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ORIGINAL ARTICLE

Interactions between lexical and syntactic L1-L2 overlap: Effects of gender congruency on L2 sentence processing in L1 Spanish-L2 German speakers

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Abstract

Bringing together lines of research from sentence processing and lexical access, this empirical study investigates the interplay between lexical (grammatical gender) and syntactic (word order) cross-linguistic overlap in L2 German. Eighty-six L1 Spanish-L2 German and thirty-six monolingual German adults completed a German self-paced reading task with noun phrases (NPs) manipulated by L1-L2 gender congruency (congruent, incongruent, neuter) and L1-L2 adjective-noun word order (pre- vs. postnominal adjectives). The study examines the effects of gender congruency, the type of L1-L2 gender mapping (i.e., presence vs. absence of each class in L1 and L2), and L2 proficiency level. Results show that the detection of ungrammatical word order in L2 German interacts with gender congruency, in that L2 speakers are only sensitive to word order violations for sentences with gender-congruent nouns. The detection of ungrammaticality for sentences containing gender-incongruent nouns only emerges at higher L2 proficiency levels. These findings underscore the role of cross-linguistic lexical overlap in syntactic processing.

Keywords: L2 processing; L2 acquisition; lexical and syntactic interaction; grammatical gender; cross-linguistic influence; asymmetric gender systems

Introduction

Research on the bilingual mental lexicon shows that bilinguals activate both languages when speaking and understanding the L1 or the L2 (for a review see Tokowicz, 2015). Such "fundamental permeability" (Kroll, 2015) between languages, evident in cross-linguistic influence, is often considered a hallmark of

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bilingