and 54% of the infelicitous items). This was confirmed by a main effect of condition (ß = -4.31, SE = 0.27, z = -15.97, p = .00). However, compared to native speakers, non-native speakers incorrectly accepted more infelicitous items, and correctly accepted fewer felicitous items, as confirmed by the interaction of group (native/non-native) by condition: (ß = 3.68, SE = 0.51, z = 7.16, p = .00).

Crucially, Spanish and English natives showed differences in their ratings. L1 Spanish participants accepted more infelicitous items than the L1 English group (54% vs. 27%, respectively). This was confirmed by a significant interaction between language group (English/Spanish) and condition: (ß = 0.87, SE = 0.41, z = 2.15, p = .03). A main effect of

language group (ß = 0.70, SE = 0.27, z = 2.64, p = .01) further indicated that the L1 Spanish group accepted significantly more items overall than the L1 English group.

Separate group analyses showed that the L1 English group had a larger effect of condition (ß = -2.90, SE = 0.31, z = -9.37, p = .00) than the L1 Spanish group (ß = -1.90, SE = 0.32, z = -5.90, p = .00). Therefore, the L1 Spanish speakers showed a reduced contrast between their ratings for each condition compared to the L1 English speakers. The separate group analyses did not show any significant effects of self-rated L2 proficiency for either group.

4.4.2.2.2. Responses times

For ease of reading, Table 4.7 shows the raw means of the response times (henceforth RTs) for correct responses. However, analyses were conducted on the log-transformed RTs (see data analysis section 4.4.1.10.2). Incorrect responses excluded from the analyses amounted to 18% of the data.

Table 4.7. Mean raw response times for correctly marked items per condition and group in Experiment 4. Standard deviation in brackets.

	English		Spanish		German	
Felicitous	1174	(342)	1134	(330)	622	(234)
Infelicitous	899	(326)	971	(330)	723	(313)

The non-native groups showed longer RTs in both conditions when compared to the German native group, and they showed different trends: while the native group showed longer RTs for the infelicitous condition compared to the felicitous one, the non-native speakers appear to be faster in the infelicitous condition than in the felicitous one. These differences between the native German and non-native speakers were confirmed by a main effect of Group (ß = 0.50, SE = 0.09, t = 5.76, p = .00), with the non-native groups responding significantly slower than the native group, and by an interaction of Group (*native/non-native*) by Condition (*felicitous/infelicitous*) (ß = -0.37, SE = 0.08, t = -4.61, p = .00). Despite the

different trends shown by native German and non-native speakers, there was a significant effect of Condition (ß = -0.13, SE = 0.04, t = -3.23, p = .00), with infelicitous items generally showing faster response times than felicitous items.

The comparison of the L1 English and L1 Spanish groups also showed small numerical differences: L1 Spanish speakers showed slower response times than L1 English speakers for the infelicitous condition, and slightly faster RTs for the felicitous condition. This small difference was significant in an interaction of Group (*English/Spanish*) by Condition (*felicitous/infelicitous*): ß =0.24, SE = 0.11, t = 2.23. Follow-up pairwise comparisons did not reach significance, however (*Felicitous sentences*: $\hat{\beta}$ = -0.03; *SE* = 0.11; *t* = -0.30; *p* = .77; *Infelicitous sentences:* $\hat{\beta}$ = 0.18; *SE* = 0.15; *t* = 1.25; *p* = .22).

Finally, L2 proficiency did not turn out to be a significant factor for the RTs of either non-native group.

4.4.2.2.3. Summary of results

The application of the untimed accuracy exclusion criterion (i.e. participants with less than 75% expected answers in the untimed questionnaire were excluded from the speeded acceptability analysis) led to a large loss of data (25% for judgment data). The analyses conducted on this reduced data set showed, as predicted, that the three participant groups accepted more felicitous items than infelicitous items, and that native speakers had more target responses than non-native speakers. Importantly, there were also differences in ratings between the two groups of non-native speakers: L1 Spanish speakers were less sensitive to the constraint, accepting more infelicitous and fewer felicitous items than L1 English speakers. Self-rated proficiency in the respective L2s was not a significant predictor of the performance of the non-native groups.

The RT patterns revealed that native speakers were faster to respond in both conditions than non-native speakers, as predicted. Moreover, L1 English speakers showed a larger difference in their RTs in each condition

than L1 Spanish speakers, although these differences were not significant in the follow-up pairwise comparisons.

4.4.2.2.4. Post-hoc analysis

The removal of participants who had performed below the 75% target response criterion in the untimed judgment task for possessor gender agreement incurred the loss of 25% of the original dataset. This loss was particularly large in the L1 Spanish group, whose participant numbers decreased from 31 to 21. Additionally, this reduction had an effect on the range of the L1 Spanish speakers' L2 English proficiency, which is relevant for assessing the extent to which L2 proficiency plays a role in the use of grammatical knowledge under processing pressure in an additional language. With the exclusion criterion, L1 Spanish speakers with lower L2 English proficiencies were removed, leaving the group with a high-end range of 75%-100% L2 proficiency, and a group mean of 86%. The exclusion of participants did not affect the L1 English group so drastically, with their L2 Spanish proficiency ranging from 20% to 87% with a mean of 60%.

This data loss was particularly large when compared to the exclusion rates in the earlier Study 1 (Chapter 3), and in the other experiments within the current study. It was suspected that the loss of variance in L1 Spanish speakers' proficiency might have made it difficult to estimate the overall trend in its effects, and that the reduction in statistical power due to the smaller number of participants might have made it difficult to establish whether these effects are generalizable. In order to address this concern, a post-hoc analysis was carried out including all participants that had passed the German La proficiency requirement, regardless of their performance in the untimed judgment task, hence including a wider range of L2 English proficiency.

This analysis confirmed the prior interaction found in the between-group analysis of L1 (English/Spanish) by condition (felicitous/infelicitous) for the judgment data (ß = 0.21, SE = 0.09, t = 2.19, p = .02) and the RT data (ß = 0.22, SE = 0.10, t = 2.20, p = .03). L1 Spanish speakers continued to accept more infelicitous items than L1 English speakers, and fewer felicitous items.

Equally, they continued to show smaller differences in RTs between conditions compared to L1 English speakers.

Crucially, the post-hoc analysis revealed a significant interaction of L2 English proficiency and Felicitousness for the L1 Spanish group in the judgment data (ß = -5.89, SE = 2.47, z = -2.38, p = .01) as well as in the RT data (ß = -1.93, SE = 0.71, t = -2.72, p = .00). Figure 4.2 shows how the increase in L2 English proficiency decreased the acceptability of infelicitous items (red bold line in left-hand figure), and Figure 4.3 shows it decreased the time L1 Spanish speakers needed to respond to infelicitous items (red bold line in right-hand figure; note that a decrease in RT represents an increase in speed, and that RTs are log-transformed).

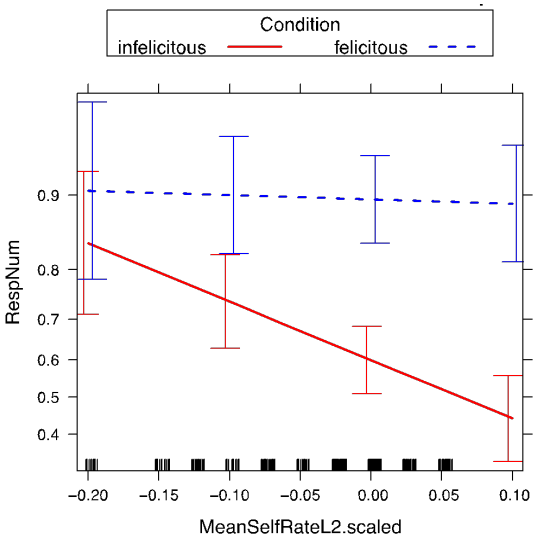

Figure 4.2. Acceptance rate of L1 Spanish speakers as modulated by their L2 English proficiency. X-axis shows proficiency from lower (left end) to higher (right end) in the post-hoc analyses of Experiment 4.

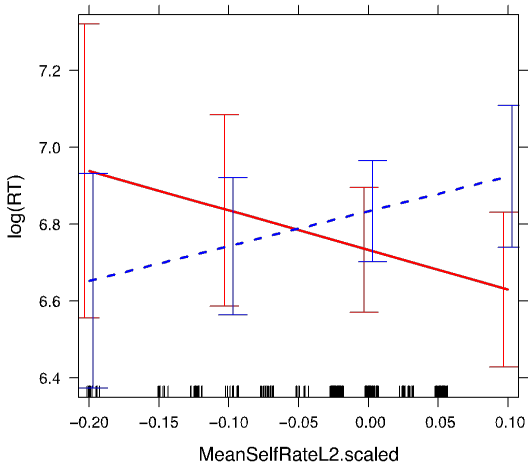

Figure 4.3. Log-transformed RTs of L1 Spanish speakers as modulated by their L2 English proficiency. X-axis shows proficiency from lower (left end) to higher (right end) in the post-hoc analyses of Experiment 4.

The follow-up tests for L1 Spanish speakers' judgment data showed that they accepted significantly fewer items for the infelicitous condition as their L2 English proficiency increased (*Infelicitous sentences* ß = -6.79, SE = 2.09, z = -3.25, p = .00, see bold red line in the left plot of Figure 4.2), while L2 English proficiency did not affect their responses to the felicitous condition (blue, dotted line): *felicitous sentences*: ß = -0.66, SE = 2.27, z = -0.29, p = .77. The follow-up tests for L1 Spanish speakers' RT data showed no significant modulation by L2 English proficiency for either condition (*Felicitous sentences:* ß = 0.86, SE = 0.65, t = 1.31, p = .19*; Infelicitous sentences:* ß = -1.38, SE = 1.00, t = -1.37, p = .18)

The same post-hoc analyses were conducted for the L1 English speakers' data. No effects of L2 Spanish proficiency were found (Figure 4.4 and 4.5).

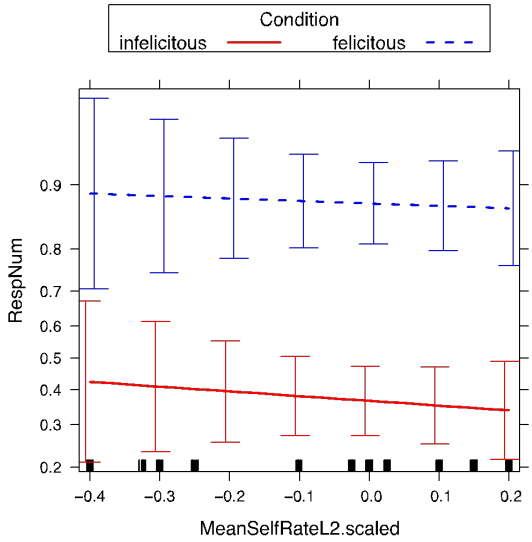

Figure 4.4. Acceptance rate of L1 English speakers as modulated by their L2 Spanish proficiency. X-axis shows proficiency from lower (left end) to higher (right end) in the post-hoc analyses of Experiment 4.

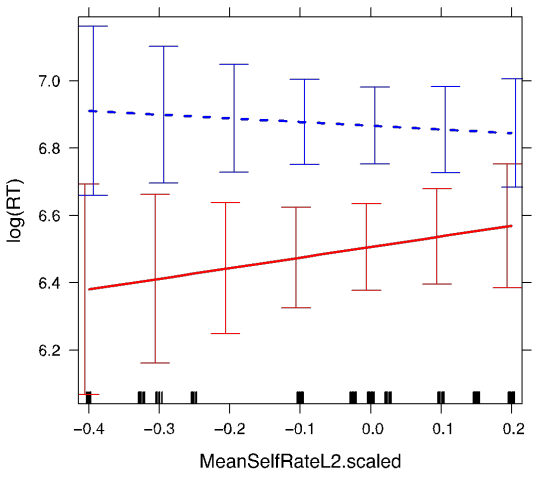

Figure 4.5. Log-response times of L1 English speakers as modulated by their L2 Spanish proficiency. X-axis shows proficiency from lower (left end) to higher (right end) in the post-hoc analyses of Experiment 4.

4.4.2.2.5. Preliminary discussion

This study tested the sensitivity of two groups of La speakers to violations of German possessor gender agreement. While possessor gender agreement is required in German and English, this constraint is absent in Spanish. The

goal was to find out whether knowledge of prior native and non-native grammars affect the use of grammatical knowledge in an additional language under processing pressure.

It was generally expected that participants would show significant sensitivity to the constraint by accepting felicitous items more often than infelicitous items, given that non-native participants were intermediate speakers of La German and had shown mature knowledge of the constraint in an untimed task. For the response times, it was predicted that participants would show slower response times to the infelicitous condition than to the felicitous condition. The findings showed that, as expected for the speeded task, participants generally accepted more felicitous items than infelicitous items. However, contrary to the prediction, participants showed faster RTs for the infelicitous condition than for the felicitous condition. This was also observed in Lago et al. (2019), where the authors predicted faster RTs to infelicitous items because the violation was not the last word of the sentence and therefore enabled participants to make their decision before the acceptability question. This could be the reason for the unexpected RT patterns in Experiment 4, in which unlike the other experiments, the violation was placed one word before the end of the sentence. However, there is not enough evidence to corroborate this account. Importantly, however, as predicted, non-native speakers showed reduced sensitivity in their judgments compared to native speakers, and they were overall slower to respond.

Interestingly, as observable in the judgment data, the constraint proved to be challenging for all three groups, with participants showing high proportions of unexpected 'acceptable' responses in the speeded task (14% acceptance of infelicitous items by German L1 speakers, and 27% and 54% by English and Spanish L1 speakers, respectively), even after excluding a significant number of non-native speakers due to low accuracy in the untimed task. This amount of unexpected 'acceptable' responses is the largest compared to the other experiments in the study, a fact that will be addressed in the general discussion in section 4.5 of this Chapter (General discussion).

For the effects of prior grammars on non-native speakers' performance, different accounts based on earlier La findings made different predictions about the pattern of differences between the two non-native speaker groups, depending on what factor is assumed to play a greater role in the use of grammatical constraints under processing pressure. Briefly, the *L1 effect account* predicted that L1 Spanish speakers would show reduced sensitivity to the constraint compared to L1 English speakers, as Spanish lacks the constraint. The *L2 effect account* predicted the reverse pattern, with L1 English speakers showing decreased sensitivity compared to L1 Spanish speakers, as L1 English speakers had Spanish as an L2. The *constraint similarity account* predicted that L1 English speakers would show increased sensitivity compared to L1 Spanish speakers thanks to their native knowledge of English, but that L1 Spanish speakers would show an increase in sensitivity as their proficiency in L2 English increases, as this account assumes that the crucial factor is the degree of proficiency in the prior language that shares the target constraint. Contrary to the La-based predictions, the *no transfer account* predicted no differences between the non-native groups, but predicted that non-native speakers would have lower sensitivity when compared to native German speakers. The findings revealed that L1 Spanish speakers had lower sensitivity to the constraint in their judgments, and were slower to correctly judge infelicitous items when compared to L1 English speakers, evidence supportive of the *L1 effect account,* while no effects of L2 proficiency were observed for either group. However, when including all L1 Spanish speakers in the post-hoc analyses of the speeded judgments, regardless of their performance in the untimed task, an *L2 proficiency effect* was observed: L1 Spanish speakers increased in sensitivity in their judgments and responded faster to infelicitous items the greater their L2 English proficiency. These two findings are discussed separately in the sections below.

Effects of native constraints

Crucially for the research question of the study, L1 Spanish speakers were overall less sensitive to the violations than L1 English speakers: L1 Spanish speakers accepted infelicitous sentences and rejected felicitous sentences

more often than L1 English speakers. Furthermore, they showed slower response times to the correctly-responded infelicitous items than L1 English speakers, which was also observed in Lago et al. (2019). This suggests that, despite only including participants who had shown target-like sensitivity in an untimed metalinguistic task, the absence of the constraint in Spanish affected how often L1 Spanish speakers detected a violation under processing pressure and how fast they made their judgment in comparison to the L1 English group, whose L1 did instantiate the target constraint. These findings are in line with the predictions of the *L1 effect account,* and contradict the predictions of the *L2 effect account* and *no transfer account*.

Effects of non-native constraints

Although the effects of the non-native constraints were not significant in the planned analyses, they reached significance in the post-hoc analyses that included the entire group of intermediate La German speakers regardless of their performance in the untimed task. These post-hoc analyses were conducted to check whether the exclusion of 25% of the data due to this performance criterion had an effect on the conclusions about non-native constraints.

While the findings of the post-hoc analyses confirmed the differences observed between L1 English and L1 Spanish speakers in their judgments and RT measures, they additionally showed an increase in L1 Spanish speakers' sensitivity in their judgments as their L2 English proficiency increased. This suggests that proficiency in a non-native language can facilitate sensitivity to violations in an additional non-native language. Further, the finding that L2 Spanish proficiency did not appear to facilitate L1 English speakers' judgments also suggests that the mere fact of knowing several languages does not necessarily facilitate the use of grammatical constraints under processing pressure, but rather that this effect is selective and emerges when the non-native language and the target language share the constraint in question. Similarly, this finding suggests that non-native constraints that do not align with the target constraint in the additional language should not be detrimental to a multilingual speaker.

Although these are plausible interpretations of the findings, the conclusion that L2 proficiency can only be facilitative has to be taken with caution, as the characteristics of the populations tested in the study might have affected whether L2 Spanish effects arose. For instance, while L1 Spanish speakers had a mean L2 English proficiency of 86% (75%-100%), English native speakers had a mean L2 Spanish proficiency of only 60% (20%-87%). If high levels of proficiency in the L2 are essential for L2 effects to appear, whether facilitative or non-facilitative, it is possible that L1 English speakers' lower proficiency in L2 Spanish prevented any L2 effects from emerging in the L1 English group. Unfortunately, despite the use of web-based testing, it was not possible to gather data from a greater number of participants for either group and therefore to recruit L1 English speakers with a wider range of L2 Spanish proficiency.

Another fact that has to be taken into account is that the order in which the languages were acquired was more homogeneous in the L1 Spanish group than in the L1 English group. While the majority of L1 Spanish speakers learned L2 English before La German, L1 English speakers were not as homogeneous regarding the order of acquisition of L2 Spanish and La German. It is possible that in order for L2 Spanish to affect La German during real-time comprehension and time-pressured metalinguistic judgments, it must have been acquired before German. A post-hoc analysis of L1 English speakers' judgments and RT with the predictor *Order of acquisition* (L2 Spanish – La German/La German – L2 Spanish) showed no significant effects of this variable, however (see Appendix B.7 for results of these tests). Considering these potentially relevant factors, it is essential to conduct further research in order to confirm or refute the existence of non-facilitatory L2 proficiency effects.

Finally, the fact that the L2 proficiency effect in the L1 Spanish group only became significant once participants with lower L2 English proficiency were included poses two further questions that should be addressed in future research: how does proficiency in L2 English correlate with the maturity of knowledge of possessor gender agreement in English, and does unsuccessful acquisition of this constraint in L2 English preclude success in acquiring the constraint in German La? Unfortunately, this study did not include a test for

the constraint in participants' L2. However, Lago et al. (2019), who also investigated intermediate La German (L1 English – L2 Spanish speakers and L1 Spanish – L2 English) speakers' sensitivity to violations of possessive pronoun gender agreement with the possessor in a speeded acceptability judgment task, did include a test of participants' L2 knowledge of the target constraint. The L2 constraint test showed that both groups were sensitive to the possessor agreement constraint in their respective L2s. Crucially, as in the current experiment, when L1 Spanish participants with low L2 English proficiency were included in their post-hoc analyses, they found that L2 English proficiency also modulated their sensitivity, with an increase in L2 proficiency resulting in an increase in rejection of infelicitous items. This suggests that the facilitative effects of L2 proficiency for gender agreement of possessive pronouns are not an isolated observation found in one experiment, but a phenomenon worthy of further investigation.

All in all, the observed facilitation by L2 English proficiency indicates that the use of grammatical knowledge in an additional language under processing pressure is not only affected by native constraints but may also be affected by non-native constraints. Further research is needed to clarify why these L2 effects emerge, and whether they are only facilitative or whether they can also be non-facilitative.

La accounts

Taken together, these findings point to a predominant effect of native constraints in the use of grammatical knowledge under processing pressure, but they also suggest that non-native constraints can enhance sensitivity when they align with the target constraint. These findings seem to be partly in line with the predictions of a *constraint similarity account*. According to this hypothesis, either or both prior languages can exert influence on the additional language and this effect depends on participants' proficiency in the language that shares the constraints with the target. In this experiment, L1 English speakers were more sensitive to the constraints than L1 Spanish speakers, as their native language shares the constraint with the target and Spanish does not, while L1 Spanish speakers with higher levels of L2

English proficiency were more sensitive than L1 Spanish speakers with lower levels of L2 English proficiency.

However, it is arguable whether the observed effects can be explained entirely by attributing them to proficiency in English, the language that shared the constraint with La German. This becomes clear when attempting to understand the processes participants underwent as they read the sentences in a speeded manner. The task required participants to build the sentence meaning and structure quickly word-by-word, retaining information that could not be reread, and judging sentences under time pressure based on the retained information. This is a taxing task for learners, because it requires reliance on working memory, which is already being put under pressure by the parsing of a foreign language at fast speed (Hopp, 2010, 2016). Given these taxing processing conditions, participants should rely on their most automatic processes, employing the more proceduralized L1 agreement procedures over L2 agreement procedures. Participants in this study had acquired their native language from birth and their non-native languages only later, and so presumably had acquired a much greater degree of automaticity in applying the native grammar. Given this linguistic profile, it is more likely that they applied their native grammar automatically when under time pressure. Under this likely processing scenario, if L1 English speakers applied their L1 agreement procedure, they would show higher sensitivity than L1 Spanish speakers, who, if they employed their L1 agreement procedure for possessive pronouns, would either not engage the search and match for the gender of the possessor (if the assumption is that L1 Spanish speakers do not match the gender of possessor and pronoun due to the absence of possessor gender marking in the pronoun), or fail to retrieve the possessor gender marking in time to parse and/or judge the sentence (if the assumption is that L1 Spanish speakers have reduced automaticity in the target German agreement procedure for possessive pronouns). The reduced sensitivity of Spanish native speakers to possessor gender agreement has not only been observed in this experiment, but also in prior research on production and acquisition of L2 English possessive pronouns (Antón-Méndez, 2011; Pozzan & Antón-Méndez, 2017), and in a

La German processing study with the same population as the current experiment (Lago et al., 2019).

Finally, the fact that only L1 Spanish speakers showed increased sensitivity to the constraint as their L2 English proficiency increased suggests that the L1 and L2 effects are of a different nature. This interpretation is discussed in detail in the General discussion in relation to the findings of the other experiments.

In conclusion, the current results seem to match the predictions of a *constraint similarity account*. Nonetheless, the different selectivity of L1 effects and L2 effects suggests that the influence of these two languages in the use of La grammatical knowledge may be of a different nature.

4.4.2.3.Experiment 5: Possessee agreement

Participants who did not obtain a minimum of 75% correct answers in the untimed acceptability judgment correction task were excluded from the analyses of the speeded acceptability judgment task (see section 4.4.1.10 for more details), which resulted in the exclusion of 20 participants. In this case, most of the loss of the data was due to the German native group (10 participants excluded), who had a reduced sensitivity to the constraint in the untimed task (see a discussion about this effect in section 4.4.2.3.5). In the non-native groups, 4 L1 English speakers were excluded, and 6 L1 Spanish speakers. Items that contained a word marked as "unknown" by the participant in the vocabulary list were further excluded from the speeded judgment and RT analyses (6.6 % of the data). The mean percentage of correct responses for each group in the untimed acceptability judgment correction task was: 92% (SD 13) for the L1 English speakers (n = 26), 87% (SD 18) for the L1 Spanish speakers (n = 24), and 81% (SD 15) for the German native speakers (n = 20). The non-native speakers included in the analyses did not differ in their judgments in the untimed task (*L1 English*: 92% (SD 13); *L1 Spanish*: 87% (SD 18), Wilcoxon signed-rank test, W = 408, p-value = .47), which suggests that they were aware of the possessee number agreement constraint to a similar extent.

4.4.2.3.1. Speeded judgments

The following table presents the mean percentage of responses marked as 'acceptable' by each participant group in each condition, as well as the mean percentage of correct responses (Table 4.8).

Table 4.8. Mean percentage of sentences marked as 'acceptable' in each condition and group in the speeded task, and mean percentage of correct responses in Experiment 5. Standard deviation in brackets.

	English		Spanish		German	
Felicitous	90	(12)	93	(9)	97	(7)
Infelicitous	39	(31)	33	(24)	3	(7)
Correct Responses	76	(18)	80	(15)	97	(6)

The three groups accepted the felicitous items more often than the infelicitous items, which was confirmed by a main effect of condition (ß = -6.03, SE = 0.54, z = -11.21, p = .00). However, the non-native groups accepted more infelicitous items than the native group. This reached significance in the interaction between language group (native/non-native) and condition (ß = 4.86, SE = 0.97, z = 5.03, p = .00), and in a main effect of group (ß = 1.21, SE = 0.37, z = 3.30, p = .00).

The acceptability rates of the English and Spanish natives did not differ substantially. They accepted at a similar rate the grammatical items (90% and 93%, respectively) and the ungrammatical items (39% and 33%, respectively). This was also confirmed by the lack of an interaction between language group (English/Spanish) and condition, and the lack of a group effect.

Finally, L2 proficiency was not a significant predictor for either non-native group.

4.4.2.3.2. Response Times

Table 4.9 presents the mean raw RTs for the correctly responded items. However, analyses were conducted on log RTs. The amount of incorrectly responded data excluded from these analyses was 16.6%.

Table 4.9. Mean response times for correctly answered items by condition and by group in the speeded task of Experiment 5. Standard deviation in brackets.

	English		Spanish		German	
Felicitous	993	(319)	917	(304)	526	(225)
Infelicitous	1091	(392)	1234	(377)	545	(221)

German native speakers showed overall faster RTs than the two non-native groups, which was expected. Moreover, native speakers showed very small differences in RTs between the conditions, while the non-native groups showed longer RTs for the infelicitous condition than the felicitous condition. These observations were confirmed in the statistical analyses by a main effect of Group (*native/non-native*, ß = 0.69, SE = 0.08, t = 8.20, p = .00), with non-native speakers reacting significantly slower overall than the native speakers; a main effect of Condition (ß = 0.14, SE = 0.03, t = 4.45, p = .00), with significantly longer RTs for the infelicitous items than the felicitous items; and a marginal interaction of Group by Condition (ß = 0.11, SE = 0.06, t = 1.76, p = .08), reflecting La speakers' larger RT difference between conditions than German L1 speakers'.

There were also significant differences between the two non-native groups: although they did not differ greatly in their RTs to the felicitous items, Spanish native speakers responded slower than L1 English speakers to the infelicitous items (1234ms vs. 1090ms, respectively). The difference was confirmed by a significant interaction of Group (*English/Spanish*) by Condition (*felicitous/infelicitous*): ß = 0.17, SE = 0.08, t = 2.15. Follow-up pairwise comparisons did not show significant differences between the groups, however (*felicitous sentences*: ß = -0.04, SE = 0.09, z = -0.40, p = .69; *infelicitous sentences* ß = 0.13, SE = 0.11, z = 1.17, p = .25).

L2 self-rated proficiency modulated L1 English speakers' response speed, as observed in a significant interaction of L2 proficiency and Condition (ß = -0.76, SE = 0.32, t = -2.38, p = .02): the higher their self-rated L2 Spanish proficiency, the faster L1 English speakers correctly responded to the infelicitous condition (see Figure 4.6 for illustration).

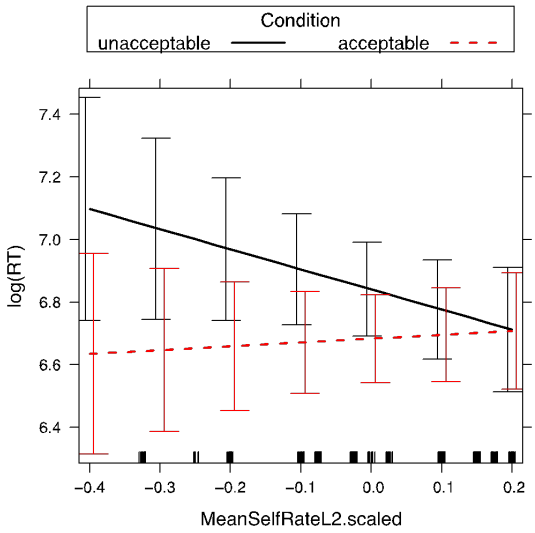

Figure 4.6. L1 English speakers' log response times to the infelicitous (black, bold line) and felicitous (red, dotted line) condition. X-axis shows L2 proficiency, from lower (left end) to higher (right end), y-axis shows log transformed response times.

4.4.2.3.3. Summary of the results

As expected, non-native speakers differed from German native speakers: they accepted more infelicitous items and fewer felicitous items, and were slower to respond. Importantly, the two non-native groups did not differ significantly from each other in the judgment rates, and L2 proficiency did not play a significant role in either group's judgments. However, Condition affected L1 Spanish speakers' RT more than that of L1 English speakers, although this difference was not significant in follow-up pairwise comparisons. Finally, L1 English speakers showed an effect of L2 proficiency: the higher self-rated L2 Spanish proficiency, the faster they responded correctly to the infelicitous items.

4.4.2.3.4. Post-hoc analysis

A close post-hoc inspection of the materials revealed that many of the items (seven out of twenty) contained a critical noun that had orthographic similarity to English, but not to Spanish (plural form in brackets): *Werk(e)* –

work(s), *Buch(¨er)* – book(s), *Recht(e)* – right(s), *Haar(e)* – hair(s), *Boot(e)* – boat(s), *Haus(¨er)* – house(s), *Feld(er)* – field(s).

Two further words were orthographically similar to both English and Spanish: *Auto(s)* – automobile(s) in English, auto(s) in some dialects of Spanish, *Hotel(s)* – hotel(s) for English, hotel(es) for Spanish. This raised the concern that orthographic similarity to the English translations might have eased L1 English speakers' detection of the violation, given that the acceptability of the item was only perceivable upon reading the critical noun's final syllable. A recent study of L2 syntactic processing found that the orthographical similarity of the L1 to the L2 could facilitate the processing of L2 syntactic structures, as faster lexical retrieval of words orthographically similar to the L1 translation equivalents freed up processing resources to cope with reading syntactic structures in a non-native language (Hopp, 2014, 2016). If the items containing German words that were orthographically similar to English but not to Spanish created an unexpected advantage for L1 English speakers over L1 Spanish speakers, this factor should make a difference to the groups' accuracy rates. Specifically, L1 English speakers should be more accurate for items containing orthographically-related critical words than for items that do not contain them, while this should not make a difference for L1 Spanish speakers. To address this concern, the factor *Cognate* (yes=orthographically similar to English/no= not orthographically similar) was added to the between-group post-hoc analysis of judgments and RTs, in interaction with Condition (felicitous/infelicitous) and L1 (English/Spanish). However, the three-way interaction was not significant for either measure (Judgments: ß = 0.44, SE = 0.85, z = 0.52, p = .60, RTs: ß = 0.25, SE = 0.15, t = 1.66, p = .10).

4.4.2.3.5. Preliminary discussion

This experiment tested the sensitivity of two groups of La speakers to violations of German possessee number agreement. Possessee number agreement with the possessive pronoun is required and marked in the pronoun's suffix in German and Spanish, while this constraint is absent in English.

Overall, it was predicted that if participants were sensitive to violations of possessee number agreement under processing pressure, they should accept felicitous items more often compared to infelicitous items. Participants were also expected to show longer RTs to infelicitous items than to felicitous ones. These predictions were confirmed, with all groups showing sensitivity to the constraint by accepting significantly more grammatical than ungrammatical items, and showing slower RTs for correctly responded infelicitous items than for felicitous items. Although several non-native participants that matched the German proficiency requirement were excluded due to their performance in the untimed task, not as many were excluded as in Experiment 4, which indicates that number agreement between pronoun and possessee was relatively straightforward for all groups. However, native German speakers showed an unexpected result: several of them failed to detect the possessee number violation in the untimed task, with a group mean of 38% acceptance of infelicitous items. This resulted in the exclusion of ten participants from the analyses of the speeded acceptability judgment task. Native speakers' high acceptance of infelicitous items in the untimed task compared to non-native speakers, who only accepted up to 18% of the infelicitous items, could be due to the untimed task format and a predictive-reading strategy. Considering that the untimed task came after the speeded acceptability task, it is possible that native German participants were hurrying to finish the experiment and resorted to a predictive reading strategy, predicting the end of a word without actually reading it (Eskenazi & Folk, 2015; Slattery & Yates, 2018). With this commonly used reading strategy, native German speakers would overlook or assume the presence of the plural marking '–e' at the possessive pronoun, or the plural marking at the possessee, hence failing to detect the ungrammaticality. The speeded acceptability task, on the other hand, presented sentences word-by-word with 550 s.o.a., which is a long time for native speakers of the language to read one single word. So it is possible that native speakers were forced to read the entire pronoun in the speeded task due to the presentation mode, as opposed to skimming over it in the untimed task, and hence detected the violations more often (the mean acceptance of infelicitous items in the speeded task was 5%, including

German L1 participants that had less than 75% accuracy in the untimed task). Although this explanation cannot be empirically tested with the current data, it does not compromise the findings from the speeded task, first because it was the non-native participants who were crucial for the research questions, and they were sensitive to the constraint to a high degree in both untimed and speeded tasks, and second because all German L1 participants had over 95% target answers in the speeded task, even when those who had scored under 75% in the untimed task were included. Despite this surprising result in the untimed task, the judgment and RT data of the speeded task showed the expected differences between native and non-native speakers: La German speakers were less sensitive and overall slower to respond than native German speakers, and were slower to respond to infelicitous items than felicitous items.

For the effects of prior grammars on La German speakers' use of the target constraint, the different La-based hypotheses predicted different patterns of differences between the two groups of non-native participants, given the differences between Spanish, German and English in possessee number agreement. The *L1 effect account* predicted that L1 English speakers would have reduced sensitivity to the constraint compared to L1 Spanish speakers, as English lacks the target constraint, whereas the *L2 effect account* predicted the opposite pattern of results, with L1 English speakers showing greater sensitivity than L1 Spanish speakers thanks to their knowledge of L2 Spanish. The *constraint similarity account*, however, predicted that L1 Spanish speakers would show greater sensitivity than L1 English speakers thanks to their native knowledge of Spanish, while L1 English speakers would show an increase in sensitivity as their proficiency in L2 Spanish increased.[15] Finally, the *no transfer account* predicted no differences between the two groups of La German speakers, but differences in sensitivity between the native German speakers and the two La German groups, with the latter showing lower sensitivity than the native group.

[15] In this case, the constraint similarity account expects participants to transfer from English, hence showing lower sensitivity than for possessor gender agreement in Experiment 4.

The judgment findings revealed no differences between the two groups of La German speakers, but differences between the native and La German groups as mentioned in the previous paragraph. This supports the *no transfer account*, indicating that neither native nor non-native grammars affected participants' metalinguistic judgments. The absence of differences between the La groups, and their lower sensitivity and slower responses when compared to native German speakers suggest that possessee number agreement is a constraint in which no transfer takes place, but in which learners perform less target-like than native speakers, as shown in multiple prior studies of L2 speakers (e.g. Sato & Felser, 2010). It is worth mentioning, however, that a series of design issues might have obscured any potential L1 differences in the judgments. For instance, the two words involved in the violation were contiguous, unlike in the experiments in which effects of the native constraints were observed (Experiments 4 and 6). This might have made the detection of the violation easy for all groups and rendered any potential difficulties caused by dissimilarities between the La and L1/L2 constraints easy to overcome, a conclusion which is partly supported by the high accuracy rates of all groups. Another factor that could have obscured the L1 differences that were found in other experiments (Experiment 4 and later, Experiment 6) is the feature tested: while gender agreement, tested in Experiment 4, is hard to acquire and process, number agreement is acquired relatively early by L2 learners (e.g. Barber & Carreiras, 2005; Faussart, Jacubowicz, & Costes, 1999; Gillon Dowens et al., 2010; Mccarthy, 2008).

Furthermore, although the judgment data showed no differences between the La speakers, their RT patterns did differ: L1 Spanish speakers responded slightly faster to felicitous items and slightly slower to infelicitous items compared to L1 English speakers. Moreover, L1 English speakers were faster to correctly respond to infelicitous items as their L2 Spanish proficiency increased. The interpretation of these effects in the absence of judgment differences can only be speculative, as faster or slower response times can have entirely different and contradictory explanations when no differences in judgments are observed. However, the RT effects suggest that there might be differences between the La groups that were not captured by

the judgment task. A possible explanation for the larger effect of condition for L1 Spanish speakers than for L1 English speakers is that L1 Spanish speakers had generally more difficulties judging violations, regardless of the specific constraint that was manipulated, while they still benefited from their Spanish knowledge in judging correctly inflected possessee number thanks to the existence of this constraint in Spanish. However, as will later be observed in Experiment 7, and as was the case for accuracy on the filler items, L1 Spanish speakers did not differ from L1 English speakers in the RTs to either condition, nor in their judgments, suggesting that they did not have more difficulties than L1 English speakers in judging violations in all conditions. Equally, any explanation for L1 English speakers' increased response speed for infelicitous items as their L2 Spanish proficiency increased must also be speculative given the absence of effects in the judgment data. This effect could indicate that having proficiency in a non-native language that shares the agreement constraint with the La can speed up the time needed to process and judge a violation of the La constraint, an effect also observed in L1 Spanish speakers' response times to possessor gender agreement in Experiment 4, which was nonetheless accompanied by more frequent rejection of infelicitous items in the judgment data. Finally, it is also important to mention that the low levels of L2 Spanish proficiency in the L1 English group might not have been enough for an L2 facilitative effect to emerge in their judgments. All these explanations for the effects observed in the RT data are only speculative. Further research with larger participant groups that show enough variation in L2 proficiency would be needed in order to explain this effect.

Taken together, the findings in the current experiment suggest that possessee number agreement in La German is not susceptible to the effects of prior languages as predicted by La transfer accounts. Instead, it is a constraint in which learners differ from native speakers by performing less target-like (Sato & Felser, 2010). The implications of these findings are discussed in further detail in relation to the findings from the other experiments of Study 2 in the general discussion.

4.4.2.4.Experiment 6: Predicative adjective concord

The exclusion of participants who scored under 75% accuracy in the untimed task resulted in the exclusion of 1 participant. Items containing vocabulary that a subject had marked as "unknown" were excluded for that subject only, resulting in the loss of 1% of the remaining data.

The mean percentage of total correct responses per group in the untimed judgment task was 97% (SD 5) in the L1 English group (n = 30), 96% (SD 8) in the L1 Spanish group (n = 30) and 100% (SD 2) in the German native group (n = 30). Non-native speakers included in the analyses did not differ in their judgments in the untimed task (*L1 English*: 97% (SD 5); *L1 Spanish*: 96% (SD 8), Wilcoxon signed-rank test, W = 528, p-value = .96), which suggests that they were aware of the predicative adjective concord constraint to a similar extent.

4.4.2.4.1. Speeded judgments

The overall accuracy of the three groups ranged from 88% and 91% in the Spanish and English native speaker groups respectively, to 97% for the German native speakers (Table 4.10).

Table 4.10. Mean percentage of responses marked as 'acceptable' by condition and group in the speeded task, and mean percentage of total correct responses in Experiment 6. Standard deviation in brackets.

	English	Spanish	German
Felicitous	92 (9)	88 (15)	98 (5)
Infelicitous	9 (24)	12 (18)	3 (7)
Correct Responses	91 (13)	88 (12)	97 (4)

As expected, participants in the three groups accepted felicitous items more often than infelicitous items. This was supported by a main effect of condition (ß = -6.67, SE = 0.35, z = -19.20, p = .00). However, non-native speakers accepted fewer felicitous items and more infelicitous items than native speakers. This was supported by a significant interaction between language group and condition (ß = 2.93, SE = 0.61, z = 4.83, p = .00).

Spanish native speakers also differed from English native speakers: they accepted fewer felicitous items and more infelicitous items than the English native group. This difference between the two non-native groups was reflected in a significant interaction between language group (English/Spanish) and condition (ß = 1.07, SE = 0.50, z = 2.14, p = .03). This difference was not significant in follow-up pairwise comparisons for each condition (*felicitous sentences; infelicitous sentences*).

Finally, analyses of L2 proficiency did not show any significant effects on either non-native group's judgment rates.

4.4.2.4.2. Response times

The response times (RTs) presented below (Table 4.11) are the raw means for the correctly responded items. The incorrectly responded items that were excluded amounted to 7.8% of the data.

Table 4.11. Mean raw response times for correctly responded items by condition and by group in the speeded task of Experiment 6. Standard deviation in brackets.

	English		Spanish		German	
Felicitous	858	(295)	899	(307)	540	(192)
Infelicitous	759	(262)	1048	(527)	529	(200)

Native speakers responded to the items generally faster than non-native speakers, as expected. Native speakers showed small differences between the conditions, while non-native speakers showed larger differences between conditions. The general speed difference between native and non-native speakers was confirmed in a main effect of Group (*native/non-native*): (ß = 0.48, SE = 0.07, t = 6.39, p = .00). There was no significant main effect of Condition nor a significant interaction of Group (*native/non-native*) by Condition (*felicitous/infelicitous*).

The two non-native groups differed in the infelicitous condition, with L1 Spanish speakers responding more slowly than L1 English speakers, but not in the felicitous condition. This pattern was confirmed in a significant interaction of Group (*English/Spanish*) by Condition (*felicitous/infelicitous*): (ß = 0.21, SE = 0.06, t = 3.35, p = .00). Follow-up pairwise comparisons

showed that L1 Spanish speakers were slightly slower in the infelicitous condition than the L1 English group: (ß = 0.19, SE = 0.11, t = 1.72, p = .09). No differences were found between the groups in the felicitous condition (ß = -0.03, SE = 0.09, t = -0.29, p = .77).

L2 proficiency was not a significant predictor of participants' RTs.

4.4.2.4.3. Summary of the results

Non-native speakers differed significantly from native ones: they accepted fewer felicitous items and more infelicitous items, and were overall slower to respond. The L1 English and L1 Spanish groups also differed: Spanish native speakers accepted fewer felicitous items and more infelicitous items than English native speakers.

The two La groups showed no differences in RTs for felicitous items, but did differ slightly in the RTs for infelicitous items, with Spanish native speakers responding later than English native speakers.

No effects of self-rated L2 proficiency were found for either measure.

4.4.2.4.4. Preliminary discussion

This experiment examined intermediate La German speakers' sensitivity to a violation of predicative adjective concord. Importantly, while German does not mark overt concord between a predicative adjective and the noun it modifies, it does require overt concord for attributive adjectives. Spanish, however, requires overt concord for both types of adjectives, while English instantiates no adjectival concord at all. The grammaticality manipulation in this experiment presented adjectives with no inflection in the grammatical condition, matching the absence of overt predicative adjective concord in German and English, and mismatching the requirement of overt concord in Spanish. The ungrammatical condition, however, showed overt adjective concord agreeing with the noun it referred to in case, number and gender, which is ungrammatical in English and German, but grammatical in Spanish.

It was predicted that if participants were sensitive to the target constraint, they should accept felicitous items more often than infelicitous items. As for their RTs, they were expected to respond slower to infelicitous items than to

felicitous items. Findings showed that, as predicted, native speakers displayed increased sensitivity in their judgments and faster response times than non-native speakers, and all participants accepted more felicitous items than infelicitous items. However, contrary to the RT prediction, infelicitous items did not receive significantly slower RTs than felicitous items. The absence of RT differences between conditions may indicate that correctly judging infelicitous items was not more effortful and costly for participants than correctly judging felicitous items. Considering the high accuracy scores in the speeded task, and the reduced RTs compared to other experiments, this is a plausible account. Nevertheless, in order to corroborate this finding, further research is needed to compare the processing effort of predicative adjective violations compared to other types of agreement violations, and how this is reflected in RTs in an RSVP paradigm (for a discussion of the relation between different types of violations, RTs and the grammaticality decision area in RSVP, see Blackwell et al., 1996).

As for differences between the La groups, given the differences in the representation of the constraint in Spanish, German and English, the following predictions were made based on prior La findings. The *L1 effect account* predicted that L1 Spanish speakers should be less sensitive to the constraint than L1 English speakers, as Spanish mismatches the target constraint, whereas the *L2 effect account* predicted the opposite, with L1 Spanish speakers showing greater sensitivity than L1 English speakers, as their L2 English instantiates the target constraint. The *constraint similarity account*, however, predicted that L1 English speakers would show greater sensitivity than L1 Spanish speakers thanks to their native knowledge of English, which shows the same constraint as German, but in turn that L1 Spanish speakers should show an increase in sensitivity as their proficiency in L2 English increases. Finally, the *no transfer account* predicted no differences between the non-native groups, but lower sensitivity in the non-native groups than the native German speakers. The findings showed that non-native speakers differed in their judgment rates and in their RTs according to the pattern predicted by the *L1 effect account*: L1 Spanish speakers accepted more ungrammatical items than L1 English speakers, and they responded slower to ungrammatical items. This suggests that L1

Spanish speakers had difficulty using an illicit overt inflection on the adjective as a cue for ungrammaticality, affecting their rejection rates and the time they needed to correctly reject these items. However, the results of the pseudo-fillers, which tested sensitivity to attributive adjective concord, cast this L1 effect in a different light. This L1 effect and the absence of L2 proficiency effects are addressed separately in the following subsections, and they are later discussed together in relation to the implications for La accounts.

Effects of native constraints

The fact that L1 Spanish speakers made more errors in their judgments and took longer to respond to infelicitous items than L1 English speakers suggests that L1 Spanish speakers had more difficulties due to the representation of the constraint in their L1. English has no overt concord for adjectives at all, whereas Spanish requires concord for both predicative and attributive adjectives. Due to the taxing demands of the task on participants' working memory and processing resources, as discussed in Experiment 4, participants may have employed their more proceduralized L1 grammatical mechanisms to overcome the processing requirements. Considering the profile of the La speakers in this study, the native processing mechanisms are assumed to be more readily available under processing pressure than non-native constraints. As mentioned earlier, participants in this study were sequential learners, which means they acquired their native tongue since birth, and only later acquired their non-native languages. The age of acquisition and frequency of use of their native language should render it the most automatic and available source of processing mechanisms, more so than their non-native language. Following this assumption, if L1 English speakers apply their L1 agreement procedure for adjective concord, they should reject overt concord in all contexts. Further, if L1 Spanish speakers apply their L1 agreement procedure for adjective concord, they should search for and accept matching overt inflection in all contexts. Although this seems to be the case for the results on predicative adjective concord in this experiment, this explanation is contradicted by the findings from the pseudo-fillers that tested sensitivity to German attributive adjective concord.

In this case, L1 Spanish speakers' application of concord, and L1 English speakers' rejection of overt concord, should have resulted in L1 Spanish speakers being more sensitive to the violation of overt attributive concord than L1 English speakers. Attributive adjectives require overt inflection in German (e.g. *Lauras Mutter war eine talentierte/*talentiert Sängerin*, 'Laura's mother was a talented singer') and in Spanish, unlike in English, and unlike for German and English predicative adjectives. Surprisingly, the judgment data from these ten pseudo-fillers showed that L1 Spanish learners were less sensitive to this constraint than L1 English speakers, despite the similarity of their L1 constraints to the target.

These findings suggest that L1 Spanish speakers had overall more problems applying the correct adjectival inflection constraint in German than L1 English speakers. Prior studies that have investigated adjectival inflection have mostly focused on learners whose L1 did not instantiate the constraint (e.g. L1 Japanese producing in L3 German in Jaensch, 2011; L1 English comprehending in L2 Spanish in Gillon Dowens et al., 2010), and they generally found that participants were capable of acquiring the constraint, and even showed processing patterns similar to native speakers of the language. However, to my knowledge, none of these studies compared learners whose L1 instantiates adjectival concord across the board with a group whose L1 does not instantiate the constraint at all in a target language that requires both overt and null inflection depending on the sentence's syntactic structure. Our findings suggest that it is harder for a learner to detect violations of adjectival concord under processing pressure when this constraint exists in their L1 under different morphosyntactic rules (i.e. Spanish) than for a learner whose L1 does not instantiate the adjective concord at all and has had to acquire the target constraint from scratch (i.e. English), even when both groups of La speakers show mature knowledge of the constraint in an untimed task. Note, however, that both La groups had high total accuracy in their speeded judgments (L1 English speakers: 91%; L1 Spanish speakers: 88% total correct responses), which suggests that L1 differences may emerge even when participants display generally consistent use of the constraint under time pressure.

Effects of non-native constraints

The absence of an L2 effect has two important implications that require discussion. On the one hand, it suggests that transfer from non-native constraints only takes place when there is a constraint that can be transferred: English lacks adjectival concord, therefore L1 Spanish speakers had nothing to transfer from L2 English. On the other hand, complementing the findings for L2 proficiency in Experiment 4, it appears that non-native constraints do not affect grammatical use of La constraints when they could result in non-facilitation, as L1 English speakers could have transferred the overt concord constraint from L2 Spanish, resulting in an incorrect judgment, but this was not observed.

As in the previous experiments, however, it is important to mention that L1 English speakers' L2 Spanish proficiency was lower than L1 Spanish speakers' L2 English proficiency. L1 English speakers had a mean of 60% L2 Spanish proficiency, ranging from 15%-87%. If higher degrees of L2 proficiency are required for an L2 effect to appear, then L1 English speakers might not have been proficient enough in L2 Spanish for an effect to emerge. This is a limitation of this study that it was not possible to overcome due to the characteristics of the L1 English population.

Implications for La accounts

The findings from the experimental and pseudo-filler items suggest that the L1 plays a crucial role in the La speakers' degree of sensitivity to violations when they are tested under processing pressure, even after showing equally mature knowledge of the constraint in an untimed task. The absence of an L2 effect suggests that having proficiency in an inflectionally poor L2 does not have a facilitatory effect for native speakers whose L1 and target La have a richer inflectional paradigm for adjectives. Furthermore, it suggests that proficiency in an inflectionally rich L2 that does align with the La constraint does not negatively impact performance in the La either, although further research that includes L1 English speakers with higher proficiency levels in L2 Spanish is needed to corroborate this interpretation.

While the findings from the experimental items are in line with the predictions of the *L1 influence account*, the findings from the pseudo-filler

items have an important implication for La accounts: even when the L1 is similar to a specific La constraint, as Spanish is similar to German in its overt inflection of attributive adjectives, if the target language offers morphosyntactic limitations for the application of the constraint (i.e. German does not overtly inflect predicative adjectives), speakers of the L1 with a broader application of a similar constraint (i.e. L1 Spanish speakers) will have more difficulties applying a conditional inflectional system than speakers of an L1 with no concord at all (i.e. L1 English speakers). These implications are discussed further in relation to the other experiments in the General Discussion in section 4.5.

4.4.2.5.Experiment 7: Subject-verb agreement

The exclusion of participants who did not achieve 75% accuracy in the untimed task resulted in the removal of 2 L1 English participants. The items with vocabulary that a subject marked as "unknown" were removed for that subject only (1.5% of the data).

Participants' mean percentage of total correct responses in the untimed judgment task was 95% (SD 8) for L1 English speakers (n = 28), 97% (SD 6) for L1 Spanish speakers (n = 31) and 99% (SD 4) for L1 German speakers (n = 30). Non-native speakers included in the analyses did not differ in their judgments in the untimed task (*L1 English*: 96% (SD 7); *L1 Spanish*: 96% (SD 6), Wilcoxon signed-rank test, W = 527, p-value = .78), which suggests that they were aware of the subject-verb agreement constraint to a similar extent.

4.4.2.5.1. Speeded judgments

All groups showed above 85% mean total accuracy (Table 4.12).

Table 4.12. Mean percentage of responses marked as 'acceptable' in the speeded acceptability task by condition and group, and mean percentage of total correct responses, in Experiment 7. Standard deviation in brackets.

	English		Spanish		German	
Felicitous	90	(12)	89	(10)	94	(8)
Infelicitous	20	(23)	18	(22)	5	(6)
Total Accuracy	85	(14)	85	(12)	95	(5)

Native and non-native speakers accepted grammatical items more often than ungrammatical items, which was confirmed by a main effect of condition (ß = -5.47, SE = 0.33, z = -16.82, p = .00). However, non-native speakers accepted fewer felicitous items than the native speakers (89% vs. 90% respectively), and more infelicitous items (18-20% vs. 5%). This difference between native and non-native speakers was significant in an interaction between language group (native/non-native) and condition (ß = 2.24, SE = 0.56, z = 3.97, p = .00), and in a marginal effect of group (native/non-native) (ß = 0.48, SE = 0.27, z = 1.81, p = .07).

Importantly, the small differences between L1 English and L1 Spanish speakers' judgments were non-significant in the interaction between language group (English/Spanish) and condition (ß = -0.22, SE = 0.39, z = -0.55, p = .58).

Finally, self-rated L2 proficiency was not a significant predictor for either group.

4.4.2.5.2. Response times

Table 4.13 presents the mean raw RTs for the correctly responded items, but analyses were conducted on the log-transformed RTs. The incorrectly responded items that were excluded amounted to 11% of the data.

Table 4.13. Mean raw response times by condition and group in Experiment 7. Standard deviation in brackets.

	English	Spanish	German
Felicitous	821 (261)	791 (249)	525 (220)
Infelicitous	914 (318)	946 (328)	518 (203)

As expected, non-native speakers showed significantly slower RTs than native speakers, as confirmed by a main effect of group (ß = 0.55, SE = 0.08, t = 7.02, p = .00). Although non-native speakers showed larger differences in their RTs between conditions than the German native group, this did not result in a significant interaction of Group by Condition. However, a main effect of Condition indicates that participants responded to infelicitous items significantly slower than to felicitous items (ß = 0.12, SE = 0.03, t = 3.90, p = .00).

As expected, there were no differences between the two groups of non-native speakers in either condition. The absence of differences was confirmed by a lack of significance in the Group effect, and in the Group by Condition interaction.

Finally, the effects of L2 proficiency on the RTs was not significant for either non-native group.

4.4.2.5.3. Summary of the results

As expected, non-native speakers' performance in the speeded task differed from native speakers': they accepted fewer grammatical items and more ungrammatical items, and were significantly slower overall than the native group. The differences between L1 English and L1 Spanish speakers were not significant for either measure, as predicted. Likewise, L2 proficiency was not a significant predictor of the judgments and RTs of either non-native group.

4.4.2.5.4. Preliminary discussion

This experiment investigated whether there were differences between the two non-native groups for a constraint that is shared in all three languages of the La speakers: subject-verb number agreement. This experiment served as a check for potential effects of lexical similarity, as English and German are closer lexically than Spanish (Schepens, Dijkstra, & Grootjen, 2012; Schepens, Dijkstra, Grootjen, & van Heuven, 2013), potentially making the task easier for L1 English speakers than L1 Spanish speakers (Hopp, 2014, 2016), as well as a check for potential intrinsic differences between the groups. If the La German groups were well matched for the study, L1

Spanish and L1 English speakers should not differ in their sensitivity to the constraint. For the general judgment rates and response times (RTs), participants of all groups were expected to show sensitivity to the constraint by accepting felicitous sentences more often than infelicitous sentences, and displaying slower RTs for the infelicitous sentences than the felicitous sentences.

The findings showed that all participants were significantly sensitive, with over 88% expected responses, and slower RTs for the infelicitous items than the felicitous items. Importantly, non-native speakers had the expected lower sensitivity and slower RTs than native speakers, but there were no significant differences between the two groups of non-native speakers. This absence of differences between the non-native groups is consistent with the hypothesis that participants of different L1 groups do not differ from each other in their use of La constraints that are similarly instantiated in their respective L1s and L2s. Given that they performed less target-like than native German speakers, as expected, this evidence also supports previous findings of a general learner effect (Sato and Felser, 2010). Also importantly, this finding further supports an absence of inherent differences between the two La groups in their German proficiency and reading skills, which was also apparent in the analyses of the filler items. The implications of these findings for La accounts are discussed along with the rest of the experiments in the General Discussion (4.5).

4.4.2.6.Summary of the results of Study 2

In Experiment 4 on possessor gender agreement, a constraint present in German and English and absent in Spanish, Spanish native speakers accepted fewer felicitous items and more infelicitous items than English native speakers. To address the concern that the results depended on the loss of 25% of the data after excluding participants with less than 75% accuracy in the untimed task, post-hoc analyses including the removed participants were conducted. These confirmed the observed differences between L1 English and L1 Spanish speakers, and additionally showed that L1 Spanish speakers rejected more infelicitous items and did so faster when their L2 English proficiency increased.

In Experiment 5 on possessee agreement, a constraint present in German and Spanish but absent in English, English and Spanish native speakers did not differ significantly from one another in their judgments. However, Spanish native speakers showed a larger effect of condition in their RTs than English native speakers, and L1 English speakers' RTs to infelicitous items sped up when their L2 Spanish proficiency increased.

In Experiment 6 on predicative adjective concord, a constraint absent in German and English and present in Spanish, L1 Spanish speakers rejected fewer infelicitous items and took longer to correctly reject them than L1 English speakers. The pseudo-filler items showed that L1 Spanish speakers were also less sensitive to attributive adjective concord than L1 English speakers, although in this case the target constraint was present in German and Spanish and absent in English.

Finally, in Experiment 7 on subject-verb number agreement, a constraint present in all three languages, no differences were found between English and Spanish native speakers' judgments or response times.

Table 4.14 provides an overview of L1 and L2 effects in each experiment.

Table 4.14. Overview of the L1 effects and L2 effects in La speakers' speeded acceptability judgments and response times in the four experiments in Study 2.

	L1 effects	
	Judgments	Response Times (RTs)
Exp. 4	L1 Spanish accept more infelicitous items than L1 English speakers.	L1 Spanish speakers show slower RTs in the infelicitous condition than L1 English speakers.
Exp. 5	No differences.	L1 Spanish speakers show slower RTs in the infelicitous condition than L1 English speakers.
Exp. 6	L1 Spanish accept more infelicitous items than L1 English speakers.	L1 Spanish speakers show slower RTs in the infelicitous condition than L1 English speakers.
Exp. 7	No differences.	No differences.
	L2 effects	
	Judgments	Response Times (RTs)
Exp. 4	Post-hoc: L1 Spanish showed more correct responses as their L2 English proficiency increased.	Post-hoc: L1 Spanish showed faster RTs as their L2 English proficiency increased.
Exp. 5	No effects.	L1 English showed faster RTs as their L2 Spanish proficiency increased.
Exp. 6	No effects.	No effects.
Exp. 7	No effects.	No effects.

4.5. General discussion

The goal of this study was to find out whether native and/or non-native grammars affect multilingual speakers' sensitivity to agreement violations in an additional language when put under processing pressure. To

investigate this question, two groups of intermediate La German speakers were tested with a speeded acceptability judgment task (SAJT) on four agreement phenomena in German. These phenomena are subject to different constraints in Spanish, English and German, the languages of the trilingual speakers tested in this study, who had mirror distributions of their L1/L2 languages (L1Spanish/L2English and L1English/L2Spanish).

In the absence of prior La morphosyntactic studies measuring grammatical knowledge under processing pressure, the predictions for this study were derived from findings obtained in the field of La acquisition (Table 4.15): the *L1 effect account* expected native constraints to have a greater effect on participants' sensitivity than L2 constraints; the *L2 effect account* expected the opposite, non-native constraints should affect La speakers' sensitivity to a greater extent; the *constraint similarity account* expected both native and non-native constraints to have an effect as long as they showed similarity to the target word order; and the *no transfer account* expected no differences between the La speakers, but differences between La speakers and native German speakers.

The findings in Experiment 4 and 6 showed that L1 constraints significantly affected participants' performance in the speeded task, while Experiments 4 and 5 showed that participants' performance was additionally modulated by their L2 proficiency. These findings indicate that prior constraints affect the use of La grammatical knowledge under processing pressure, but they also reveal that these effects are more selective than initially predicted.

Before discussing the implications of these findings for an account of La grammatical use under processing pressure, the next section discusses the general findings regarding the use of agreement phenomena under processing pressure.

Table 4.15. Overview of the expected L1 and L2 effects according to each La transfer account.

	L1 effect: L1 group differences	L2 effect: L2 proficiency differences
L1 effect account	Experiments 4 and 6 show that L1 Spanish have lower sensitivity than L1 English speakers. Experiment 5 shows that L1 English have lower sensitivity than L1 Spanish speakers.	No effects.
L2 effect account	Experiments 4 and 6 show that L1 English have lower sensitivity than L1 Spanish speakers. Experiment 5 shows that L1 Spanish have lower sensitivity than L1 Spanish speakers.	No effects.
Constraint similarity account	Experiments 4 and 6 show that L1 Spanish have lower sensitivity than L1 English speakers. Experiment 5 shows that L1 English have lower sensitivity than L1 Spanish speakers.	Experiments 4 and 6 show that L1 Spanish have increased sensitivity as their L2 English proficiency increases. Experiment 5 shows that L1 English speakers have increased sensitivity as their L2 Spanish increases.
No transfer account	There are no differences between the two groups of La speakers. La speakers show lower sensitivity than speakers.	There is no effect of L2 proficiency in any of the four experiments.

4.5.1. Sensitivity to La German agreement constraints under processing pressure

An interesting finding in this study is that participants' sensitivity differed substantially among the four phenomena. While Experiments 5, 6 and 7 elicited above 80% expected responses in native German speakers' and La speakers' speeded judgments, Experiment 4 on possessor gender agreement violations showed a high incidence of unexpected responses in the three groups (Table 4.16).

Table 4.16. Mean percentage of total expected responses in the four speeded acceptability judgment experiments of Study 2, by group.

	English	Spanish	German
Experiment 4	79	66	92
Experiment 5	76	80	97
Experiment 6	91	88	97
Experiment 7	85	85	95

The manipulations of possessor gender agreement in Experiment 4 elicited a high amount of unexpected 'acceptable' responses in participants' speeded judgments and in La German speakers' answers to the untimed task. In the case of the untimed judgments, considering La speakers' intermediate to advanced level of proficiency in German, and their target performance in the untimed judgments for the other experiments, La speakers' amount of unexpected 'acceptable' responses in Experiment 4's untimed task was surprisingly high, resulting in the exclusion of a large number of participants for the analyses of the speeded judgment data. Equally surprising is the amount of unexpected answers La speakers continued to provide in the speeded task once participants with less than 75% expected responses in the untimed task had been excluded. Similarly, German native speakers, who showed a high percentage of target responses in the untimed task, also showed an unexpectedly large amount of unexpected answers in the speeded task.

There are several factors that might have played a role in the remarkable differences in unexpected 'acceptable' rates between possessor gender agreement and the other three agreement phenomena. Firstly, compared to the other experiments, the design of the possessor gender agreement experiment contained a manipulation that made it more difficult: while felicitous items presented matching gender between the possessor and the pronoun's root (e.g. *Herr Wagner* and *sein-e* in *Herr Wagner küsste zartlich seine Freundin,* 'Mr Wagner kissed tenderly his girlfriend'), they showed mismatching gender between the root and possessee (*sein* and *Freundin*). In contrast, the infelicitous items contained a mismatch between the gender of the possessor and the pronoun's root (*Herr Wagner* and *ihre* in *#Herr Wagner küsste zärtlich ihre Freundin*, 'Mr Wagner kissed tenderly her girlfriend'), but a false match with the gender of the possessee (*ihre* and *Freundin*). Although the false match effect between the root of the possessive pronoun and the upcoming noun in infelicitous items is irrelevant for the manipulation at stake, it has been shown to produce interference effects in prior production studies of possessive pronouns (Lightbown & Spada, 2000; Martens, 1988; Muñoz Lahoz, 1994; Joanna White et al., 2007; Zobl, 1985). So far, however, the false match effect in possessive pronouns has not been found to be relevant in comprehension (see Lago et al., 2019; Pozzan & Antón-Méndez, 2017, for recent findings).

Another factor that could influence the general difficulty of possessor gender agreement is the fact that possessive pronouns require two types of agreement. While the pronoun's root needs to match a possessor antecedent in gender, number, and person, the suffix of the possessive pronoun has to overtly agree with the upcoming possessee in gender, number, and case. From the processing perspective, the retrieval of antecedent features for possessor match with the pronoun's root, and the simultaneous preparation for agreement with the following possessee should make the comprehension of possessive pronouns altogether more challenging for non-native as well as native speakers than, for instance, the processing of adjectival concord or subject-verb agreement in number, which require agreement with one word instead of two. The added difficulty of agreeing with two words simultaneously could additionally explain why possessee number agreement

in Experiment 5 was the experiment with the next lowest accuracy rates for the non-native groups after possessor gender agreement, as it presented possessive pronouns and hence also required a double agreement process (mean total accuracy of L1 Spanish = 80%; and L1 English = 76%).

Although Lago et al. (2019) did not directly investigate the impact on processing of the double agreement needed for possessive pronoun gender agreement, the study focused on the processing mechanisms used by intermediate La German speakers (L1 English-L2 Spanish and L1 Spanish-L2 English) for possessive pronoun gender agreement with the possessor. With a SAJT and a SPR, they tested two possible accounts of the observed L2 difficulty with this constraint: an account that claims there is a universal, L1-independent tendency to establish agreement locally, as claimed by Pozzan and Antón-Méndez (2017); and an alternative account that claims L1 Romance speakers apply L1 agreement procedures to English pronouns during production, establishing gender agreement between the pronoun and the possessee noun, as claimed by Antón-Méndez (2010). Lago and colleagues' findings showed that L1 Spanish speakers had lower sensitivity to possessor gender violations than L1 English speakers, but they did not find higher rates of unexpected responses in their SAJT or slower reading times in their SPR to items with a mismatch in gender between the possessor and the possessee noun, which does not support Antón-Méndez' (2010) account. Lago and colleagues suggest that the observed L1 effects in production and comprehension result from two different mechanisms: one for production, which leads L1 Romance speakers to co-activate the gender of the pronoun and the possessee, as speakers have been shown to plan nouns and modifiers before producing the noun phrase (Schriefers, 1993; Schiller and Caramazza, 2003), and hence results in gender mismatch effects for L1 Romance speakers who employ forward agreement with the possessee during production; and one for comprehension, in which co-activation of the possessee does not happen before encountering it (unless it is highly predictable), and L1 effects arise from L1 Romance speakers' difficulties in retrieving the possessor noun. Following Lago and colleagues' findings, it could be the case that all participant groups in Experiment 4 had difficulties retrieving the possessor noun due to the

processing demands of the task and of the double agreement constraint, and that this was especially difficult for L1 Spanish speakers, for whom possessor gender retrieval for pronoun agreement is not a procedure existent in their L1, and hence not as automatized as for L1 German and L1 English speakers. This is further discussed in the next section.

An additional factor that might have reduced the amount of target responses in possessor gender agreement is the nature of the infelicitous sentences: these were not strictly unacceptable to the same extent as in the remaining experiments, because the pronoun in 'Mr Müller saved her patient' could be matched to a sentence-external antecedent. Therefore, although participants were explicitly instructed to judge the items' acceptability based on the context of the sentence given, they might still have considered a sentence-external antecedent. This could have reduced the unacceptability of infelicitous sentences for participants who matched the pronoun's root features to an external antecedent that was not provided in the sentence context.

The remaining experiments showed a high number of target answers in the untimed as well as the speeded task for all groups (above 85% correct responses). Interestingly, however, despite the differences in participants' general sensitivity between phenomena that potentially posed processing difficulties such as possessor gender agreement (Experiment 4) and easier phenomena such as adjective concord (Experiment 6), both constraints elicited significant differences between the two groups of La speakers, even after controlling for their knowledge of the constraint in the untimed task.

Several important implications for future La research can be derived from these findings. Firstly, agreement phenomena may present additional difficulties for non-native speakers which are unrelated to L1 and L2 differences (Experiment 4 on possessor gender agreement). These factors seem to affect native speakers of the language too. Secondly, despite the difference in difficulty between the phenomena tested, easier- and harder-to-process agreement phenomena may still show significant differences between non-native La speakers that point to the influence of native and in some cases non-native constraints.

Finally, a consistent finding in all four experiments was native German speakers' greater sensitivity and response speed compared to La speakers. Native German speakers showed more frequent acceptance of felicitous items and rejection of infelicitous items, and had faster response times. Moreover, they showed smaller effects of felicitousness in their RTs, indicating that they were just as fast at correctly responding to felicitous items as to infelicitous items. These results are not surprising: participants in the non-native groups were intermediate to advanced speakers of La German, and were therefore not expected to be nativelike. Similarly, the small effect of condition on native speakers' response times was also unsurprising, as ceiling effects were expected in the native participants' performance on tasks which were primarily designed to test non-native speakers.

Taken together, these findings suggest that the experimental set up of this study was adequate to test the effects of prior grammars (L1 and L2 English and Spanish) on the use of La German constraints under processing pressure, and they confirm that German possessive pronouns as well as German adjectival concord are fruitful areas for research on cross-linguistic influences.

4.5.2. Effects of prior grammatical knowledge

Crucial for the research questions of the study are the differences observed between the La groups in Experiments 4 and 6, and the facilitative effects of L2 proficiency observed in Experiments 4 and 5.

Experiments 4 and 6 showed that L1 Spanish speakers were less sensitive to the constraints in their judgments and in their RTs than L1 English speakers. In both experiments, Spanish had dissimilar constraints to German, while English had similar constraints. This suggests that L1 constraints affected La participants' performance in these experiments, matching the prediction of the *L1 effect account*. However, L2 proficiency modulated participants' performance in Experiments 4 and 5: L1 Spanish speakers were faster in rejecting infelicitous items and gave more target-like judgments in Experiment 4 as their L2 English proficiency increased, while in Experiment 5 L1 English speakers were faster in rejecting ungrammatical

items as their L2 Spanish proficiency increased. These findings contradict the predictions of the *L1 effect account* and *L2 effect account,* which posit a sole influence of the L1 constraints (*L1 effect account*) or L2 constraints (*L2 effect account*), and suggest that the *constraint similarity account* might be a better explanation of the results. However, the effects observed were selective, as L1 effects were not found in all contexts in which they were possible (e.g. Experiment 5), nor did L2 effects appear in all contexts (Experiments 4-6). The next sections discuss in more detail the pattern of results for native constraints and non-native constraints.

4.5.3. The role of native constraints

Two findings suggest that L1 constraints had an effect on participants' sensitivity to the La constraints: L1 Spanish speakers' lower sensitivity to possessor gender agreement compared to L1 English speakers in Experiment 4, and L1 Spanish speaker's lower sensitivity to predicative adjective concord compared to L1 English speakers in Experiment 6. In Experiment 4 on possessor gender agreement, L1 Spanish speakers' lower sensitivity in their judgments, and slower RTs to correctly judged infelicitous sentences compared to L1 English speakers suggests that the absence of a constraint in the native tongue may make the use of the constraint under processing pressure in the La less consistent than when this constraint is also instantiated in the L1. The findings from Experiment 6 on adjectival concord, however, are not as straightforward. In Experiment 6, L1 Spanish participants, whose L1 instantiates [+inflection] for all declinable adjectives, had difficulties correctly applying the [-inflection] constraint for predicative adjectives in La German as well as the [+inflection] constraint for attributive adjectives in the pseudo-fillers compared to L1 English speakers, whose L1 instantiates no adjectival inflection (i.e. [-inflection] in all contexts). An exclusive *L1 influence account* predicts lower sensitivity for L1 Spanish speakers than L1 English speakers for [-inflection] in La German predicative adjectives, but greater sensitivity for [+inflection] in La German attributive adjectives. This latter prediction was not confirmed in the pseudo-filler results: L1 Spanish speakers were actually less target-like than L1 English speakers. Nonetheless, if adjectival concord is viewed as a

whole, including attributive and predicative adjectives, then it is plausible that speakers with an L1 that applies a constraint that is constrained in the La by morphosyntactic restrictions have more difficulties resetting their parameters to these morphosyntactic restrictions than speakers who have to learn the target La constraint from scratch (i.e. speakers whose L1 lacks the constraint to begin with).

While Experiments 4 and 6 found different manifestations of an L1 effect under processing pressure (e.g. the failure to apply consistently an La constraint which is absent in the L1 in Experiment 4, and the failure to use an La constraint dissimilarly represented in the L1 in Experiment 6), Experiment 5 did not show the same pattern of L1 effects despite a design that enabled them. This experiment showed longer RTs for L1 Spanish speakers than L1 English speakers for the infelicitous items, which indicates that L1 Spanish speakers had more difficulties processing these items before judging them. This result was unexpected, because Experiment 5 tested number agreement between the possessive pronoun's inflection and the possessee, a constraint existent in Spanish but not in English. Although a relevant effect, this difference in response times between the groups was not present in the judgment data, as L1 Spanish speakers did not show lower sensitivity than L1 English speakers, which was the case for the L1 effects in Experiment 4 and 6. If anything, L1 Spanish speakers showed more accuracy in their judgments than L1 English speakers (80% L1 Spanish vs. 76% L1 English total correct responses), but not significantly so. In the preliminary discussion of Experiment 5 (4.4.2.3.5) it was suggested that the observed difficulty of L1 Spanish speakers might be due to an extended effect of their difficulties processing 3rd person singular possessive pronouns (*his*/*her*), which was shown to be significantly difficult for this group of speakers already in Experiment 4 and in prior research (Lago et al., 2019; Lightbown & Spada, 2000; Martens, 1988; Muñoz Lahoz, 1994; Joanna White et al., 2007; Zobl, 1985). However, as also noted in that discussion, this is only a speculation, as it cannot be confirmed by the data, and would require further research.

Taken together, the L1 effects observed in Experiments 4 and 6 suggest that L1 constraints play a significant role in the use of grammatical

knowledge in an additional language when speakers are put under processing pressure. However, native constraints were not the only factor relevant to the La speakers' performance. Proficiency in their L2 was found to modulate their sensitivity in Experiments 4 and 5. This effect is discussed in the next section.

4.5.4. The role of proficiency in a non-native language

The second crucial finding in this study is the role of non-native proficiency in the performance of the La groups, separate from the observed L1 effects. L2 English proficiency improved L1 Spanish speakers' judgments and accelerated their response speed to possessor gender violations in Experiment 4, and L2 Spanish proficiency increased the response speed of L1 English speakers to possessee number violations in Experiment 5. These effects indicate that there is more to La grammatical use under processing pressure than the influence of L1 constraints. However, unlike the L1 effects found so far, which appeared in RT measures for the three experiments designed to test them (Experiments 4-6), and in the judgments for two experiments (Experiments 4 and 6), L2 effects appeared in more specific contexts, which can be summarized as follows:

a) *L2 proficiency effects appeared when the L2 instantiated the La constraint and the L1 did not*. E.g. L2 English facilitated L1 Spanish speakers' judgments in Experiment 1, in which English and German instantiated gender possessor agreement and Spanish did not. However, L2 English did not modulate L1 Spanish speakers' judgments of subject-verb agreement in Experiment 7, a constraint existent in English as well as in Spanish. Further, L2 English did not modulate L1 Spanish speakers' judgments of predicative adjective concord (Experiment 6). In this case, while English lacks adjectival inflection, German inflects attributive but not predicative adjectives. Therefore, L1 Spanish speakers, who inflect both attributive and predicative adjectives, had no constraint to transfer or activate from English, as this language lacks inflection completely.

b) *L2 proficiency effects were facilitative only*. The increase in L2 proficiency resulted in an increase in target responses (Experiment 4), and a decrease in time needed to correctly reject infelicitous sentences (Experiments 4 and 5). On no occasion did it result in an increase in incorrect or non-target responses, or in an increase of time needed to correctly reject violations.

However, these findings have to be interpreted with caution. The L2 English effect in Experiment 4 was only observed in post-hoc analyses that included participants with less than 75% target responses in the untimed task. Note that these analyses were conducted because of the concern that the variance in the data had been limited when excluding 25% of the data due to the La speakers' non-target-like performance in the untimed ask. Only when these participants were reintroduced in the analyses did the L2 modulation appear. Further, the absence of non-facilitative effects in either group, but especially in the L1 English speakers, should not be taken as evidence for the claim that only facilitation takes place with increasing L2 proficiency, as several factors might have played a role in producing the current pattern of L2 effects. On the one hand, L1 English participants did not have the same high range of L2 Spanish proficiency (60% total proficiency in the self-rating score, range 15 - 87) as L1 Spanish speakers had of L2 English proficiency (80% total proficiency in the self-ratings, range 50 – 100). This might have prevented any effects of L2 Spanish proficiency from appearing in L1 English speakers' judgments. Notice, however, that L1 English speakers were quicker to reject violations in Experiment 5 as their L2 Spanish proficiency increased, a finding that can be interpreted as facilitation by L2 Spanish grammar, albeit not reflected in the judgment data. It is possible that in order for L2 proficiency to affect L1 English speakers' judgments, a higher range of proficiency is needed. Further, it is also possible that non-facilitation only takes place when La speakers have native-like levels of proficiency in the L2. Perhaps only L2 grammar that has been highly automatized to native-like levels through extensive exposure to its grammatical processing mechanisms can have an effect on La speakers' metalinguistic decisions. This has been claimed for

La speakers' acquisition of an La at the initial levels of proficiency (Falk & Bardel, 2011; Rothman, 2015), although it has not been directly tested yet. Further research with larger groups of La participants with wider ranges of L2 proficiency would be needed in order to establish when L2 affects La grammatical use. Moreover, studies addressing these effects should measure participants' grammatical knowledge of the target constraint in the L2 (as in Lago et al., 2019), which was not done in this study. This measurement could determine whether it is knowledge of the constraint in the L2 that modulates sensitivity to the La constraint or global L2 proficiency as measured by general proficiency tasks.

Taken together, the observed L2 effects indicate that the use of La constraints under processing pressure is subject to a more complex set of L1 and L2 effects than those initially predicted. These have important implications for La accounts, which are discussed in the next section.

4.5.5. Implications for La research

Table 4.17 summarises the predictions of the four La transfer accounts. Ticks and crosses indicate whether or not each prediction was confirmed in Study 2.

Table 4.17. Overview of the L1 and L2 proficiency effects predicted by each La transfer account for Study 2. A tick indicates the predictions that confirmed by the effects in Study 2, a cross those that were not.

	L1 effect: L1 group differences	L2 effect: L2 proficiency differences
L1 effect account	✓ Experiments 4 and 6 show that L1 Spanish speakers have lower sensitivity than L1 English speakers. ✗ Experiment 5 shows that L1 English speakers have lower sensitivity than L1 Spanish speakers.	✗ L2 proficiency does not affect the performance of La groups in Experiments 4, 5 and 6.
L2 effect account	✗ Experiments 4 and 6 show that L1 English speakers have lower sensitivity than L1 Spanish speakers. ✗ Experiment 5 shows that L1 Spanish speakers have lower sensitivity than L1 Spanish speakers.	✗ L2 proficiency does not affect the performance of La groups in Experiments 4, 5 and 6.
Constraint similarity account	✓ Experiments 4 and 6 show L1 Spanish speakers have lower sensitivity than L1 English speakers. ✗ Experiment 5 shows that L1 English speakers have lower sensitivity than L1 Spanish speakers.	✓ Experiments 4 and 6 show L1 Spanish speakers have greater sensitivity as their L2 English proficiency increases. ✗ Experiment 5 shows that L1 English speakers have greater sensitivity as their L2 Spanish proficiency increases.
No transfer account	✓ Observed in experiment 7: There are no differences between the two groups of La speakers, but La German speakers show lower sensitivity than L1 German speakers.	✓ Observed in experiment 7: L2 proficiency does not affect the performance of the La groups.

The L1 and L2 effects found in the judgment data in Experiment 4 suggest that both grammars play a role simultaneously in participants' use of La grammatical knowledge under processing pressure, while the individual L1 effects in Experiment 6 and the L2 proficiency effect in Experiment 5 suggest that these can also occur in isolation. These findings suggest that the *L1 effect account* and the *L2 effect account*, which both posit a sole effect of one prior grammar under all circumstances, are not good explanations of the pattern of results obtained in this study.

Equally, the prediction of the *no transfer account* was not confirmed for the phenomena that showed cross-linguistic differences in the instantiation of the constraint (Experiments 4-6). However, it was confirmed in Experiment 7, which tested a constraint present in all three languages.

Together, the pattern of effects across the four experiments points to a partial match with the *constraint similarity account*, which posits simultaneous effects of both prior grammars, modulated by proficiency.

However, the pattern of results is more complex than that predicted by any of these four accounts. While L1 constraints provide a general explanation of differences between the La groups across contexts: participants whose L1 instantiates the constraint were more sensitive than participants whose L1 does not instantiate it or instantiates it differently, L2 modulated performance in a facilitative way and only in specific contexts. The selectivity and nature of L1 and L2 effects suggest that these two phenomena might be the result of different mechanisms, as suggested in Chapter 3 for the findings in Study 1.

L1 effects were more general, affecting response times and judgments in two out of three experiments designed to test them (Experiments 4 and 6). Task demands might have had a crucial role in shaping these effects: participants were presented the sentence rapidly word by word, which impeded rereading and therefore required them to rely heavily on their working memory. They had to build the sentence structure and meaning as it unfolded word by word, as well as retain information for the speeded end-of-sentence judgment, which was presented right after the violation was revealed, greatly limiting time for metalinguistic reflection. As discussed previously, this time and processing pressure should elicit the most

instinctive and automatic responses from participants (e.g. Hopp, 2010). Under the assumption that the L1 grammatical mechanisms are the most proceduralized due to the age at which the sequential learners of this study acquired them and the frequency with which they used them (compared to their other non-native languages), it is plausible that they were deployed by the non-native speakers when processing resources did not suffice to retrieve or apply the target La constraint. The outcome of this use of L1 grammatical mechanisms when the target La could not be retrieved resulted in more target-like performance for L1 English speakers than L1 Spanish speakers in Experiments 4 and 6. In these experiments, the Spanish constraint differed from the German constraint but English did not. Therefore, when the non-native speakers failed to use the target German agreement procedure and instead employed their native agreement procedure, this resulted in more errors for L1 Spanish speakers and fewer errors for L1 English speakers. In general, L1 effects occurred in the situations in which they were possible.

In contrast to the pervasiveness of L1 effects, L2 effects appeared in very specific contexts. If L2 effects are both facilitative and non-facilitative, then these effects should have appeared in both La groups for Experiments 4-6: six times in total. Instead, they appeared only when the La constraint was missing from participants' L1 but was present in their L2 (Experiments 4 and 5), and not in all measures (Experiment 4 showed L2 English proficiency effects in both judgment and response time data for L1 Spanish speakers, while Experiment 5 showed an L2 Spanish proficiency effect in the L1 English speakers' response times only). Moreover, this effect appeared in addition to the L1 difference in Experiment 4, which indicates that L2 facilitation takes place in addition to L1 effects. In light of this pattern of results, and assuming that increasing levels of L2 proficiency correlate with increasing levels of proceduralization in deploying L2 grammatical mechanisms, one can speculate that the deployment of L2 mechanisms is possible but less likely or less influential, and may be slower than the deployment of L1 mechanisms. At increased levels of L2 proficiency, the probability of applying an L2 mechanism that aligns with the La is higher, as long as the L1 mechanism does not already align with

the La target. If the L1 constraint aligns with the target constraint, then the strength and speed of the L1 activation should reduce the probability of L2 agreement procedures influencing the metalinguistic judgment. Although this is a plausible account of L2 effects, it cannot be supported with the current data, as the design did not measure processing and activation directly, but only the outcome of these processes. Moreover, the L2 effect was infrequent, which could also be due to the range of L2 proficiency, as discussed above.

What can be taken from these findings for accounts of La grammatical use in real-time comprehension is the following: L1 and L2 constraints may simultaneously have an effect on La speakers' performance. L1 effects elicit differences between groups of La speakers regardless of their L2. However, in cases in which the L1 effect results in reduced sensitivity, participants' L2 knowledge can enhance their performance. Future research is necessary to determine the differences between L1 and L2 effects. To ensure sufficient statistical power to detect subtle effects, and a sufficient range of L2 proficiency to detect effects that may only occur at the extremes, ideally at least double the number of multilingual speakers would be tested, while methods such as eye-movement monitoring during reading and event-related potentials could help address relevant processing questions that could inform the results of Study 2. Eye movement monitoring during reading could help determine the extent to which La speakers base their decisions on relevant or irrelevant elements of the sentence such as the antecedent, possessor and possessee, and measurement of ERPs could help determine when La speakers engage rapid automatic decision processes and when they engage slower deliberative processes.

4.6. Summary and conclusion

Study 2 investigated whether the use of La agreement constraints under processing pressure was affected by multilingual speakers' instantiation of the constraint in their native and non-native languages. Four predictions were made based on prior research on La acquisition: the *L1 effect account* predicts that only L1 constraints have an effect; the *L2 effect account* predicts that only L2 constraints have an effect; the *constraint similarity*

account predicts that both constraints simultaneously have an effect; and the *no transfer account* predicts that neither language affects participants' performance. These hypotheses were based on La acquisition research at the initial stages of acquisition that used untimed methods to test metalinguistic knowledge. It was an open question whether they would hold true for the use of grammatical knowledge under time pressure in intermediate La speakers who had already shown mature knowledge of the agreement constraints in an untimed task. The findings showed that both languages affected participants' performance in a speeded acceptability judgment task, which suggests a match with the *constraint similarity account*. However, the effects were selective, which indicates that the pattern of effects from prior languages is more complex than that predicted by the *constraint similarity account*: while L1 constraints affected the degree of sensitivity La participants had to the constraints, leading to lower La sensitivity if they did not align with the La, knowledge of an L2 that aligned with the La enhanced participants' sensitivity to constraints that were absent in their L1, in addition to any effects of their native constraints.

Chapter 5

Conclusions

5.1. Introduction

This dissertation investigated whether multilingual speakers at intermediate levels of proficiency in the La were affected by their native and non-native grammars while using La constraints under processing pressure. The goal was to observe whether these La speakers, who showed mature knowledge of the constraints in untimed tasks, were capable of applying them under time pressure, and whether they would perform differentially in these tasks depending on how their L1 and L2 instantiated the constraints.

For this purpose, seven German phenomena that were similarly or differentially instantiated in English and Spanish were investigated (see Table 5.1 and Table 5.2). Study 1 (Experiments 1-3) looked into La speakers' sensitivity to linear word order in a self-paced reading task, while Study 2 (Experiments 4-7) tested participants' sensitivity to four types of German agreement with a speeded acceptability judgment task.

Three experiments included a target constraint that aligned with English but not with Spanish (Experiments 1, 4, and 6), while in two experiments the constraint aligned with Spanish but not with English (Experiments 2 and 5, see Table 5.1 and Table 5.2). Two additional phenomena that did not differ between Spanish and English were tested (Experiment 3, Experiment 7). These served as baselines for the remaining experiments, to ensure that potential differences in the other phenomena were specifically due to cross-linguistic influence, rather than overall differences between the participant groups.

By employing this cross-linguistic design on different measures of timed grammatical knowledge, and on two sets of linguistic phenomena, the goal was to obtain an overview of the contexts under which prior grammars may have an effect on La grammatical use. Self-paced reading was used to observe whether effects of prior grammars emerge when learners can

comprehend and build the sentence's meaning at their own pace, while the acceptability judgment task measured the learners' metalinguistic knowledge when they were forced to read and build sentence meaning at a speeded pace, taxing working memory and eliciting automatic responses. Furthermore, by testing two different linguistic phenomena, it was possible to observe whether prior grammars affect morphosyntactic constraints such as the agreement phenomena tested, or non-morphosyntactic constraints such as linear word order.

Table 5.1. Overview of the three word order phenomena investigated in Experiments 1-3 with a self-paced reading paradigm. The experimental manipulation is boldfaced.

Exp. 1 Main clause Object pro. Placement	German	Olivers Oma **betrachtete ihn/*ihn betrachtete**.
	English	Oliver's grandma **observed him/*him observed**.
	Spanish	La abuela de Oliver **lo observaba/*observaba lo**.
Word order is similar in German and English, dissimilar in Spanish.		
Exp. 2 Subord. clause Object pro. Placement	German	Samuel sagte, dass die Nachbarn **ihn hörten/*hörten ihn**.
	English	Samuel said that the neighbours **heard him/*him heard**.
	Spanish	Samuel dice que los vecinos **lo oyeron/*oyeron lo**.
Word order similar in German and Spanish, dissimilar in English.		
Exp. 3 Verb group Object Placement	German	Das Team darf **Sport treiben/*treiben Sport**.
	English	The team can **practise sports/*sports practice**.
	Spanish	El equipo puede **practicar deporte/*deporte practicar**.
Word order present in German, absent in English and Spanish.		

Table 5.2. Overview of the four agreement phenomena investigated in Experiments 4-7 with a speeded acceptability judgment task. The experimental manipulation is boldfaced.

Exp. 4 Possessor Agreement	German	Herr Wolf rettete **seine/*ihre Patientin**.
	English	Mr Wolf saved **his/*her patient**.
	Spanish	El Sr Wolf salvó a **su paciente**.
Agreement present in German and English, absent in Spanish.		
Exp. 5 Possessee Agreement	German	Herr Boch zeigte **seine/*sein Werke**.
	English	Mr. Boch showed **his works**.
	Spanish	El Sr. Boch mostró **sus/*su obras**.
Agreement present in German and Spanish, absent in English.		
Exp. 6 Predicative Adjective	German	Das Kleid aus Indien war **schön**.
	English	The dress from India was **pretty**.
	Spanish	El vestido de India era **bonito/*bonita/*bonit-Ø.**
Agreement absent in German and English, present in Spanish.		
Exp. 7 Subject-verb Agreement	German	[...] dass die Eltern viel getanzt **haben/*hat**.
	English	[...] that the parents **have/*has** danced a lot.
	Spanish	[...] que los padres **han/*ha** bailado mucho.
Agreement present in German, English and Spanish.		

Four predictions regarding the effects of prior languages were elaborated based on prior La acquisition findings (given the absence of La processing studies):

L1 effect account. If only participants' native constraints affected their use of grammatical knowledge under processing pressure, then participants whose L1 constraint is similar to the target German

constraint should be more sensitive to the violations than participants whose L1 constraint is dissimilar to the target.

L2 effect account. If only participants' L2 affected their use of grammatical knowledge under processing pressure, then participants whose L2 constraint is similar to the target constraint should be more sensitive to the violations than participants whose L2 constraint is dissimilar to the target.

Constraint similarity account. If both native and non-native constraints simultaneously affect sensitivity to constraints in a cumulative manner, and this is affected by proficiency in the language that aligns with the La, then participants should show an effect of the L1 constraints as well as the L2 constraints when they align with the target word order.

No transfer account. If neither the L1 nor the L2 affect the degree of sensitivity to the constraint, neither La group should show different degrees of sensitivity to the constraints. However, they should be less target-like than native German speakers.

Results of the seven experiments showed two main findings. The first relevant finding was that participants' prior grammatical knowledge affected their use of La constraints under processing pressure, partially matching the constraint-similarity account based on cumulative transfer. The second relevant finding was that participants' mature knowledge of a constraint as shown in an untimed task did not guarantee they could use this knowledge consistently in a real-time comprehension task.

These two findings are discussed in relation to the differences in the task demands and linguistic phenomena in the next sections, followed by a review of their implications for La accounts.

5.2. Differences in the knowledge and use of La grammatical constraints

Participants in the seven experiments had mature knowledge of the target constraint as shown in the untimed task (Table 5.3). A relevant open question was whether they were capable of applying this knowledge under processing pressure. Two possibilities were contemplated: either La speakers can use their knowledge error-free during processing in the speeded tasks, or they cannot, given that non-native speakers may face high processing demands when comprehending a non-native language under time pressure, and could be affected by cross-linguistic conflicts with their L1 and L2 grammars. The findings of this dissertation show that mature knowledge of a constraint in an untimed task did not lead to error-free use of the constraint under processing pressure in all phenomena. Further, they showed that the use of La constraints in real-time could be affected by prior grammars, but that the extent to which this cross-linguistic influence took place depended on the specific phenomenon under study.

La learners' judgments of word order phenomena (Experiments 1, 2 and 3), subject-verb agreement (Experiment 7), and predicative adjective agreement (Experiment 6), were accurate in over 85% of the trials, with an unexpected acceptance of no more than 20% of ungrammatical items in both paradigms. However, learners' target-like performance dropped substantially for the possessive pronoun Experiment 4, in which they accepted up to 54% of infelicitous items (L1 Spanish speakers), and less drastically but still substantially for Experiment 5, in which they accepted 39% (L1 English speakers).

Table 5.3. Mean percentage of correct or expected responses for the timed tasks in experiments 1-7, presented by participant group and experiment (standard deviation in brackets).

	English		Spanish		German	
Experiment 1	87	(13)	87	(12)	97	(6)
Experiment 2	82	(14)	84	(14)	96	(6)
Experiment 3	86	(15)	90	(10)	96	(6)
Experiment 4	79	(15)	66	(16)	92	(9)
Experiment 5	76	(18)	80	(15)	97	(6)
Experiment 6	91	(13)	88	(12)	97	(4)
Experiment 7	85	(14)	85	(12)	95	(5)

Several explanations could account for the difference in overall performance of La speakers in the different experiments. One explanation for their error-prone performance in Experiment 4 and 5 is that the difficulty posed by the phenomenon during La acquisition persisted after the metalinguistic knowledge of the constraint was acquired, and spilled into processing. However, although L2 learners have shown persistent difficulties acquiring and producing possessive pronouns in Germanic languages that require a lexical-semantic gender agreement with the 3rd person singular possessor (Lightbown & Spada, 2000; Martens, 1988; Muñoz Lahoz, 1994; White, Muñoz, & Collins, 2007; Zobl, 1985), learners have also shown error-prone production of subject-verb number agreement and adjective concord, constraints that were tested in Experiment 7 and 6 respectively and did not show a substantial drop in La speakers' overall accuracy. Therefore, the amount of errors participants made for Experiments 4 and 5 cannot be entirely attributed to difficulties during acquisition.

Alternatively, La speakers' reduced target-like performance for possessive pronoun agreement could be attributed to the processing demands of the speeded acceptability judgment task paired with the demands of processing possessive pronoun possessor and possessee agreement. When reading a German possessive pronoun, participants needed to search for a possessor antecedent, retrieve its person, number, and

gender features in order to check them against the pronoun's root features. Additionally, they had to process the possessive pronoun's inflection and retain its possible combinations of gender, number and case to match them with an upcoming possessee. Hence, participants were computing two types of agreement simultaneously when reading the possessive pronoun: backwards agreement with the possessor, and forwards agreement with the possessee. Added to these demanding grammatical requirements, participants had to keep pace with the task demands. Speeded acceptability judgments allowed participants to see only one word at a time, which was presented briefly (500ms) in the centre of the screen before the next word appeared. Given this presentation mode and speed, participants' working memory capacity was greatly taxed: they had to build the sentence meaning and structure as it unfolded at a speeded pace in a word by word manner, and retain relevant information, as no re-reading was possible. The grammaticality or acceptability manipulation was located in the last words of each item, after which they had to provide a speeded metalinguistic judgment. These task demands, coupled with the possibility that non-native speakers' working memory capacity is depleted to a greater extent than native speakers' during L2 comprehension (Mcdonald, 2006; Sagarra & Herschensohn, 2013), and that they have greater difficulty integrating information from different sources (Hopp, 2009; a. Sorace & Serratrice, 2009; A. Sorace, 2011), it is plausible that the demands of the possessive pronoun agreement computations were too high in comparison to the demands of the other phenomena (which required computations between two words instead of three).

Although there is no unequivocal explanation for the difference in the difficulty La speakers' showed when using the constraints in certain experiments compared to others (despite their knowledge of the constraints in untimed tasks), what is crucial for the research question of this dissertation is that the effects from native and non-native grammars were found regardless of the amount of errors each phenomena elicited. This is discussed in the next section.

5.3. The role of prior grammars in La grammatical use during timed comprehension

La speakers' judgments showed differences that were traceable to how their native language instantiated the La constraint (Experiment 4 and 6). This was taken as evidence that L1 constraints affect La speakers' use of grammatical knowledge, leading to reduced sensitivity when they do not align with the La. Moreover, proficiency in an L2 was also found to modulate participants' performance above and beyond any L1 effects: an increase in proficiency in the L2 that aligned with the La resulted in an increase of correct rejections (Experiment 1 and 4). Taken together, these findings suggest that prior grammatical knowledge can affect how La speakers' process and judge certain phenomena. The selectivity of these effects is discussed separately in the next subsections.

5.3.1. L1 effects

Five of the seven phenomena tested presented constraints that were dissimilar between Spanish and German or between English and German. The experimental manipulations used these cross-linguistic conflicts to observe whether differences in the representation of the L1 and La constraints, and between the L2 and La constraints, would have an effect on how successfully participants applied an La constraint under processing pressure. Experiments 1, 4 and 6 tested phenomena that were instantiated similarly in German and English, but differently in Spanish. Results show that L1 Spanish speakers made fewer target-like judgments than L1 English speakers, and had slower response times to ungrammatical items in Experiment 4 and 6 (Table 5.4). Experiments 2 and 5 tested phenomena that were instantiated similarly in German and Spanish, but differently in English. L1 English speakers did not show significant differences from L1 Spanish speakers in the judgments to either experiment.

These findings can be summarized as follows:

1. Differences between the groups in their sensitivity to violations could be traced to effects of their L1 constraints. However, these effects were selective:
    a. Differences between the La groups were only found for phenomena in which the Spanish constraint was instantiated differently to the target and the English constraints. In these cases, L1 Spanish speakers showed reduced sensitivity in their judgments compared to L1 English speakers.
    b. Differences between the La groups' judgments were only found for agreement phenomena (Experiments 4 and 6), tested with the SAJT, and not for the word order phenomena (Experiments 1-3), tested with a self-paced reading paradigm.

Table 5.4. Differences between La groups in the timed judgment rates for each experiment, and differences between the La groups in the time measures taken in each study. Time measures are reading patterns for Study 1 at the critical region and spillover region, and response times to correctly judged items for Study 2.

		Judgments	Time measures
Study 1 Word order	Exp. 1	No differences	L1 English speed up later than L1 Spanish
	Exp. 2	No differences	No differences
	Exp. 3	No differences	No differences
Study 2 Agreement	Exp. 4	L1 Spanish less sensitive than L1 English	L1 Spanish slower than L1 English in infelicitous condition
	Exp. 5	No differences	L1 Spanish slower than L1 English in infelicitous condition.
	Exp. 6	L1 Spanish less sensitive than L1 English	L1 Spanish slower than L1 English in infelicitous condition
	Exp. 7	No differences	No differences

Several accounts could be provided for the selectivity of the L1 effects. Firstly, the fact that L1 effects only appeared when Spanish as an L1 could have a detrimental impact on La sensitivity but not when L1 English could be detrimental could suggest L1 Spanish speakers were generally less able to carry out the tasks than L1 English speakers. This hypothesis can be discarded, however, given that the baseline Experiment 3 (object placement in a self-paced reading task), baseline Experiment 7 (subject-verb number agreement in a SAJT), and the filler items showed no differences between the groups' judgments and reading times.

Another potential explanation for the presence of L1 Spanish detrimental effects is that the lexical similarity between English and German facilitated

L1 English speakers' comprehension of the items. This similarity may have liberated processing space for L1 English speakers' to overcome the potential detrimental effects of the conflict between English and German constraints in Experiments 2 and 5 before they made their judgments. Recent L2 studies suggest that the lexical similarity between L1 and L2 may facilitate processing of complex L2 structures (Hopp, 2014, 2016). These accounts claim that lexical access is a key step for structure building in comprehension, and that the orthographically closer the L2 words are to L1 translation equivalents, the faster the lexical access will be, depleting fewer resources, and allowing for these to be allocated to syntactic processing. Although it is not possible to back this explanation empirically with the current data as the experiments were not designed to include lexical similarity as a facilitative factor, it is the most plausible explanation for the selectivity of L1 effects on the participant groups.

However, the selectivity of L1 effects was not only observed in the groups it affected, but also in the experimental task in which it emerged. Participants' judgments showed L1 differences in the agreement phenomena, but not in the word order phenomena. Two possible explanations exist for these findings: either the task demands had an impact on the emergence of L1 effects, given that agreement was tested with a SAJT, and word order with a SPR; or the constraints of phenomena themselves (agreement vs. word order) were the root cause of the differences in L1 effects. Regarding the impact of the processing demands involved in each task, both tasks required participants to make an acceptability judgment after reading a sentence, and impeded rereading the sentences. However, in the self-paced reading paradigm, participants could pace their own reading, they could observe how many words the sentences contained (note that all words were shown as dashed, and were revealed and dashed again one at a time), which enabled them to see at which point of the sentence they found themselves, and they were presented with the violation two to three words before they were asked to make a grammaticality judgment. Given that the task required them to judge grammaticality, it is

possible that the two words after the violation and before the judgment (originally designed to capture spillover effects) served as a buffer area, granting participants additional time to engage their metalinguistic knowledge of the rule before making a judgment, and reducing the likelihood of automatic responses that could have led to potentially detrimental L1 effects in the cases in which L1 and La constraints differed. Contrary to the self-paced reading task, the speeded acceptability task displayed each word in the middle of the screen at a 500ms rate for all participants, it did not reveal the length of the sentence, it showed the violation at the end of the sentence immediately before the judgment had to be made, and had a three second time-out for the response. In this case, participants' working memory may have been more taxed than in the SPR, as they had to retain more information and process it faster, leaving less processing resources and less time to access their metalinguistic knowledge of the constraint, and hence eliciting automatic answers. If participants' L1 is taken to be more automatic than their L2 due to their sequential multilingual profile, it is therefore plausible that the enhanced pressure which should elicit automatic answers led to an increase in L1 detrimental effects when L1 and La constraints differed. In summary, the reduced processing pressure in the SPR task compared to the SAJT might have been responsible for the absence of L1 differences in La speakers' judgments, granting participants more processing time to employ the target mechanism.

Alternatively, differences between word order and agreement may have determined whether these phenomena can elicit L1 effects. The word order experiments tested linear order constraints. These constraints were instantiated in some form in English, Spanish and German: all three languages have a canonical placement for objects in relation to subjects and finite verbs. Additionally, the violations involved the displacement of the object and the finite verb, which were in contiguous positions, rendering the violation potentially more conspicuous for all groups. Therefore, it is possible that La learners, regardless of linear word order constraints in their L1, could apply the La constraints and use them during processing with

similar success. By contrast, the experiments on agreement tested constraints that were either absent or present in the L1 of the speakers (e.g. Spanish does not instantiate possessive pronoun agreement in gender with the possessor). Therefore, L1 speakers needed to acquire and then apply a feature-retrieving and -matching mechanism that was previously absent in their L1 (Experiment 4 and 5), or they had to inhibit an unnecessary L1 mechanism for the La constraint (Experiment 6).

Given that the tasks demands and phenomena types (word order vs. agreement) are confounded, it is not possible to discern whether the absence of L1 effects in Experiments 1 and 2 are due to task effects (the use of a SPR) or due to phenomena-related factors (word order violations were easier to detect). Further research that employs different measures of grammatical knowledge and processing on the same phenomenon is needed (see suggestions in section 4 of this chapter).

A final possible explanation that could account for the task/phenomena and group selectivity of L1 effects is that L1 constraints were activated to different degrees throughout the seven phenomena by both participant groups. The more time participants were given to reflect before a judgment, the more time they had to reach the correct judgment, and hence the less likely that a detrimental effect of an L1 constraint would be observed, which explains the absence of L1 effects for word order phenomena in the self-paced reading. The less time participants were given to reflect before a judgment, the more likely they were to make their judgments based on their more automatized, L1 constraint, which explains the L1 effects in the agreement phenomena for L1 Spanish speakers. Further, this explanation would not be contradicted by the absence of differences between in the baseline Experiments 3 and 7, as English and Spanish constraints were similar, and hence L1 activation (be it L1 English or L1 Spanish) would lead to the same outcome. Although a potential account for the results, in order to confirm that L1 constraints were active to different degrees throughout all seven experiments, it would be necessary to design an

entirely different set of experiments with a different paradigm, which was out of scope for this dissertation.

Taken together, these L1 effects observed suggest L1 constraints can have an effect on the use of La constraints under processing pressure, but that these are limited to certain phenomena, and/or can be elicited by specific tasks. The results of this dissertation suggest that L1 effects may appear when working memory is taxed by a task that impedes sentence rereading and requires the processing, retention and retrieval of words presented at a fast pace. This kind of task demands rapid and automatic responses, as it decreases participants' chances of completing a full parse of the La sentence. Under these circumstances, it is plausible that participants employ their native knowledge to overcome potential breakdowns of La processing, as the native language of sequential La speakers can be assumed to be their most automatized language due to its acquisition (since birth), and longer use and exposure.

5.3.2. L2 effects

Effects of L2 proficiency were selective: they mostly affected L1 Spanish speakers' performance; and they were facilitative, but not detrimental (Table 5.5). There are several factors that might have played a role in this selectiveness, such as the similarity between the English and German lexicon as opposed to Spanish and German, the experimental manipulation of the cross-linguistic differences, or the differences in the respective L2 proficiency ranges of English and L1 Spanish speakers. These factors are discussed in the next paragraphs. However, before delving into the discussion of the selectivity of L2 effects, it is important to note that what is termed here as *L2 proficiency* is not an unequivocal measure of participants' proficiency in their L2. This measure was determined either by participants' score in a placement test (Experiments 1-3) or by their own self-ratings (Experiments 4-7). Proficiency in a language, however, is hard to measure as a stand-alone variable, especially with placement tests, given that other factors might correlate or interact in this measure, such as the length of

acquisition of the L2, age of acquisition, frequency of use, context of use, dominance, etc. Further, while age of acquisition and proficiency in La German were matched between the La groups, it was not the case for participants' age of acquisition of the L2 and L2 proficiency, given the difficulty in finding matching candidates. I acknowledge this caveat, and use the term L2 proficiency as a proxy measure of participants' maturity in their L2 knowledge and competence for the following discussion.

Table 5.5. Effects of an L2 proficiency increase for each La group. The left-hand column shows L2 proficiency effects in their judgments, while right-hand column shows L2 proficiency effects in the time measures taken in each study (reading patterns for Study 1 at the critical region and spillover region, and response times to correctly judged items for Study 2).

		Judgments	Time measures
Study 1 Word order	Exp. 1	L1 Spanish show increased correct responses	No effects
	Exp. 2	No effects	L1 Spanish show faster reading times on the critical region
	Exp. 3	L1 Spanish show increased correct responses	No effects
Study 2 Agreement	Exp. 4	L1 Spanish show increase expected responses in post-hoc analyses	No effects
	Exp. 5	No effects	L1 English show faster correct rejections
	Exp. 6	No effects	No effects
	Exp. 7	No effects	No effects

One of the potential explanations for the selectivity of L2 proficiency effects is the similarity between English and German lexicon, as compared

to Spanish and German. L2 English proficiency increased L1 Spanish speakers' correct rejection of ungrammatical items in Experiments 1 and Experiment 4, as well as the speed at which they correctly rejected infelicitous items in Experiment 4. Further, L2 English proficiency facilitated L1 Spanish speakers' judgments of object placement in verb groups, for which English and Spanish equally misaligned with German. Additionally, no facilitation of L2 Spanish proficiency was found for L1 English speakers' judgments in Experiment 2, in which the German word order aligned with Spanish but not with English. The lexical similarity between an L1 and an L2 has been claimed to facilitate processing of complex L2 grammatical structures (Hopp, 2014, 2016). As lexical access is essential for structure building in comprehension, the orthographically closer the L2 words are to L1 translation equivalents, the faster the lexical access will be. This account claims that L1-ortographic similarity enhanced lexical retrieval should spare processing resources, and allow these to be dedicated to syntactic processing. If this account were extended to the possibility of facilitation due to L2-La orthographical similarity, it would be plausible to expect L2 English to facilitate La German sentence processing for L1 Spanish speakers, and to expect no effects of L2 Spanish proficiency for L1 English speakers. A caveat of this explanation is that, if this lexical facilitation hypothesis applied indiscriminately across constraints, L2 English proficiency should have facilitated all L1 Spanish speakers' judgments, which was not the case. Nevertheless, it is possible that the facilitation of lexical similarity between English and German enhances processing of constraints that are absent in the speakers' L1 (as in L1 Spanish speakers for Experiments 1, 3, 4), or a constraint that is represented differently (e.g. Experiment 1 and 3, in which English proficiency affected L1 Spanish speakers' judgments), but not when the speaker's L1 have an equivalent constraint in place (e.g., Experiment 2, in which Spanish and German show the same linear word order, and English proficiency was not found to affect L1 Spanish speakers' reading patterns).

Another factor that could have had an impact on the selectivity of the L2 proficiency effects regards the differences between the L2 proficiency ranges in the L1 English and L1 Spanish participant groups: L1 English speakers had overall lower L2 Spanish proficiency compared to L1 Spanish speakers' L2 English proficiency. Moreover, although L1 Spanish speakers had mostly acquired English before German, multiple L1 English speakers in Study 1 and Study 2 had acquired German before Spanish. This lower range of proficiency in L2 Spanish, and the differences in the order of acquisition might have impacted the extent to which L2 proficiency could affect their processing and judgments. Furthermore, La speakers' knowledge of the L2 target constraint was not tested. It is possible that L1 English speakers did not have mature knowledge of the target constraint in Spanish, which would therefore pre-empt any facilitation from any alignment between Spanish and German constraints. Prior studies on La acquisition have claimed that high levels of proficiency in an L2 are essential for the L2 to play an active role in the acquisition of the L3 (Falk & Bardel, 2011; Rothman, 2015). Future research could avoid this confound by recruiting large numbers of participants whose L2 proficiency levels are low and high enough for potential L2 effects to be observable, by testing the target constraint in the L2, and by controlling for the order of acquisition of the non-native languages.

Together, the observed L2 proficiency effects suggest that prior grammatical knowledge can facilitate La grammatical use, which has been observed in the study of initial stages of La acquisition (Flynn, 1983, 1987; Flynn, Foley, & Vinnitskaya, 2004). While the cited studies showed that initial stage La acquisition was enhanced by the knowledge of prior languages, whether these were participants' native or their non-native tongues, our findings suggest that some degree of facilitation is taking place at later stages of La proficiency during real-time comprehension, when L2 and La align. No detrimental L2 effects were found, but further research is needed to address whether L2 constraints can or cannot be detrimental in La grammatical use during real-time comprehension altogether.

5.4. Implications for La accounts of grammatical use during comprehension

Taken together, the L1 and L2 effects observed in the experiments suggest that the prior languages of multilingual speakers affect their real-time grammatical use in a La. This is an innovative finding, given that up till recently (see Lago, Stutter Garcia, & Felser, 2019), timed measures and grammaticality measures had not been jointly used to investigate the effects of prior grammars during real-time processing of an La.

The L1 effects observed suggest that native constraints were deployed to cope with tasks demands that depleted La speakers' processing resources. Prior studies that investigated the effect of L2 processing limitations in conjunction with cross-linguistic conflicts found similar results when testing L2 participants with speeded tasks (Hopp, 2010). On the other hand, the nature of the L2 proficiency effects suggest that higher levels of proficiency in a language that aligns with the La constraint enhances sensitivity to La constraints, beyond the effects of their native constraints.

The appearance of L1 and L2 effects seems tied to the type of processing pressure applied by the task. L1 constraints played a role in the outcome of metalinguistic processing when La speakers were presented the stimuli at a fast, predetermined pace, and were given a limited amount of time to judge (e.g. in a speeded acceptability judgment task), reflecting the automatic nature of the native mechanisms. However, L2 constraints appeared to have been deployed more often when La learners could pace their own reading speed and had therefore more processing time (e.g. in a self-paced reading paradigm).

This could indicate that native processing mechanisms are activated to a larger extent than L2 mechanisms during the reading of the La. If La speakers are not allowed reflection time before a judgment, their native mechanisms will have an effect on the outcome of their processing, as observed in the speeded acceptability judgments of L1 Spanish speakers. Nevertheless, if La speakers are granted enough processing time, they might have the chance to revise their initial L1 parse before the judgment, or to

invoke during reading the slower and lower activated L2 mechanism when it aligns with the La. These possibilities should be contemplated in future research that attempts to model accounts of La grammatical use during processing.

Finally, three factors could be essential in determining the role of native and non-native constraints in La processing, and should therefore be taken into account in future research:

1) *The similarity between L1/L2 and La constraints*. The qualitative differences between the La constraint, and the L1 and L2 equivalent constraints may determine whether L1 and L2 are relevant for La processing. For instance, possessor pronoun agreement involved a constraint present in English and absent in Spanish, which lead L1 Spanish speakers to make more errors than L1 English speakers. Further, increased levels of L2 English proficiency facilitated L1 Spanish speakers' judgments. Differently to possessive pronoun agreement, however, the fact that English and German coincided in null overt concord for predicative adjectives (Experiment 6) did not result in L2 English proficiency facilitation for L1 Spanish speakers, as the absence of adjectival inflection in English was not a constraint, and hence they could not use it to reset their native overt inflection parameters to the optionality of German adjectival inflection.

2) *L2 proficiency*. It is possible that higher levels of L2 proficiency are required for any facilitative (and potentially, non-facilitative) effects to arise. L1 Spanish speakers had high L2 English proficiency, while L1 English speakers had low L2 Spanish proficiency. While L1 Spanish speakers showed effects of L2 proficiency in their judgments, L1 English speakers did not.

3) *Lexical facilitation*. Although only a tentative suggestion, recent research in L2 processing (Hopp, 2014, 2016), as well as studies in L3 acquisition (Rothman, 2011, 2015) suggest that the

degree of lexical similarity between the L1/L2 and the La may be crucial for facilitation to take place. This could potentially explain why L1 English speakers did not activate their L2 Spanish proficiency when it could have been facilitative for their sensitivity. Equally, it might have facilitated their overall comprehension of the items.

5.5. Conclusions and further research

Two studies that used timed and untimed measures of grammatical knowledge investigated the degree to which the sensitivity to La violations was affected by multilinguals' native and non-native prior grammars.

The findings showed La speakers were affected by both their L1 and L2 constraints when their grammatical knowledge was tested under processing pressure. The L1 effects observed suggest that participants automatically recruit their native mechanisms to cope with the processing demands of La real-time comprehension for metalinguistic purposes. When the native constraints align with the La constraints, the use of native mechanisms results in enhanced sensitivity to violations, while the opposite is the case when native constraints do not align with the La constraints. On the other hand, the L2 proficiency effects suggest that knowledge of an L2 that aligns with the La can enhance participants' sensitivity to La violations.

This was an innovative and exploratory set of experiments. Despite several confounds that prevent some of its findings from being unequivocal, it has shown that it is possible to investigate the effects of multiple languages during real-time comprehension. This information is not only relevant for the field of La research itself, but it can also be further illuminating for research into L1 effects during L2 processing, which have so far presented mix results regarding the role of L1 constraints (for a review, see Clahsen & Felser, 2006a, 2006b, 2017). Furthermore, it may help us understand comprehension difficulties that learners of an La with several prior languages may have during communication, which is relevant for language teaching and language assessment. Finally, it hopefully

contributes towards the development of a model for the processing of multiple languages, which is at the moment at the very initial stages of research.

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A.1.Participant information

Table A.a. Original pool of L1 English and L1 Spanish speakers for Study 1. Range between brackets.

	L1 English (n = 27)	L1 Spanish (n = 29)
Age	27 (20 – 60)	27 (19 – 56)
Goethe score (%)	69 (37 – 97)	60 (33 – 87)
AoA La	21 (11 – 42)	22 (10 – 53)
Length LaA (years)	5 (0.1 – 13)	4 (1 – 11)
L2	Spanish	English
Proficiency L2 (%)	70 (20 – 98)	72 (50 – 98)
AoA L2	14 (5 – 25)	8 (0 – 18)
Length L2A (years)	9 (0.7 – 30)	14 (5 – 29)

Table A.b. Count of additional languages spoken by each La German participant group.

	L1 English	L1 Spanish		L1 English	L1 Spanish
None	7	10	Irish	1	0
Arabic	2	0	Italian	1	1
Basque	0	1	Italian	0	2
Chinese	0	1	Japanese	0	1
Catalan	0	2	Norwegian	1	0
Danish	2	0	Russian	1	2
Dutch	1	0	Swedish	2	0
French	9	7	Portuguese	1	0
Finnish	1	0	Punjabi	1	0

A.2.Materials for the self-paced reading judgments Study 1

A.2.1 Experiment 1

Experiment 1 consisted of 20 sets of items distributed in two conditions. In the infelicitous condition, the object pronoun preceded the main verb.

1. Olivers alte Oma {betrachtete ihn/ihn betrachtet} täglich durch das Fenster.
2. Marks amerikanische Cousinen {trafen ihn/ihn trafen} gestern vor dem Fußballspiel.
3. Richards unhöfliche Kundin {ärgerte ihn/ihn ärgerte} stark mit komischen Fragen.
4. Martins italienische Freundin {liebte ihn/ihn liebte} wirklich trotz der Entfernung.
5. Karls kleine Töchter {fanden ihn/ihn fanden} lustig mit dem Kostüm.
6. Die kranken Patienten {brauchten dich/dich brauchten} dringend nach der Operation.
7. Der komische Mann {störte dich/dich störte} sehr mit lauten Geräuschen.
8. Die netten Nachbarn {besuchten dich/dich besuchten} oft bei schönem Wetter.
9. Marias ganze Familie {kannte dich/dich kannte} schon von dem Klassenfoto.
10. Die strenge Lehrerin {beschrieb dich/dich beschrieb} als einen fleißigen Schüler.
11. Sebastians neues Handy {gefiel ihm/ihm gefiel} sehr trotz einiger Defekte.
12. Julians freundliche Kollegen {gratulierten ihm/ihm gratulierten} direkt nach dem Vortrag.
13. Benjamins persönlicher Detektiv {begegnet ihm/ihm begenget} heimlich in einem Park.
14. Fabians vorsichtige Chefin {kündigte ihm/ihm kündigte} sofort wegen der Beschwerden.
15. Dirks frühere Ehefrau {schadete ihm/ihm schadete} rücksichtslos mit zahlreichen Vorwürfen.
16. Das begeisterte Publikum {glaubte dir/dir glaubte} alles dank deines Talents.

17. Die zufriedenen Gäste {dankten dir/dir dankten} herzlich für die Hilfe.
18. Die junge Frau {vertraute dir/dir vertraute} endlich trotz der Zweifel.
19. Der genervte Nachbar {drohte dir/dir drohte} verärgert mit der Polizei.
20. Die ungeduldige Akademikerin {widersprach dir/dir widersprach} ständig während der Konferenz.

A.2.2 Experiment 2

Experiment 2 consisted of 20 sets of items distributed in two conditions. In the infelicitous condition, the object pronoun followed the main verb in the subordinate clause.

21. Stefan merkte, dass die Kollegin {ihn langweilte/langweilte ihn} und müde machte.
22. Frank meinte, dass die Studenten {ihn hassten/hassten ihn} oder inkompetent fanden.
23. Tom wollte, dass die Kauffrau {ihn bediente/bediente ihn} und Details erklärte.
24. Samuel erzählte, dass die Nachbarn {ihn hörten/hörten ihn} und sofort reagierten.
25. Alex meinte, dass die Mitarbeiterin {ihn mochte/mochte ihn} aber schüchtern war.
26. Andrej erzählte, dass die Psychologin {ihn traf/traf ihn} aber nicht verstand.
27. Wir wussten, dass die Reporterin {dich mochte/mochte dich} oder interessant fand.
28. Ich glaubte, dass der Kellner {dich sah/sah dich} aber beschäftigt war.
29. Wir hofften, dass die Polizei {dich fand/fand dich} und schnell befreite.

30. Anne merkte, dass der Techniker {dich liebte/liebte dich} aber nichts sagte.
31. Jan sah, dass der Inspektor {dich warnte/warnte dich} und sauer war.
32. Daniel dachte, dass die Ärztin {ihm glaubte/glaubte ihm} aber Fragen hatte.
33. Max erklärte, dass die Kommission {ihm zustimmte/zustimmte ihm} und beeindruckt schien.
34. Hans merkte, dass seine Mutter {ihm misstraute/misstraute ihm} und selten glaubte.
35. Philipp erzählte, dass die Konferenz {ihm gefiel/gefiel ihm} aber anstrengend war.
36. Paul wollte, dass seine Eltern {ihm vertrauten/vertrauten ihm} und ruhig blieben.
37. Kirstin sagte, dass die Gäste {dir dankten/dankten dir} und zufrieden waren.
38. Du sagtest, dass das Mädchen {dir begegnete/begegnete dir} und alles erzählte.
39. Birgit dachte, dass das Geschenk {dir nützte/nützte dir} und lange hielt.
40. Karla bemerkte, dass die Professorin {dir gratulierte/gratulierte dir} und erfreut aussah.

A.2.3 Experiment 3

Experiment 3 included 20 sets of items distributed in two conditions. In the infelicitous condition, the object noun followed the main verb.

41. Der Archäologe wollte {Ruinen entdecken/entdecken Ruinen} und einige Mysterien aufklären.
42. Der Kurzfilm könnte {Kritik bekommen/bekommen Kritik} denn er ist polemisch.
43. Der Praktikant soll {Projekte vorschlagen/vorschlagen Projekte} und sie dann durchführen.

44. Das Team darf {Sport treiben/treiben Sport} aber du noch nicht.
45. Der Journalist durfte {Dokumente kopieren/kopieren Dokumente} aber kein Wort verändern.
46. Das Kind kann {Süßigkeiten mitbringen/mitbringen Süßigkeiten} und sie leise essen.
47. Das Unternehmen will {Kontaktdaten sammeln/sammeln Kontaktdaten} um Kunden zu erreichen.
48. Der Architekt musste {Änderungen machen/machen Änderungen} und die Pläne verbessern.
49. Der Spion muss {Geheimnisse verbergen/verbergen Geheimnisse} um sicherer zu leben.
50. Die Organisation sollte {Unterstützung erhalten/erhalten Unterstützung} um Wälder zu schützen.
51. Das Mädchen hatte {Geschenke bekommen/bekommen Geschenke} aber noch nicht ausgepackt.
52. Mein Vater hat {Geschichten erzählt/erzählt Geschichten} um Kinder zu amüsieren.
53. Die Regierung hatte {Alkohol verboten/verboten Alkohol} aber das Rauchen erlaubt.
54. Der Mitarbeiter hatte {Proteste organisiert/organisiert Proteste} denn er war unzufrieden.
55. Das Computerprogramm hat {Probleme gelöst/gelöst Probleme} und alles funktionierte danach.
56. Der Regisseur hatte {Bücher verfilmt/verfilmt Bücher} aber erfolglos Theaterstücke geschrieben.
57. Der Sturm hat {Gebäude zerstört/zerstört Gebäude} und viele Leute verletzt.
58. Der Mieter hat {Geister gesehen/gesehen Geister} und unheimliche Stimmen gehört.
59. Die Piraten hatten {Gold gefunden/gefunden Gold} aber es danach versteckt.

60. Die Großeltern haben {Bonbons gekauft/gekauft Bonbons} weil heute Weihnachten ist.

A.2.4 Filler items

61. Ständig suchen die fleißige Bienen nach frischen Blumen.
62. In offenem Wasser schwimmen die Delphine am schnell.
63. Am Nordpol sind mittlerweile schon viele Tierarten ausgestorben.
64. Am Flussufer beißen Krokodile afrikanische häufig die Elefanten.
65. Aufgeregt läuft der Hund den sportlichen Jungen hinterher.
66. *In Ländern wenigen lebt der Wolf in Wildnis.
67. *Im Herbst fliegen die Gänse in den Süden.
68. *Unter diesem Stein wohnt eine gefährliche ganz Krabbe.
69. *Nach dem Essen schlafen die Schimpansen in Ruhe.
70. *Gestern hat der Bär einen großen Fisch fressen.

A.3.Materials for the untimed judgment task of Study 1

A.3.1 Experiment 1

1. Karinas komplizierte Argumente {überzeugten dich/dich überzeugten} nie.
2. Philipps stolzer Vater {beobachtete ihn/ihn beobachtete} beim Basketballtraining.
3. Jakobs frühere Kollegen {fanden ihn/ihn fanden} sympathisch.
4. Die junge Sekretärin {antwortete dir/dir antwortete} sofort.
5. Pauls rebellische Studenten {widersprachen ihm/ihm widersprachen} jeden Tag.
6. Die französische Küche {schmeckte ihm/ihm schmeckte} sehr.

A.3.2 Experiment 2

7. Anne vermutete, dass der Student {dich liebte/liebte dich}.

8. Robert erzählte, dass die Künstlerin {ihn fotografierte/fotografierte ihn}.
9. Jonas wollte, dass seine Schwester {ihn anrief/anrief ihn}.
10. Julia erklärte, dass das Geld {dir gehörte/gehörte dir}.
11. Du dachtest, dass der Hund {dir folgte/folgte dir}.
12. Peter sagte, dass die Medizin {ihm half/half ihm}.

A.3.3 Experiment 3

13. Mein Großvater konnte {Apfelstrudel backen/backen Apfelstrudel}.
14. Die Altenpfleger sollten {Anerkennung bekommen/bekommen Anerkennung}.
15. Die Unternehmen wollten {Aktien verkaufen/verkaufen Aktien}.
16. Das Buch hat {Preise gewonnen/gewonnen Preise}.
17. Die Demonstranten haben {Plakate gemalt/gemalt Plakate}.
18. Der Dieb hatte {Kunstwerke gestohlen/gestohlen Kunstwerke}.

A.3.4 Fillers

19. Vor einem Gewitter fliegen Vögel tief.
20. Als Heilmittel gegen verbrannte Haut kann Aloe Vera benutzt werden.
21. Nachts sinken die Temperaturen in der Sahara unter 0ºC.
22. *In Kolumbien kann man unglaublich leckeres Obst **gegessen**.
23. *Im alten **schon** Ägypten waren Katzen Haustiere.
24. *Auf diesem Baum **sitzen** der Koalabär schon stundenlang.

A.4.Instructions for the self-paced reading task

Anweisungen für das Experiment

In diesem Experiment werden Sie 70 Sätze lesen, die Wort für Wort gezeigt werden.
Um mit dem Experiment anzufangen und auch um jedes Wort sichtbar zu

machen, können Sie entweder das grüne Quadrat oder das rote Dreieck drücken. Sobald Sie die Taste drücken, um das nächste Wort zu sehen, wird das vorherige Wort, das auf dem Monitor zu sehen war, verschwinden. Nachdem Sie einen ganzen Satz gelesen haben, werden Sie eine Frage sehen. Nun müssen Sie entscheiden, ob Sie den gezeigten Satz grammatikalisch korrekt oder inkorrekt fanden, indem Sie jeweils die grüne oder die rote Taste drücken.

Hier einige Beispiele:

(1) „Der Mann und sein Sohn gehen in den Park." →  grammatikalisch korrekt.

(2) „Der Mann und sein Sohn geht in den Park." → grammatikalisch inkorrekt. 

Sie werden vor Beginn des Experiments vier Beispiele sehen. Während des Experiments sollten Sie jedes Wort sorgfältig lesen und die Fragen so schnell und genau wie möglich beantworten. Wenn Sie nicht sicher sind, was die richtige Antwort ist, antworten Sie einfach instinktiv, und lassen Sie keine Frage unbeantwortet.

Nach der ersten Hälfte des Experiments können Sie eine Pause machen.

Wenn Sie noch Fragen haben, fragen Sie bitte jetzt.

Jetzt können Sie beginnen. Viel Spaß!

A.5. Untimed grammaticality judgment correction task

Fragebogen: Anweisungen

Bitte lesen Sie die folgenden 24 Sätze und geben Sie an, ob diese grammatikalisch korrekt oder inkorrekt sind, indem Sie die jeweiligen Kästchen markieren. Wenn Sie den Satz als grammatikalisch inkorrekt bewerten, korrigieren Sie bitte den Fehler. Falls Sie nicht sicher sind, was die richtige Antwort ist, antworten Sie einfach instinktiv, und lassen Sie keine Frage unbeantwortet.

Beispiele

	korrekt	inkorrekt
„Der Mann und sein Sohn gehen in den Park.“	X	
„Der Mann und sein Sohn geht in den Park.“		X
gehen		

FRAGEBOGEN

Sätze	korrekt	inkorrekt
1. Die Unternehmen wollten Aktien verkaufen.		
2. Pauls rebellische Studenten widersprachen ihm jeden Tag.		
3. Die Altenpfleger sollten finden Anerkennung.		
4. Mein Großvater konnte Apfelstrudel backen.		
5. Nachts sinken die Temperaturen in der Sahara unter 0ºC.		
6. Die Demonstranten haben Plakate gemalt.		
7. Die junge Sekretärin dir antwortete sofort.		
8. Peter sagte, dass die Medizin half ihm.		
9. Vor einem Gewitter fliegen Vögel tief.		

10. Im alten schon Ägypten waren Katzen Haustiere.		
11. Philipps stolzer Vater ihn beobachtete beim Basketballtraining.		
12. Der Dieb hatte gestohlen Kunstwerke.		
13. In Kolumbien kann man unglaublich leckeres Obst gegessen.		
14. Julia erklärte, dass das Geld gehörte dir.		
15. Karinas komplizierte Argumente überzeugten dich nie.		
16. Robert erzählte, dass die Künstlerin fotografierte ihn.		
17. Jakobs frühere Kollegen fanden ihn sympathisch.		
18. Die französische Küche ihm schmeckte sehr.		
19. Du dachtest, dass der Hund dir folgte.		
20. Das Buch hat gewonnen Preise.		
21. Jonas wollte, dass seine Schwester ihn anrief.		
22. Anne vermutete, dass der Student dich liebte.		
23. Auf diesem Baum sitzen der Koalabär schon stundenlang.		
24. Als Heilmittel gegen verbrannte Haut kann Aloe Vera benutzt werden.		

A.6. Vocabulary list

WORTSCHATZ LISTE

Bitte schreiben Sie die Nummer der Wörter, die Ihnen nicht bekannt sind.

Wortschatz Liste

Bitte streichen Sie die Worte durch, die Ihnen nicht bekannt sind.

Beispiel: das Haus die ~~Wöptentz~~

NOMEN			
das Computer-programm	der Sport	die Reporterin	
das Geschenk	der Sturm	die Töchter	**VERBEN**
das Gold	der Techniker	die Unterstützung	ärgern
das Handy	der Vater	die Abenteurer	bedienen
das Kind	die Akademikerin	die Änderungen	begegnen
das Mädchen	die Ärztin	die Bonbons	bekommen
das Publikum	die Chefin	die Bücher	beschreiben
das Team	die Ehefrau	die Cousinen	besuchen
das Unternehmen	die Familie	die Dokumente	betrachten
der Alkohol	die Frau	die Eltern	brauchen
der Archäologe	die Freundin	die Gäste	danken
der Architekt	die Kauffrau	die Gebäude	drohen
der Detektiv	die Kollegin	die Geheimnisse	entdecken
der Inspektor	die Kommission	die Geister	erhalten
der Journalist	die Konferenz	die Geschichten	erzählen
der Kellner	die Kritik	die Großeltern	finden
der Kurzfilm	die Kundin	die Kollegen	gefallen
der Mann	die Lehrerin	die Kontaktdaten	glauben
der Mieter	die Mitarbeiterin	die Nachbarn	gratulieren
der Mitarbeiter	die Mutter	die Patienten	hassen
der Nachbar	die Oma	die Probleme	hören
der Praktikant	die Organisation	die Projekte	kaufen
der Regisseur	die Polizei	die Proteste	kennen
der Spion	die Professorin	die Ruinen	kopieren
	die Psychologin	die Studenten	kündigen
	die Regierung	die Süßigkeiten	

langweilen
lieben
lösen
machen
misstrauen
mitbringen
mögen
nützen
organisieren
sammeln
schaden
sehen
stören
treffen
treiben
verbergen
verbieten
verfilmen
vertrauen
vorschlagen
warnen
widersprechen
zerstören
zustimmen

A.7.Personal information questionnaire and consent form

Personal Information		Code:	
Last Name	First Name		Today's date
Date of birth	Female ( )		Male ( )
Telephone number (s)		Email-address	
Your current occupation?			
Your highest educational qualification (equivalent to) (please circle)	Secondary school (GCSE or equivalent)	High school diploma / A-levels or equivalent	Degree (BA/ MA/ PhD)
	Professional Training Certified Nursing Assistant (USA)	Other?	
Your parents' highest educational qualification (mother and/or father)? (please circle)	Secondary school (GCSE or equivalent)	High school diploma / A-levels or equivalent	Degree (BA/ MA/ PhD)
	Professional Training	Other?	

Which language(s) have you learned? (including your first language, in order of acquisition)			
Language	From which age on?	For how long?	Context of acquisition (at home, at school, other) Please specify
1.			
2.			

Current Language use?

(Percentage per week)

In the first row please write the names of the languages you actually use in everyday life. Please indicate the average percentage you use with each communicative partner / for each activity. The amount should add up to 100% in each row.

In which language(s) do you communicate	English	German	Spanish	Arabic	Language ……..
with your partner					
with your children					
with your parents					
with extended family					
with your friends					
at work / studies					
In which language do you watch TV					
listen to radio / music					
read (books, newspaper, etc.)					

If you were not born in Germany: At which age did you arrive in Germany?

Have you lived in countries other than Germany?	For how long?	Why? (school, studies, etc.)
1.		
2.		
3.		
4.		

General health condition				
Handedness?	Right ( )	Left ( )		
Eyesight?	Normal ( )	Near-sighted ( )	Far-sighted ( )	Other eye problems? Please specify
	Corrected with?	Glasses ( )	Contact Lenses ( )	
Hearing?	Normal ( )	Impaired ( )	If impaired, please specify	
	Corrected with a hearing aid?	Yes ( )	No ( )	
Have you been diagnosed with any language related impairments (dyslexia, stuttering, etc.)	No ( )	Yes ( )	If yes, please specify	
Have you had any neurological problems? (seizures, stroke, epilepsy, etc.)	No ( )	Yes ( )	If yes, please specify	

How do you feel today?	fine ( )	other ( )	If other, please specify

A.8.Consent form

Consent

Having been informed about the experimental technique and the contents of the study,

I,

……

……..

(first name, surname)

am giving my informed consent to participate in an ☐ Eyetracking-Experiment

☐ EEG-Experiment

☐ Reaction-time-Experiment (please tick the appropriate box)

of the *Potsdam Research Institute for Multilingualism*.

I have been informed and I accept, that

- the data recorded will be processed electronically and will be analysed for scientific purposes
- the data will be fully anonymised (by way of the use of a code number) and kept confidential. It will be stored to be analysed and archived.
- the depersonalised data will be used for academic purposes such as teaching, conferences and publications.

I was assured by the project leader that the data protection act will be fully respected.

I agree that my personal master data will be made available to other studies in the Linguistics or Psychology Department.

☐ **Yes** ☐ **No**

I know that I can withdraw my consent for the experiment for any reason at any point without any negative consequences.

Potsdam, ……

……
(Participant Signature)

A.9. Reading times

A.9.1 Experiment 1

Table A.c. Mean reading times per word position (standard deviation in brackets) for Experiment 1.

	P1		P2		P3		P4		P5		P6		P7		P8		P9	
English																		
Grammatical	659	(241)	790	(254)	746	(184)	989	(407)	817	(353)	816	(307)	672	(284)	642	(295)	1088	(490)
Ungrammatical	661	(176)	833	(300)	831	(263)	838	(303)	921	(402)	878	(447)	574	(279)	566	(298)	900	(466)
Spanish																		
Grammatical	732	(208)	1031	(353)	1091	(444)	1122	(378)	961	(374)	906	(264)	750	(288)	648	(189)	1116	(317)
Ungrammatical	690	(187)	1117	(355)	1088	(328)	1048	(351)	1079	(434)	709	(217)	537	(178)	442	(139)	815	(310)
German																		
Grammatical	545	(115)	594	(157)	525	(128)	566	(149)	483	(156)	486	(141)	435	(84)	429	(80)	708	(190)
Ungrammatical	589	(175)	581	(117)	535	(135)	540	(134)	483	(99)	399	(81)	343	(69)	337	(81)	499	(202)

A.9.2 Experiment 2

Table A.d. Mean reading times per word position (standard deviation in brackets) for Experiment 2.

		P1		P2		P3		P4		P5	
English	Gram.	612	(176)	729	(226)	554	(164)	533	(163)	748	(252)
	Ungram.	588	(183)	708	(202)	539	(160)	561	(212)	741	(244)
Spanish	Gram.	755	(207)	887	(318)	679	(271)	675	(223)	910	(265)
	Ungram.	694	(222)	847	(231)	590	(152)	636	(250)	903	(330)
German	Gram.	513	(112)	523	(114)	432	(78)	420	(68)	495	(126)
	Ungram.	524	(132)	526	(121)	458	(90)	417	(86)	496	(128)
		P6		P7		P8		P9		P10	
English	Gram.	712	(280)	973	(450)	693	(274)	730	(345)	1259	(537)
	Ungram.	979	(344)	939	(413)	699	(338)	597	(178)	1133	(475)
Spanish	Gram.	854	(400)	1008	(275)	654	(208)	666	(178)	1307	(390)
	Ungram.	1172	(393)	974	(399)	588	(245)	580	(167)	927	(265)
German	Gram.	426	(84)	483	(126)	456	(97)	465	(112)	812	(237)
	Ungram.	583	(182)	481	(90)	379	(73)	401	(94)	611	(260)

A.9.3 Experiment 3

Table A.f. Mean reading times per word position (standard deviation in brackets) for Experiment 3.

	P1		P2		P3		P4		P5		P6		P7		P8		P9	
English																		
Grammatical	538	(159)	790	(284)	626	(184)	887	(303)	1023	(420)	588	(218)	628	(224)	609	(255)	1054	(390)
Ungrammatical	541	(175)	760	(273)	653	(214)	934	(406)	1083	(487)	587	(308)	502	(224)	480	(212)	834	(367)
Spanish																		
Grammatical	627	(239)	974	(437)	836	(341)	1096	(375)	1174	(401)	683	(225)	624	(172)	659	(188)	1240	(379)
Ungrammatical	642	(245)	924	(266)	835	(240)	1192	(378)	1224	(415)	653	(279)	513	(195)	518	(154)	896	(353)
German																		
Grammatical	495	(116)	566	(141)	450	(104)	525	(144)	518	(128)	443	(109)	414	(88)	444	(79)	696	(212)
Ungrammatical	513	(144)	564	(141)	461	(127)	507	(147)	549	(137)	416	(83)	383	(98)	365	(81)	641	(299)

A.10 Full results for Study 1

A.10.1 Experiment 1

Table A.1. Results from the analysis of the self-paced reading judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 1.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	-0.58	0.27	-2.13	0.03
Group native vs nonnative	0.74	0.44	1.69	0.09
Condition	-6.45	0.47	-13.72	0.00
Accuracy Fillers Online	0.18	0.13	1.33	0.18
Group native vs nonnative:Condition	3.79	0.82	4.60	0.00
L1 English vs. L1 Spanish				
(Intercept)	-0.31	0.28	-1.13	0.26
L1Spanish	0.12	0.31	0.37	0.71
Condition	-4.48	0.41	-10.90	0.00
L3 proficiency	0.15	0.17	0.87	0.39
Accuracy Fillers Online	0.12	0.17	0.73	0.47
L1Spanish:Condition	-0.17	0.50	-0.35	0.73
L2 proficiency in L1 English				
(Intercept)	-0.18	0.29	-0.62	0.54
Condition	-4.96	0.57	-8.76	0.00
L2 proficiency	-0.19	0.21	-0.90	0.37
L3 proficiency	0.26	0.26	1.00	0.32
Condition:L2 proficiency	0.02	0.35	0.04	0.97
Condition:L3 proficiency	-1.98	0.48	-4.15	0.00
L2 proficiency in L1 Spanish				
(Intercept)	-0.34	0.32	-1.05	0.29
Condition	-5.09	0.59	-8.63	0.00
L2 proficiency	-0.21	0.22	-0.97	0.33
L3 proficiency	-0.09	0.22	-0.42	0.68
Condition:L2 proficiency	-0.88	0.44	-1.99	0.05
Condition:L3 proficiency	-0.64	0.40	-1.61	0.11

Table A.2. Results from the analysis of the self-paced reading RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 1.

	Estimate	Std. Error	df	t value	Pr(>|t|)
L1 German vs. La German Critical Region					
(Intercept)	0.46	0.50	60.08	0.91	0.36
Group	-0.77	0.13	58.67	-6.14	0.00
Condition	0.00	0.03	977.53	0.06	0.95
Accuracy Fillers Online	0.01	0.01	59.67	2.51	0.01
Group:Condition	-0.00	0.06	978.24	-0.01	0.99
Spillover 1					
(Intercept)	0.97	0.55	60.03	1.76	0.08
Group	-0.80	0.14	58.06	-5.80	0.00
Condition	0.38	0.04	954.50	8.56	0.00
Accuracy Fillers Online	0.01	0.01	59.50	2.05	0.04
Group:Condition	-0.11	0.09	953.02	-1.28	0.20
Spillover 2					
(Intercept)	0.74	0.68	60.49	1.10	0.28
Group	-0.65	0.17	58.29	-3.85	0.00
Condition	0.76	0.05	1005.69	13.88	0.00
Accuracy Fillers Online	0.02	0.01	60.02	2.66	0.01
Group:Condition	-0.17	0.11	1007.62	-1.56	0.12
L1 English vs. L1 Spanish Critical Region					
(Intercept)	0.78	0.53	34.88	1.47	0.15
L1Spanish	-0.04	0.13	34.20	-0.28	0.78
Condition	0.01	0.05	546.24	0.28	0.78
L3 proficiency	0.29	0.07	34.49	4.02	0.00
Accuracy Fillers Online	0.01	0.01	34.80	1.09	0.28
L1Spanish:Condition	-0.03	0.07	547.82	-0.45	0.65
Spillover !					
(Intercept)	1.51	0.57	36.50	2.66	0.01
L1Spanish	0.19	0.14	35.23	1.35	0.19
Condition	0.13	0.08	541.03	1.56	0.12
L3 proficiency	0.40	0.08	36.27	5.33	0.00
Accuracy Fillers Online	0.00	0.01	36.43	0.16	0.87
L1Spanish:Condition	0.40	0.12	545.41	3.38	0.00
Spillover 2					
(Intercept)	2.12	0.11	40.04	18.96	0.00
L1Spanish	0.13	0.16	35.96	0.85	0.40
Condition	0.50	0.11	575.96	4.53	0.00
L3 proficiency	0.50	0.08	35.35	6.36	0.00
L1Spanish:Condition	0.35	0.16	576.95	2.19	0.03

Table A.3. Results from the analysis of the impact of L2 proficiency in L1 English speakers and L1 Spanish speakers' self-paced reading RTs in Exp. 1.

	Estimate	Std. Error	df	t value	Pr(>|t|)
L2 proficiency in L1 English Critical Region					
(Intercept)	1.45	0.08	21.64	17.09	0.00
L2 proficiency	0.06	0.08	17.63	0.72	0.48
Condition	0.01	0.05	281.03	0.27	0.79
L3 proficiency	0.38	0.08	17.24	4.72	0.00
L2 proficiency:Condition	0.01	0.05	281.85	0.26	0.80
Spillover 1					
(Intercept)	1.73	0.09	19.92	19.22	0.00
L2 proficiency	0.04	0.09	17.79	0.43	0.68
Condition	0.12	0.08	273.70	1.60	0.11
L3 proficiency	0.48	0.09	17.62	5.58	0.00
L2 proficiency:Condition	0.10	0.08	274.96	1.24	0.21
Spillover 2					
(Intercept)	2.28	0.10	17.15	22.09	0.00
L2 proficiency	0.12	0.10	17.80	1.15	0.27
Condition	0.50	0.10	295.72	5.15	0.00
L3 proficiency	0.61	0.10	17.33	5.79	0.00
L2 proficiency:Condition	0.04	0.10	296.24	0.35	0.73
L2 proficiency in L1 Spanish Critical Region					
(Intercept)	1.17	0.09	14.68	12.83	0.00
L2 proficiency	0.19	0.09	14.54	2.05	0.06
Condition	-0.02	0.05	260.60	-0.31	0.75
L3 proficiency	0.14	0.09	14.83	1.58	0.13
L2 proficiency:Condition	0.01	0.05	260.16	0.14	0.89
Spillover 1					
(Intercept)	1.65	0.11	16.90	15.47	0.00
L2 proficiency	0.13	0.10	15.48	1.30	0.21
Condition	0.53	0.09	261.33	5.97	0.00
L3 proficiency	0.24	0.10	15.51	2.33	0.03
L2 proficiency:Condition	0.05	0.09	177.08	0.49	0.62
Spillover 2					
(Intercept)	2.09	0.13	17.36	16.54	0.00
Spill. 2 L2 proficiency	0.06	0.11	14.50	0.52	0.61
Spill. 2 Condition	0.88	0.13	274.44	6.66	0.00
Spill. 2 L3 proficiency	0.23	0.11	14.99	2.08	0.06
Spill. 2 L2 proficiency:Condition	0.00	0.14	176.94	0.01	1.00

A.10.2 Experiment 2

Table A.4. Results from the analysis of the self-paced reading judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 2.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	-0.18	0.18	-1.01	0.31
Group	0.57	0.35	1.64	0.10
Condition	-5.16	0.32	-15.97	0.00
Accuracy Fillers Online	-0.04	0.13	-0.32	0.75
Group :Condition	3.43	0.60	5.74	0.00
L1 English vs. L1 Spanish				
(Intercept)	0.10	0.21	0.46	0.65
Group	0.04	0.30	0.12	0.90
Condition	-3.24	0.31	-10.43	0.00
L3 proficiency	0.26	0.17	1.55	0.12
Accuracy Fillers Online	-0.19	0.17	-1.13	0.26
Group:Condition	-0.46	0.44	-1.05	0.29
L2 proficiency in L1 English				
(Intercept)	0.21	0.21	1.00	0.32
Condition	-3.46	0.36	-9.59	0.00
L2 proficiency	-0.06	0.15	-0.37	0.71
L3 proficiency	0.40	0.18	2.22	0.03
Condition:L2 proficiency	-0.41	0.30	-1.39	0.17
Condition:L3 proficiency	-1.02	0.34	-2.97	0.00
L2 proficiency in L1 Spanish				
(Intercept)	0.13	0.25	0.52	0.60
Condition	-3.90	0.41	-9.52	0.00
L2 proficiency	-0.27	0.26	-1.03	0.30
L3 proficiency	0.02	0.24	0.09	0.93
Condition:L2 proficiency	0.16	0.39	0.42	0.68
Condition:L3 proficiency	-0.44	0.33	-1.33	0.18

Table A.5. Results from the analysis of the self-paced reading RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 2.

	Estimate	Std. Error	df	t value	Pr(>|t|)
L1 German vs. La German					
Critical Region					
(Intercept)	0.94	0.56	59.71	1.69	0.10
Group	-0.91	0.14	58.61	-6.49	0.00
Condition	-0.24	0.03	946.80	-8.71	0.00
Accuracy Fillers Online	0.01	0.01	59.46	1.49	0.14
Group :Condition	0.11	0.05	950.80	1.96	0.05
Spillover 1					
(Intercept)	1.17	0.51	60.83	2.29	0.03
Group	-0.51	0.13	57.67	-3.97	0.00
Condition	0.38	0.04	950.06	8.62	0.00
Accuracy Fillers Online	0.01	0.01	60.35	2.30	0.03
Group :Condition	-0.18	0.09	955.78	-2.02	0.04
Spillover 2					
(Intercept)	1.01	0.55	61.20	1.86	0.07
Group	-0.56	0.14	58.00	-4.07	0.00
Condition	0.43	0.05	975.36	8.97	0.00
Accuracy Fillers Online	0.01	0.01	60.69	2.46	0.02
Group :Condition	-0.26	0.10	980.97	-2.66	0.01
L1 English vs. L1 Spanish					
Critical Region					
(Intercept)	1.12	0.65	34.89	1.73	0.09
Group	-0.02	0.15	34.75	-0.12	0.91
Condition	-0.20	0.05	539.69	-4.19	0.00
L3 proficiency	0.25	0.09	34.89	2.85	0.01
Accuracy Fillers Online	0.00	0.01	34.89	0.30	0.77
Group:Condition	0.05	0.07	535.57	0.68	0.50
Spillover 1					
(Intercept)	1.68	0.51	36.39	3.28	0.00
Group	0.32	0.12	35.31	2.62	0.01
Condition	0.24	0.09	549.57	2.70	0.01
L3 proficiency	0.36	0.07	34.57	5.24	0.00
Accuracy Fillers Online	0.00	0.01	35.76	0.46	0.65
Group:Condition	0.08	0.12	544.29	0.62	0.53
Spillover 2					
(Intercept)	1.70	0.55	36.56	3.09	0.00
Group	0.30	0.13	35.44	2.28	0.03
Condition	0.27	0.09	566.39	2.86	0.00
L3 proficiency	0.40	0.07	34.96	5.36	0.00
Accuracy Fillers Online	0.00	0.01	35.99	0.38	0.71
Group:Condition	0.03	0.13	562.44	0.26	0.79

Table A.6. Results from the analysis of the impact of L2 proficiency in L1 English speakers and L1 Spanish speakers' self-paced reading RTs in Exp. 2.

	Estimate	Std. Error	df	t value	Pr(>|t|)
L2 proficiency in L1 English Critical Region					
(Intercept)	1.40	0.09	16.67	15.39	0.00
L2 proficiency	-0.03	0.09	16.76	-0.29	0.78
Condition1	-0.20	0.05	279.29	-3.90	0.00
L3 proficiency	0.37	0.09	16.74	3.95	0.00
L2 proficiency:Condition	0.04	0.05	279.35	0.75	0.46
Spillover 1					
(Intercept)	2.03	0.10	22.78	20.22	0.00
L2 proficiency	0.09	0.08	16.35	1.07	0.30
Condition	0.23	0.09	265.76	2.61	0.01
L3 proficiency	0.42	0.08	16.34	5.01	0.00
L2 proficiency:Condition	0.02	0.09	262.52	0.27	0.79
Spillover 2					
(Intercept)	2.03	0.11	22.43	18.57	0.00
L2 proficiency	0.08	0.09	16.71	0.91	0.37
Condition	0.26	0.10	274.97	2.71	0.01
L3 proficiency	0.47	0.09	16.68	5.00	0.00
L2 proficiency:Condition	0.03	0.10	273.38	0.33	0.75
L2 proficiency in L1 Spanish Critical Region					
(Intercept)	1.19	0.12	16.53	10.27	0.00
L2 proficiency	0.16	0.12	15.95	1.33	0.20
Condition	-0.15	0.05	265.46	-3.31	0.00
L3 proficiency	0.09	0.11	16.14	0.84	0.41
L2 proficiency:Condition	0.17	0.05	200.76	3.57	0.00
Spillover 1					
(Intercept)	2.11	0.08	17.31	24.98	0.00
L2 proficiency	0.12	0.08	16.85	1.44	0.17
Condition	0.34	0.09	278.16	3.85	0.00
L3 proficiency	0.26	0.08	17.11	3.16	0.01
L2 proficiency:Condition	-0.09	0.09	190.03	-1.02	0.31
Condition:L3 proficiency	0.08	0.09	277.39	0.84	0.40
Spillover 2					
(Intercept)	2.07	0.09	17.89	22.77	0.00
L2 proficiency	0.10	0.09	16.91	1.18	0.25
Condition	0.34	0.09	285.44	3.70	0.00
L3 proficiency	0.27	0.09	17.01	3.16	0.01
L2 proficiency:Condition	-0.10	0.09	199.46	-1.03	0.31

A.10.3 Experiment 3

Table A.7. Results from the analysis of the self-paced reading judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 3.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	-0.17	0.22	-0.78	0.44
Group	0.51	0.35	1.47	0.14
Condition	-5.86	0.37	-15.91	0.00
Group	-0.02	0.13	-0.19	0.85
Group:Condition	2.78	0.62	4.52	0.00
L1 English vs. L1 Spanish				
(Intercept)	0.11	0.25	0.43	0.67
Group	-0.02	0.31	-0.06	0.95
Condition	-4.11	0.38	-10.69	0.00
L3 proficiency	-0.08	0.18	-0.45	0.65
Group	-0.01	0.17	-0.03	0.98
Group:Condition	-0.61	0.50	-1.23	0.22
L2 proficiency in L1 English				
(Intercept)	0.13	0.33	0.41	0.68
Condition	-5.10	0.61	-8.42	0.00
L2 proficiency	-0.02	0.21	-0.09	0.93
L3 proficiency	0.06	0.28	0.23	0.82
Condition:L2 proficiency	-0.34	0.36	-0.94	0.35
Condition:L3 proficiency	-2.30	0.52	-4.42	0.00
L2 proficiency in L1 Spanish				
(Intercept)	-0.07	0.23	-0.29	0.77
Condition	-4.84	0.51	-9.57	0.00
L2 proficiency	-0.30	0.19	-1.58	0.11
L3 proficiency	-0.30	0.23	-1.31	0.19
Condition:L2 proficiency	-1.04	0.35	-2.94	0.00
Condition:L3 proficiency	-0.70	0.43	-1.62	0.11

Table A.8. Results from the analysis of the self-paced reading RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 3.

	Estimate	Std. Error	df	t value	Pr(>|t|)
L1 German vs. La German Critical Region					
(Intercept)	0.52	0.52	62.32	1.00	0.32
Group	-0.89	0.13	61.08	-6.62	0.00
Condition	-0.06	0.03	1004.37	-2.55	0.01
Accuracy Fillers Online	0.01	0.01	61.81	2.17	0.03
Group:Condition	-0.05	0.05	1003.79	-1.02	0.31
Spillover 1					
(Intercept)	0.95	0.49	61.60	1.94	0.06
Group	-0.41	0.12	59.38	-3.27	0.00
Condition	0.26	0.04	1006.90	6.16	0.00
Accuracy Fillers Online	0.02	0.01	61.01	2.86	0.01
Group:Condition	0.04	0.08	1006.36	0.51	0.61
Spillover 2					
(Intercept)	0.96	0.62	62.67	1.53	0.13
Group	-0.41	0.16	59.93	-2.54	0.01
Condition	0.66	0.06	1031.76	11.85	0.00
Accuracy Fillers Online	0.02	0.01	61.66	2.74	0.01
Group:Condition	0.15	0.11	1031.10	1.35	0.18
L1 English vs. L1 Spanish Critical Region					
(Intercept)	0.85	0.49	37.33	1.74	0.09
Group	-0.02	0.12	37.12	-0.14	0.89
Condition	-0.08	0.04	575.99	-1.80	0.07
L3 proficiency	0.29	0.07	36.55	4.14	0.00
Accuracy Fillers Online	0.00	0.01	36.97	0.74	0.47
Group:Condition	-0.02	0.06	570.38	-0.40	0.69
Spillover 1					
(Intercept)	1.51	0.53	36.23	2.87	0.01
Group	0.05	0.13	36.13	0.38	0.70
Condition	0.31	0.08	584.06	3.73	0.00
L3 proficiency	0.31	0.08	34.87	4.02	0.00
Accuracy Fillers Online	0.01	0.01	35.65	1.08	0.29
Group:Condition	-0.08	0.11	576.32	-0.71	0.48
Spillover 2					
(Intercept)	2.32	0.65	38.03	3.59	0.00
Group	0.14	0.16	37.64	0.88	0.38
Condition	0.85	0.11	603.71	7.56	0.00
L3 proficiency	0.53	0.09	36.16	5.67	0.00
Accuracy Fillers Online	0.00	0.01	37.17	0.04	0.97
Group:Condition	-0.21	0.15	597.20	-1.36	0.17

Table A.9. Results from the analysis of the impact of L2 proficiency in L1 English speakers and L1 Spanish speakers' self-paced reading RTs in Exp. 3.

	Estimate	Std. Error	df	t value	Pr(>|t|)
L2 proficiency in L1 English					
Critical Region					
(Intercept)	1.36	0.08	20.88	18.09	0.00
L2 proficiency	0.03	0.07	16.80	0.47	0.64
Condition	-0.08	0.05	268.74	-1.69	0.09
L3 proficiency	0.41	0.07	16.74	5.68	0.00
L2 proficiency:Condition	0.03	0.05	259.10	0.57	0.57
Spillover 1					
(Intercept)	2.23	0.10	16.14	23.28	0.00
L2 proficiency	0.07	0.09	15.52	0.69	0.50
Condition	0.31	0.08	264.02	3.67	0.00
L3 proficiency	0.37	0.10	15.19	3.87	0.00
L2 proficiency:Condition	0.01	0.09	250.81	0.07	0.94
Spillover 2					
(Intercept)	2.60	0.12	17.74	22.62	0.00
L2 proficiency	0.14	0.11	16.99	1.25	0.23
Condition	0.85	0.12	278.16	6.91	0.00
L3 proficiency	0.64	0.11	16.42	5.76	0.00
L2 proficiency:Condition	0.24	0.13	265.44	1.85	0.07
L2 proficiency in L1 Spanish					
Critical Region					
(Intercept)	1.05	0.09	22.17	12.31	0.00
L2 proficiency	0.15	0.08	18.14	1.92	0.07
Condition	-0.10	0.04	305.74	-2.47	0.01
L3 proficiency	0.14	0.08	18.03	1.74	0.10
L2 proficiency:Condition	-0.05	0.04	304.31	-1.11	0.27
Spillover 1					
(Intercept)	1.98	0.09	21.16	21.84	0.00
L2 proficiency	0.14	0.08	18.31	1.66	0.11
Condition	0.24	0.08	319.96	3.08	0.00
L3 proficiency	0.22	0.08	17.51	2.67	0.02
L2 proficiency:Condition	0.14	0.08	287.88	1.68	0.09
Spillover 2					
(Intercept)	2.28	0.12	27.02	19.21	0.00
L2 proficiency	0.14	0.09	18.58	1.54	0.14
Condition	0.65	0.10	324.11	6.76	0.00
L3 proficiency	0.24	0.09	17.77	2.59	0.02
L2 proficiency:Condition	0.21	0.10	325.15	2.02	0.04

Appendix B

B.1. Participants

Table B.a. Original pool of L1 English and L1 Spanish speakers for Study 2. Range between brackets.

	L1 English (n = 41)	L1 Spanish (n = 40)
Age	27 (19 - 56)	29 (21 - 46)
Goethe score (%)	70 (43- 90)	67 (36 - 90)
Self-rated proficiency La	72 (22 - 100)	72 (32 - 100)
AoA La	18 (11 - 34)	20 (5 - 40)
Length LaA (years)	6.2 (0.6 - 41)	5 (0.1 - 16)
L2	Spanish	English
Self-rated proficiency L2	59 (15 - 92)	82 (52 - 100)
AoA L2	15 (6 - 29)	8 (3 - 16)
Length L2A (years)	5 (0.3 - 20)	10 (0.1 - 24)

Additional languages

Table B.b. Count of additional languages spoken by each La German participant group in Study 1.

	L1 English	L1 Spanish		L1 English	L1 Spanish
None	11	11	Irish (intermediate)	1	0
Arabic (beginner)	2	0	Irish (advanced)	2	0
Catalan (beginner)	0	3	Italian (beginner)	2	5
Catalan (intermediate)	1	2	Italian (intermediate)	0	2
Catalan (advanced)	0	1	Italian (advanced)	2	1
Chinese (beginner)	1	1	Japanese (beginner)	2	2
Dutch (beginner)	2	0	Korean (intermediate)	1	0
Dutch (intermediate)	1	0	Russian (beginner)	5	2
French (beginner)	4	9	Russian (intermediate)	1	0

French (intermediate)	7	4	Swedish (beginner)	1	0
French (advanced)	2	2	Polish (beginner)	0	1
Galician (advanced)	0	1	Portuguese (beginner)	4	1
Hebrew (beginner)	2	0	Portuguese (intermediate)	1	0
Hindi (beginner)	1	0	Tagalog (beginner)	1	0
Irish (beginner)	1	0	Turkish (beginner)	1	0

B.2. Materials for the speeded acceptability judgments

B.2.1 Experiment 4

Experiment 4 comprised 20 sets of items distributed in two conditions. In the infelicitous condition, the pronoun and the possessor noun disagreed in gender. The gender of the possessee disagreed with the possessor, creating a false match with the possessive pronoun's root in the infelicitous condition. Note that some feminine nouns are marked in German by way of a suffix (e.g. Patient/Patientin, patient.$_{MASC}$/patient.$_{FEM}$).

1. Herr Wolf rettete gestern {seine/ihre} Patientin.
2. Herr Neumann brauchte dringend {seine/ihre} Anwältin.
3. Herr Schneider beruhigte langsam {seine/ihre} Schülerin.
4. Herr Fischer weckte morgens {seine/ihre} Tante.
5. Herr Werner badete abends {seine/ihre} Tochter.
6. Herr Wagner küsste zärtlich {seine/ihre} Freundin.
7. Herr Becker suchte dringend {seine/ihre} Chefin.
8. Herr Hartmann bediente fröhlich {seine/ihre} Kundin.
9. Herr Hoffmann warnte heute {seine/ihre} Studentin.
10. Herr Schäfer liebte heimlich {seine/ihre} Kollegin.
11. Frau Klein besuchte mehrmals {ihren/seinen} Zahnarzt.
12. Frau Müller nervte dauernd {ihren/seinen} Cousin.
13. Frau Schröder ärgerte häufig {ihren/seinen} Bruder.
14. Frau Schmidt begrüßte freundlich {ihren/seinen} Lehrer.

15. Frau Schwarz verklagte endlich {ihren/seinen} Mieter.
16. Frau Braun hörte ständig {ihren/seinen} Nachbarn.
17. Frau Krüger erkannte sofort {ihren/seinen} Schüler.
18. Frau Schulz pflegte geduldig {ihren/seinen} Vater.
19. Frau Lange bezahlte endlich {ihren/seinen} Vermieter.
20. Frau Weber vermisste gestern {ihren/seinen} Enkel.

B.2.2 Experiment 5

Experiment 5 comprised 20 sets of items distributed in two conditions. In the infelicitous condition, the pronoun and the possessee noun disagreed in number.

21. Herr Möller zerkratzte ständig {seine/sein} Autos.
22. Herr Kaiser testete gestern {seine/sein} Augen.
23. Herr Jung zeigte stolz {seine/sein} Werke.
24. Herr Hahn kannte immer {seine/sein} Rechte.
25. Herr Schubert bügelte morgens {seine/sein} Hemden.
26. Herr Vogel verschenkte großzügig {seine/sein} Bilder.
27. Herr Friedrich übte abends {seine/sein} Lieder.
28. Herr Keller pflegte mittags {seine/sein} Pferde.
29. Herr Günther erreichte immer {seine/sein} Ziele.
30. Herr Frank renovierte jährlich {seine/sein} Hotels.
31. Frau Krause trocknete morgens {ihre/ihr} Haare.
32. Frau Meier vermietete häufig {ihre/ihr} Boote.
33. Frau Weiß suchte gestern {ihre/ihr} Bücher.
34. Frau Schmid verkaufte endlich {ihre/ihr} Häuser.
35. Frau Pfeiffer reinigte gründlich {ihre/ihr} Ohren.
36. Frau Pohl badete eilig {ihre/ihr} Kinder.
37. Frau Kühn pflegte regelmäßig {ihre/ihr} Felder.
38. Frau Huber fütterte abends {ihre/ihr} Tiere.
39. Frau Horn fand endlich {ihre/ihr} Hefte.
40. Frau Vogt rasierte sorgsam {ihre/ihr} Beine.

B.2.3 Experiment 6

Experiment 6 comprised 20 sets of items distributed in two conditions. In the infelicitous condition, the adjective showed overt agreement with the subject noun.

41. Das Kleid aus Indien war {schön/schönes}.
42. Das Kind aus Pakistan war {klug/kluges}.
43. Das Auto in Italien war {alt/altes}.
44. Das Bad in Kroatien war {klein/kleines}.
45. Das Jahr in Spanien war {heiß/heißes}.
46. Das Fahrrad aus Amsterdam war {neu/neues}.
47. Das Schloss in Belgien war {groß/großes}.
48. Das Glas aus Ägypten war {bunt/buntes}.
49. Das Bett aus Schweden war {weich/weiches}.
50. Das Fest in München war {laut/lautes}.
51. Das Baby aus London war {lieb/liebes}.
52. Das Pferd aus Amerika war {krank/krankes}.
53. Das Schwein in Finnland war {wild/wildes}.
54. Das Bier aus Berlin war {kalt/kaltes}.
55. Das Dach in Marokko war {weiß/weißes}.
56. Das Dorf neben Monaco war {reich/reiches}.
57. Das Schiff nach Sizilien war {leer/leeres}.
58. Das Meer vor Libyen war {tief/tiefes}.
59. Das Metall aus Irland war {hart/hartes}.
60. Das Wetter in Uruguay war {gut/es}.

B.2.4 Experiment 7

Experiment 7 comprised 20 sets of items distributed in two conditions. In the infelicitous condition, the finite verb in the relative clause mismatched in number the subject. Note that the German form for perfect past (inflected

form of the auxiliary *haben* and the past participle of the main verb, e.g. *haben getanzt,* 'have danced') can also be simple past. This is the case of the items in this experiment. The translation will provide the English perfect present, given that otherwise the manipulation is not observable.

61. Ben erzählt, dass die Eltern damals viel getanzt {haben/hat}.
62. Paul sagt, dass die Vögel ganz laut gesungen {haben/hat}.
63. Felix meint, dass die Autoren gestern viel geschrieben {haben/hat}.
64. Tim erklärt, dass die Ärzte sehr hart gearbeitet {haben/hat}.
65. Daniel sagt, dass die Gäste schon genug gegessen {haben/hat}.
66. Phillip meint, dass der Minister jetzt endlich gekündigt {hat/haben}.
67. Patrick erklärt, dass der Student ziemlich lange gelernt {hat/haben}.
68. Tobias sagt, dass der Journalist heute mehrmals angerufen {hat/haben}.
69. Tobias behauptet, dass der Tourist ganz wenig getrunken {hat/haben}.
70. David erzählt, dass der Diplomat gestern viel erlebt {hat/haben}.
71. Oliver erklärt, dass der Techniker sehr spät angekommen {ist/sind}.
72. Frank meint, dass der Fußballer sehr alt geworden {ist/sind}.
73. Robert sagt, dass der Hund allein hierher gelaufen {ist/sind}.
74. Mark sagt, dass der Professor vor kurzem verreist {ist/sind}.
75. Thomas sagt, dass der Großvater schon wieder eingeschlafen {ist/sind}.
76. Michael erzählt, dass die Kinder zu früh aufgewacht {sind/ist}.
77. Martin behauptet, dass die Schüssel immer wieder verschwunden {sind/ist}.
78. Stephan denkt, dass die Nachbarinnen zu lange geblieben {sind/ist}.

79. Dirk sagt, dass die Flugzeuge zu spät gelandet {sind/ist}.
80. Peter meint, dass die Besucher gestern früh geflogen {sind/ist}.

B.2.5 Fillers

1. Sofort lösten die Studenten das komplizierte Problem.
2. Irgendwann hörten die Bürger die traurige Wahrheit.
3. Außerhalb der Stadt sieht man die Sterne am besten.
4. Im Januar war es in Berlin sehr kalt.
5. Rote Früchte enthalten unglaublich viele Vitamine.
6. Der beste Bier findet man in Deutschland.
7. Letzte Jahr gab es viele starke Stürme.
8. Langsam läuft die Großeltern zurück nach Hause.
9. Natürliche Säfte ist gesünder als künstliche Säfte.
10. Ein schwere Erkältung kann gefährlich sein.
11. Junge Kinder leiden mehr unter der starken Hitze.
12. Erneuerbare Energien werden von der Industrie langsam häufiger benutzt.
13. Grüne Farben sind sehr entspannend für die menschlichen Augen.
14. Heutzutage sind die Temperaturen extremer als vor zwanzig Jahren.
15. Ein starkes Gewitter hat heute vier kleine Gebäude zerstört.
16. Eine großes Frühstück ist ein guter Anfang des Tages.
17. Eine gutes Beziehung braucht häufig viel Aufmerksamkeit.
18. Eine echter Freund ist immer zuverlässig.
19. Täglich schlafen der Koalabär bis zu zwanzig Stunden.
20. Bald könnten das Leben auf der Erde härter sein.

B.2.6 Pseudofillers

Word order pseudo-fillers

1. Der Hund jagt häufig die Katzen.
2. Die Firma braucht dringend neue Mitarbeiter.

3. Die Eltern versteckten gestern die Geschenke.
4. Fleißige Studenten bestehen erfolgreich die Prüfungen.
5. Marias Oma backte wieder leckere Kekse.
6. Der Vogel fressen immer kleine Insekten.
7. Viele Schulen organisierst regelmäßig tolle Ausflüge.
8. Die Pferd beißt selten den Besitzer.
9. Der Rentnerin kauft ständig billige Produkte.
10. Die Kino ändert dauernd das Programm.

Predicative adjective pseudo-fillers

1. Martins jetzige Freundin ist eine bekannte Schauspielerin.
2. Saras letztes Konzert war ein großartiger Erfolg.
3. Marias neues Meisterwerk ist ein spannender Krimi.
4. Jacobs geliebte Heimat war eine wunderschöne Stadt.
5. Lauras nette Mutter ist eine erstaunliche Schwimmerin.
6. Timos jüngster Sohn war ein talentiert Sänger.
7. Martinas nächstes Projekt ist ein groß Haus.
8. Claras zweite Tochter ist eine erfolgreich Politikerin.
9. Judiths ruhiger Vater ist ein berühmt Maler.
10. Annas einzige Erinnerung war ein alt Foto.

B.3. Materials for the untimed judgment task of Study 2

B.3.1 Experiment 4

1. Herr Wolf besuchte seine Tante.
2. Herr Neumann bezahlte seine Köchin.
3. Herr Schneider begrüßte seine Kundin.
4. Frau Lange badete ihren Sohn.
5. Frau Klein brauchte ihren Arzt.
6. Herr Becker beruhigte ihre Enkelin.
7. Herr Hoffmann suchte ihre Nachbarin.
8. Frau Müller erkannte seinen Onkel.
9. Frau Schröder hasste seinen Vermieter.

10. Frau Schmidt küsste seinen Vater.

B.3.2 Experiment 5

11. Herr Fischer vermietet seine Autos.
12. Herr Werner verkauft seine Bücher.
13. Herr Wagner zeigt seine Bilder.
14. Frau Braun liebt ihre Kinder.
15. Frau Krüger renoviert ihre Häuser.
16. Herr Schäfer übt sein Lieder.
17. Herr Möller füttert sein Pferde.
18. Herr Kaiser baut sein Boote.
19. Frau Weber pflegt ihr Tiere.
20. Frau Schulz wäscht ihr Hemden.

B.3.3 Experiment 6

21. Das Spiel war ganz spannend.
22. Das Mädchen war so süß.
23. Das Gold war unglaublich teuer.
24. Das Land war extrem kalt.
25. Das Problem war ziemlich groß.
26. Das Eis war total leckeres.
27. Das Licht war zu helles.
28. Das Gesicht war so schönes.
29. Das Wort war eigentlich englisches.
30. Das Leben war ganz hartes.

B.3.4 Experiment 7

31. Tina hat ganz lange gespielt.
32. Anna hat heute intensiv gelernt.
33. Jonas ist sofort wieder eingeschlafen.
34. Frank ist zu spät aufgestanden.

35. Timo ist zu Hause geblieben.
36. Marie haben im See gebadet.
37. Emma haben zu viel gegessen.
38. Daniel haben einfach nichts verstanden.
39. Philipp sind noch nicht angekommen.
40. Julia sind im Moment verreist.

B.3.5 Fillers

41. Als Tim ins Bett ging, hatte er gerade gegessen.
42. Bevor Laura den Marathon lief, hatte sie hart trainiert.
43. Nachdem Dennis etwas kleines gefrühstückt hatte, duschte er schnell.
44. Als Sabrina ein Geräusch hörte, hatte sie ein bisschen Angst.
45. Bevor Stephan sein Studium begann, hatte er lange gearbeitet.
46. Nachdem Melanie das Bier ausgetrunken hatte, ging wieder tanzen.
47. Bevor Nikolas die Prüfung schrieb, hatte viel Kaffee getrunken.
48. Als Franziska nach Mallorca fuhr, hatte schon gekündigt.
49. Bevor Frank schwer krank wurde, hatte ständig gehustet.
50. Als Sandra ins Kino ging, hatte bereits gebadet.

B.3.6 Pseudofillers

51. Gestern haben wir zwei kleine Augen in der Dunkelheit gesehen.
52. Wir sollten alle unsere Rechte kennen.
53. Maria hat ein rotes Heft verloren, hast du es gesehen?
54. Lisa hat sich das linke Bein gebrochen.
55. Wir haben das Feld neben unserem Haus gekauft.
56. Die Diebe haben zehn berühmte Werk gestohlen.
57. Ich habe ein einziges Ziele: bald ein Haus zu kaufen.
58. Viele Hotel bieten Frühstuck an.
59. Tina hat ein Paar weiße Haar auf ihrem Kopf gesehen.
60. Der Ball hat mein rechtes Ohren voll getroffen!

B.4. Instructions for the speeded acceptability judgment task

Bitte lesen Sie die folgende Instruktion sorgfältig durch, bevor Sie das Experiment beginnen.

In diesem Experiment werden Ihnen Sätze in der Bildschirmmitte angezeigt. Die Sätze werden Wort für Wort in schneller Abfolge präsentiert.
Am Ende jedes Satzes wird die Frage "*Ist der Satz akzeptabel?*" auf dem Bildschirm angezeigt. Ihre Aufgabe ist es dann, so schnell wie möglich eine Antwort zu geben. Die zwei möglichen Antworten sind "*Ja*" (der Satz ist akzeptabel) oder "*Nein*" (der Satz ist nicht akzeptabel).

Und was ist akzeptabel oder nicht akzeptabel? Akzeptabel ist, was ein deutscher Muttersprachler sagen würde, und nicht akzeptabel ist, was ein Muttersprachler nie sagen würde. Sehen Sie sich die folgenden Beispiele an:

Akzeptabel: "Der Mann und sein Sohn gehen in den Park."
Nicht akzeptabel: "Der Mann gehen und sein Sohn in den Park."
Obwohl beide Sätze den gleichen Inhalt haben, und man beide verstehen könnte, würde ein deutscher Muttersprachler in einem normalen Satz das Verb "gehen" nach "Mann und Sohn" benutzen, aber nicht dazwischen! Deswegen ist der zweite Satz nicht akzeptabel.

Akzeptabel: "Kathi hat gestern eine leckere Suppe gekocht."
Nicht akzeptabel: "Kathi hat gestern einen leckeren Suppe gekocht."
Hier kann man auch den Sinn beider Sätze verstehen, aber da Suppe ein feminines Wort ist, würde kein Muttersprachler "einen leckeren Suppe" sagen, weil ein**en** leckere**n** *hier maskulin wÃ¤re! Daher ist der zweite Satz nicht akzeptabel.*

Beachten Sie bei Ihrer Beurteilung außerdem bitte nur den Kontext des gegebenen Satzes. Zum Beispiel:
Akzeptabel: "Anna hat zwei Stunden gearbeitet und danach ist sie nach

Hause gegangen".

Nicht akzeptabel: "Anna hat zwei Stunden gearbeitet und danach ist er nach Hause gegangen".

Wer ist nach Hause gegangen? Im ersten Satz ist "sie", Anna, nach Hause gegangen, aber im zweiten Satz ist "er" nach Hause gegangen, also ein Mann! In dem Satz wurde aber vorher kein Mann erwÃ¤hnt. Anna ist die einzige gegebene Person im Satz, und deswegen ist das Wort "er", welches sich auf einen unbekannten Mann bezieht, in diesem Kontext nicht akzeptabel.

Drücken Sie die Taste "f" auf Ihre Tastatur für "JA" (der Satz ist akzeptabel).
Drücken Sie die Taste "j" auf Ihre Tastatur für "NEIN" (der Satz ist nicht akzeptabel).

Es ist besonders wichtig, dass Sie so schnell wie möglich antworten. Sie haben nur 3 Sekunden, um Ihre Antwort abzugeben. Sie können aber nach jedem Satz kleine Pausen machen, wenn Sie den folgenden Text sehen: "Wenn Sie bereits sind, drücken Sie irgendeine Taste, um fortzufahren". Bleiben Sie bitte während des gesamten Experiments aufmerksam!

Jetzt werden Sie ein paar Übungsbeispiele bearbeiten, danach fängt das Experiment an!

B.5. Vocabulary list

The vocabulary list included verb in the simple past, single nouns and plural nouns. They are all listed below in alphabetical order, grouped by category.

angriff	angepasst	der Banker	der Student
anrief	angerufen	der Beamte	der Tänzer
anschrie	angezündet	der Chef	der Techniker
ärgerte	aufgewacht	der Cousin	der Tierschützer

badete	beantragt	der Demonstrant	der Tourist
bediente	beendet	der Detektiv	der Vermieter
begrüßte	bestellt	der Dieb	der Wachmann
bemerkte	bewertet	der Diplomat	der Wagen
benannte	bezahlt	der Ehemann	der Zahnarzt
beruhigte	durchsucht	der Einkauf	die Anwältin
beschäftigte	eingenommen	der Einkäufer	die Chefin
beschrieb	eingeschlafen	der Einwohner	die Kollegin
besuchte	erlebt	der Enkel	die Kundin
bezahlte	erstellt	der Fahrer	die Tante
brachte	evaluiert	der Fan	die Anweisungen
brauchte	fotografiert	der Feuerwehrmann	die Ärzte
bügelte	gearbeitet	der Flugbegleiter	die Augen
erkannte	gebacken	der Gast	die Autoren
erreichte	geblieben	der Invalide	die Autos
erschreckte	gedreht	der Jäger	die Beine
fand	geflogen	der Journalist	die Besucher
fütterte	gegeben	der Juwelier	die Beweise
grüßte	gegessen	der Kassierer	die Bilder
hasste	gekündigt	der Kaufmann	die Boote
hörte	gelandet	der Kellner	die Brände
informierte	gelaufen	der Klient	die Brötchen
kannte	gelernt	der Koch	die Bücher
kontaktierte	gelöscht	der Kredit	die Desserts
kontrollierte	gemalt	der Kriminelle	die Eltern
küsste	gemessen	der Kritiker	die Felder
liebte	gesammelt	der Kunde	die Flugzeuge
mochte	geschossen	der Künstler	die Gäste
nervte	geschrieben	der Lehrer	die Gemälde
rasierte	gestohlen	der Leser	die Getränke
reinigte	gesungen	der Maurer	die Haare
renovierte	getanzt	der Mechaniker	die Hasen

repräsentierte	getrunken	der Mieter	die Häuser
rettete	geübt	der Minister	die Hefte
sah	gewonnen	der Moderator	die Hemden
schrieb	geworden	der Motor	die Hotels
störte	gezeichnet	der Nachbarn	die Kinder
suchte	herausgelassen	der Offizier	die Kostüme
testete	installiert	der Paparazzi	die Lampen
trocknete	repariert	der Passagier	die Lieder
überraschte	unterschrieben	der Patient	die Nachbarinnen
übte	verreist	der Patient	die Ohren
unterstütze	verschwunden	der Pirat	die Pferde
untersuchte	versteckt	der Politiker	die Prüfungen
verkaufte	zubereitet	der Polizist	die Rechte
verklagte	zurückgezahlt	der Polizist	die Reisen
verließ	das Bad	der Professor	die Rezepte
vermietete	das Dach	der Regisseur	die Ringe
vermisste	das Dorf	der Reisepass	die Schüssel
verschenkte	das Fest	der Reporter	die Skulpturen
verstand	das Glas	der Rezeptionist	die Spiele
warnte	das Metall	der Sammler	die Szenen
weckte	der Abenteurer	der Schatz	die Tabletten
zeigte	der Agent	der Schauspieler	die Tiere
zerkratzte	der Arbeiter	der Schneider	die Urlaubstage
sprach	der Architekt	der Schriftsteller	die Vögel
traf	der Arzt	der Schüler	die Wahlen
pflegte	der Auswanderer	der Schulleiter	die Werke
angekommen	der Bäcker	der Sportler	die Ziele
			die Zimmer

B.6. Personal information questionnaire and consent form

Please fill in the form below. Your personal details will be anonymized and saved along with your answers to the linguistic background details. We use these details for research purposes solely.

Your answers will be combined with those of other participants and then interpreted with them. Only the results of the group analyses will be reported in possible publications or presentations.

Personal Information

Initials (*e.g. Max Mustermann = MM*):	
Email address:	
Age:	
Sex:	◯ Male ◯ Female
Handedness:	◯ Right-handed ◯ Left-handed
Highest educational qualification:	
Current country of residence:	
Which is your mother tongue?	◯ English ◯ Spanish ◯ German
Which of the following foreign languages did you start learning first?	◯ German ◯ Spanish
Place of birth:	
Do you have any language-related impairments (dyslexia, stuttering, etc.)? *(List)*:	
Have you already taken part in an experiment at the Potsdam Research Institute for Multilingualism? *(yes/no)*:	
How did you find out about this experiment? *(Email, Facebook, friends, eBay etc.)*:	

Language Profile

Please fill in the information about the languages you have learned.
Under **Age**, write the age (in years) at which you started learning the language
(*e.g. write "3" if you started learning the language when you were about 3 years old*)
Under **Length**, write the number of months you have learned the language for.
(*e.g. write "72" if you learned the language for 6 years (=72 months) in total*)
Under **Context**, write in which context(s) you learned the language (*e.g. in school, at home, abroad, etc*)

	Age (years)	Length (months)	Context
Spanish			
German			

Other languages?
(Write here any other languages you know along with the level you have in each -e.g. beginner, intermediate, advanced)

How often do you use each of your languages?

English:	○daily	○weekly	○monthly	○yearly	○hardly ever
Spanish:	○daily	○weekly	○monthly	○yearly	○hardly ever
German:	○daily	○weekly	○monthly	○yearly	○hardly ever
Other languages:	○daily	○weekly	○monthly	○yearly	○hardly ever

Please provide an estimate of your level of proficiency in the following languages according to your own judgment. You should choose a number between 1 (least nativelike) and 10 (most nativelike) that best applies to each of your skills. If you have absolutely no knowledge of the language, then select "NA" for all four skills.

Spanish

Listening:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA
Speaking:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA
Reading:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA
Writing:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA

German

Listening:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA
Speaking:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA
Reading:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA
Writing:	○1	○2	○3	○4	○5	○6	○7	○8	○9	○10	○NA

How long have you been living in a German-speaking country?
(Write here the number of months, e.g. "36" if you have been in the country for 3 years)

You will receive a personal code at the end of the experiment. Please send us the code per email if you wish to receive a transfer with the expense allowance of 5 EUROS for your participation. We will also need your account number (preferably a German account, otherwise make sure that your bank account belongs to a SEPA country, see below***). Alternatively, you can collect personally the compensation at our Institute (Campus Golm in Potsdam, Haus 2).

You will receive precise instructions regarding the transfer of the expense allowance at the end of the experiment.

Please note that it is essential that you complete the experiment in a concentrated and diligent manner! If a large part of your answers are incorrect, we withhold the right to refrain from transferring the expense allowance.

Please send an email to Anna Stutter Garcia (anna.stutter@gmail.com) if you have any questions.

☐ **By filling in this form, you are giving your consent for your data to be used as explained above.**

****Countries that are included in the SEPA: all 28 member states of the European Union, and the following non-EU states: Iceland, Liechtenstein, Norway, Switzerland, Monaco and San Marino.****

B.7 Full results for Study 2

B.7.1 Experiment 4

Table B.1. Results from the analysis of the speeded acceptability judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 4.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	0.90	0.16	5.56	0.00
Group	-0.30	0.30	-1.01	0.31
Condition	-4.31	0.27	-15.97	0.00
Group:Condition	3.68	0.51	7.16	0.00
L1 English vs. L1 Spanish				
(Intercept)	0.34	0.21	1.65	0.10
Group	0.70	0.27	2.64	0.01
Condition	-2.91	0.30	-9.67	0.00
L3 proficiency	-0.88	1.01	-0.87	0.39
Group:Condition	0.87	0.41	2.15	0.03
L2 proficiency in L1 English				
(Intercept)	0.34	0.19	1.81	0.07
L2 proficiency	0.24	0.98	0.24	0.81
Condition	-2.90	0.31	-9.37	0.00
L3 proficiency	-1.47	1.31	-1.13	0.26
L2 proficiency:Condition	-1.85	1.50	-1.23	0.22
L2 proficiency in L1 Spanish				
(Intercept)	1.14	0.22	5.27	0.00
L2 proficiency	-2.35	2.15	-1.09	0.27
Condition	-1.90	0.32	-5.90	0.00
L3 proficiency	0.80	1.47	0.54	0.59
L2 proficiency:Condition	-2.79	3.41	-0.82	0.41

Table B.2. Results from the post-hoc analysis of the speeded acceptability judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 4.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	0.95	0.17	5.65	0.00
Group	0.05	0.30	0.17	0.87
Condition	-4.16	0.34	-12.42	0.00
Group:Condition	4.31	0.64	6.77	0.00
L1 English vs. L1 Spanish				
(Intercept)	0.71	0.22	3.26	0.00
Group	0.62	0.28	2.18	0.03
Condition	-2.52	0.26	-9.83	0.00
L3 proficiency	-0.81	1.03	-0.79	0.43
Group:Condition	0.68	0.35	1.96	0.05
L2 proficiency in L1 English				
(Intercept)	0.67	0.21	3.19	0.00
L2 proficiency	-0.46	1.08	-0.42	0.67
Condition	-2.51	0.26	-9.69	0.00
L3 proficiency	-2.37	1.34	-1.76	0.08
L2 proficiency:Condition	-0.29	1.32	-0.22	0.82
L2 proficiency in L1 Spanish				
(Intercept)	1.25	0.18	7.09	0.00
L2 proficiency	-3.42	1.47	-2.32	0.02
Condition	-1.75	0.25	-7.00	0.00
L3 proficiency	1.82	1.28	1.43	0.15
L2 proficiency:Condition	-5.89	2.47	-2.38	0.02

Table B.3. Results from the analysis of the speeded acceptability RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 4.

	Estimate	Std. Error	t value	Pr(>|t|)
L1 German vs. La German				
(Intercept)	6.50	0.05	132.38	0.00
Group	0.50	0.09	5.76	0.00
Condition	-0.13	0.04	-3.23	0.00
Group:Condition	-0.37	0.08	-4.61	0.00
L1 English vs. L1 Spanish				
(Intercept)	6.68	0.07	92.41	0.00
Group	0.09	0.10	0.88	0.39
Condition	-0.46	0.07	-6.32	0.00
L3 proficiency	0.11	0.39	0.28	0.78
Group:Condition	0.24	0.11	2.23	0.03
L2 proficiency in L1 English				
(Intercept)	6.69	0.06	108.85	0.00
L2 proficiency	0.13	0.33	0.40	0.69
Condition	-0.46	0.08	-6.08	0.00
L2 proficiency:Condition	0.27	0.41	0.66	0.51
L2 proficiency in L1 Spanish				
(Intercept)	6.80	0.09	76.29	0.00
L2 proficiency	-0.61	0.97	-0.63	0.54
Condition	-0.21	0.09	-2.28	0.02
L2 proficiency:Condition	-0.23	0.91	-0.25	0.80

Table B.4. Results from the post-hoc analysis of the speeded acceptability RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 4.

	Estimate	Std. Error	t value	Pr(>|t|)
L1 German vs. La German				
(Intercept)	6.49	0.04	147.88	0.00
Group	0.52	0.08	6.64	0.00
Condition	-0.08	0.04	-2.15	0.03
Group:Condition	-0.28	0.08	-3.67	0.00
L1 English vs. L1 Spanish				
(Intercept)	6.69	0.06	110.15	0.00
Group	0.07	0.09	0.79	0.43
Condition	-0.36	0.07	-5.41	0.00
L3 proficiency	-0.05	0.31	-0.16	0.88
Group:Condition	0.22	0.10	2.20	0.03
L2 proficiency in L1 English				
(Intercept)	6.69	0.05	129.53	0.00
L2 proficiency	0.10	0.26	0.39	0.70
Condition	-0.36	0.07	-5.30	0.00
L2 proficiency:Condition	0.42	0.37	1.16	0.25
L2 proficiency in L1 Spanish				
(Intercept)	6.78	0.07	103.39	0.00
L2 proficiency	-0.06	0.63	-0.10	0.92
Condition	-0.10	0.07	-1.38	0.17
L2 proficiency:Condition	-1.94	0.71	-2.72	0.01

B.7.2 Experiment 5

Table B.5. Results from the analysis of the speeded acceptability judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 5.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	0.40	0.23	1.72	0.09
Group	1.21	0.37	3.30	0.00
Condition	-6.03	0.54	-11.21	0.00
Group:Condition	4.86	0.97	5.03	0.00
L1 English vs. L1 Spanish				
(Intercept)	1.02	0.22	4.71	0.00
Group	0.00	0.30	0.01	0.99
Condition	-3.13	0.30	-10.40	0.00
L3 proficiency	-0.87	1.08	-0.80	0.42
Group:Condition	-0.58	0.43	-1.34	0.18
L2 proficiency in L1 English				
(Intercept)	1.07	0.25	4.26	0.00
L2 proficiency	-0.36	1.27	-0.28	0.78
Condition	-3.21	0.32	-10.03	0.00
L3 proficiency	-0.97	1.47	-0.66	0.51
L2 proficiency:Condition	-0.30	1.66	-0.18	0.86
L2 proficiency in L1 Spanish				
(Intercept)	1.02	0.23	4.39	0.00
L2 proficiency	0.82	1.86	0.44	0.66
Condition	-3.73	0.37	-10.10	0.00
L3 proficiency	-0.93	1.75	-0.53	0.60
L2 proficiency:Condition	2.88	3.19	0.90	0.37

Table B.6. Results from the analysis of the speeded acceptability RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 5.

	Estimate	Std. Error	t value	Pr(>|t|)
L1 German vs. La German				
(Intercept)	6.45	0.04	149.68	0.00
Group	0.69	0.08	8.20	0.00
Condition	0.14	0.03	4.45	0.00
Group:Condition	0.11	0.06	1.76	0.08
L1 English vs. L1 Spanish				
(Intercept)	6.76	0.06	105.13	0.00
Group	0.05	0.09	0.59	0.56
Condition	0.14	0.06	2.59	0.01
L3 proficiency	-0.38	0.34	-1.13	0.27
Group:Condition	0.17	0.08	2.15	0.03
L2 proficiency in L1 English				
(Intercept)	6.76	0.07	99.18	0.00
L2 proficiency	-0.26	0.33	-0.79	0.44
Condition	0.16	0.06	2.79	0.01
L2 proficiency:Condition	-0.76	0.32	-2.38	0.02
L2 proficiency in L1 Spanish				
(Intercept)	6.80	0.07	99.41	0.00
L2 proficiency	-0.41	0.68	-0.61	0.55
Condition	0.31	0.05	5.83	0.00
L2 proficiency:Condition	0.54	0.51	1.05	0.29

Table B.7. Results from the post-hoc cognate analysis of the speeded acceptability judgments between L1 English and L1 Spanish speakers in relation to Condition in Exp.5.

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.00	0.22	4.62	0.00
Group	0.02	0.30	0.07	0.95
Condition	-3.16	0.30	-10.41	0.00
Cognates	-0.51	0.32	-1.59	0.11
L3 proficiency	-0.86	1.09	-0.79	0.43
Group:Condition	-0.53	0.44	-1.21	0.22
Group:Cognates	0.53	0.43	1.25	0.21
Condition:Cognates	0.02	0.57	0.03	0.97
Group:Condition:Cognates	0.45	0.85	0.52	0.60

Table B.8. Results from the post-hoc cognate analysis of the speeded acceptability RTs between L1 English and L1 Spanish speakers in relation to Condition in Exp.5.

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	6.76	0.06	105.29	0.00
Group	0.05	0.09	0.60	0.55
Condition	0.14	0.06	2.48	0.01
Cognates	0.07	0.07	1.05	0.30
L3 proficiency	-0.38	0.34	-1.10	0.28
Group:Condition	0.18	0.08	2.27	0.02
Group:Cognates	0.01	0.08	0.14	0.89
Condition:Cognates	-0.17	0.11	-1.57	0.12
Group:Condition:Cognates	0.25	0.15	1.66	0.10

B.7.3 Experiment 6

Table B.9. Results from the analysis of the speeded acceptability judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 6.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	0.06	0.20	0.28	0.78
Group	-0.15	0.36	-0.41	0.68
Condition	-6.67	0.35	-19.20	0.00
Group:Condition	2.93	0.61	4.83	0.00
L1 English vs. L1 Spanish				
(Intercept)	-0.15	0.26	-0.55	0.58
Group	0.11	0.33	0.32	0.75
Condition	-6.08	0.43	-14.16	0.00
L3 proficiency	-3.37	1.18	-2.84	0.00
Group:Condition	1.07	0.50	2.14	0.03
L2 proficiency in L1 English				
(Intercept)	-0.18	0.29	-0.60	0.55
L2 proficiency	-0.93	1.13	-0.82	0.41
Condition	-6.27	0.53	-11.78	0.00
L3 proficiency	-3.15	1.32	-2.38	0.02
L2 proficiency:Condition	-3.27	2.04	-1.60	0.11
L2 proficiency in L1 Spanish				
(Intercept)	-0.04	0.24	-0.17	0.87
L2 proficiency	0.05	2.29	0.02	0.98
Condition	-4.92	0.38	-12.89	0.00
L3 proficiency	-2.84	2.12	-1.34	0.18
L2 proficiency:Condition	3.58	3.06	1.17	0.24

Table B.10. Results from the analysis of the speeded acceptability RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 6.

	Estimate	Std. Error	t value	Pr(>|t|)
L1 German vs. La German				
(Intercept)	6.37	0.04	162.60	0.00
Group	0.48	0.07	6.39	0.00
Condition	0.01	0.02	0.44	0.66
Group:Condition	-0.03	0.05	-0.67	0.50
L1 English vs. L1 Spanish				
(Intercept)	6.54	0.06	106.18	0.00
Group	0.07	0.09	0.84	0.40
Condition	-0.11	0.04	-2.67	0.01
L3 proficiency	-0.20	0.31	-0.63	0.53
Group:Condition	0.21	0.06	3.35	0.00
L2 proficiency in L1 English				
(Intercept)	6.54	0.06	108.69	0.00
L2 proficiency	-0.11	0.31	-0.34	0.74
Condition	-0.11	0.04	-2.85	0.00
L2 proficiency:Condition	0.07	0.21	0.31	0.75
L2 proficiency in L1 Spanish				
(Intercept)	6.61	0.06	103.43	0.00
L2 proficiency	0.91	0.60	1.52	0.14
Condition	0.10	0.05	1.99	0.05
L2 proficiency:Condition	0.33	0.45	0.73	0.46

B.7.4 Experiment 7

Table B.11. Results from the analysis of the speeded acceptability judgments in relation to Condition between L1 German and La German speakers, between L1 English and L1 Spanish speakers, and the effects of L2 proficiency in L1 English speakers and L1 Spanish speakers in Exp. 7.

	Estimate	Std. Error	z value	Pr(>|z|)
L1 German vs. La German				
(Intercept)	-0.02	0.17	-0.14	0.89
Group	0.48	0.27	1.81	0.07
Condition	-5.47	0.33	-16.82	0.00
Group:Condition	2.24	0.56	3.97	0.00
L1 English vs. L1 Spanish				
(Intercept)	0.40	0.22	1.83	0.07
Group	-0.11	0.29	-0.38	0.70
Condition	-4.04	0.29	-13.94	0.00
L3 proficiency	-1.01	1.01	-1.00	0.32
Group:Condition	-0.22	0.39	-0.55	0.58
L2 proficiency in L1 English				
(Intercept)	0.40	0.22	1.80	0.07
L2 proficiency	0.66	1.07	0.62	0.54
Condition	-4.04	0.32	-12.82	0.00
L3 proficiency	-0.28	1.20	-0.23	0.82
L2 proficiency:Condition	0.37	1.47	0.25	0.80
L2 proficiency in L1 Spanish				
(Intercept)	0.30	0.22	1.36	0.17
L2 proficiency	0.53	1.94	0.27	0.78
Condition	-4.30	0.35	-12.45	0.00
L3 proficiency	-3.02	1.86	-1.63	0.10
L2 proficiency:Condition	3.58	2.68	1.34	0.18

Table B.12. Results from the analysis of the speeded acceptability RTs in relation to Condition between L1 German and La German speakers, and between L1 English and L1 Spanish speakers in Exp. 7.

	Estimate	Std. Error	t value	Pr(>|t|)
L1 German vs. La German				
(Intercept)	6.30	0.05	131.82	0.00
Group	0.55	0.08	7.02	0.00
Condition	0.12	0.03	3.90	0.00
Group:Condition	0.04	0.06	0.62	0.54
L1 English vs. L1 Spanish				
(Intercept)	6.55	0.07	95.28	0.00
Group	0.01	0.09	0.16	0.87
Condition	0.08	0.05	1.56	0.12
L3 proficiency	-0.19	0.32	-0.60	0.55
Group:Condition	0.09	0.07	1.21	0.23
L2 proficiency in L1 English				
(Intercept)	6.55	0.07	92.61	0.00
L2 proficiency	-0.26	0.34	-0.79	0.44
Condition	0.08	0.05	1.54	0.12
L2 proficiency:Condition	0.09	0.27	0.32	0.75
L2 proficiency in L1 Spanish				
(Intercept)	6.56	0.07	95.84	0.00
L2 proficiency	0.48	0.60	0.80	0.43
Condition	0.16	0.05	3.20	0.00
L2 proficiency:Condition	-0.31	0.47	-0.66	0.51

A.7.3 Effect of order of acquisition in the four experiments

Table B.13. Impact of order of acquisition on the speeded acceptability judgments of all experiments in Study 2.

	Estimate	Std. Error	z value	Pr(>|z|)
Experiment 4				
(Intercept)	0.02	0.26	0.07	0.94
L1Spanish	1.23	0.53	2.32	0.02
Condition	-2.89	0.38	-7.58	0.00
Order Languages	0.61	0.35	1.75	0.08
L3 proficiency	-1.23	0.94	-1.31	0.19
Group:Condition	0.89	0.84	1.07	0.29
Group:Order Languages	-0.86	0.63	-1.38	0.17
Condition:Order Languages	-0.82	0.56	-1.45	0.15
Group:Condition:Order Languages	0.76	0.98	0.77	0.44
Experiment 5				
(Intercept)	0.72	0.30	2.39	0.02
Group	-0.33	0.69	-0.48	0.63
Condition	-3.58	0.44	-8.17	0.00
Order Languages	0.49	0.39	1.27	0.20
L3 proficiency	-0.57	1.06	-0.54	0.59
Group:Condition	0.67	0.97	0.69	0.49
Group:Order Languages	0.22	0.77	0.29	0.77
Condition:Order Languages	0.86	0.57	1.50	0.13
Group:Condition:Order Languages	-1.77	1.10	-1.60	0.11
Experiment 6				
(Intercept)	-0.20	0.36	-0.57	0.57
Group	0.44	0.68	0.65	0.51
Condition	-6.24	0.59	-10.52	0.00
Order Languages	0.10	0.49	0.20	0.84
L3 proficiency	-3.50	1.22	-2.86	0.00
Group:Condition	1.99	0.93	2.13	0.03
Group:Order Languages	-0.44	0.81	-0.54	0.59
Condition:Order Languages	0.26	0.77	0.34	0.74
Group:Condition:Order Languages	-1.21	1.14	-1.06	0.29
Experiment 7				
(Intercept)	0.47	0.29	1.62	0.10
Group	-0.89	0.59	-1.50	0.13
Condition	-4.14	0.39	-10.53	0.00
Order Languages	-0.14	0.39	-0.36	0.72
L3 proficiency	-0.89	1.00	-0.88	0.38
Group:Condition	0.41	0.80	0.51	0.61
Group:Order Languages	1.00	0.69	1.44	0.15
Condition:Order Languages	0.21	0.54	0.40	0.69
Group:Condition:Order Languages	-0.89	0.94	-0.94	0.35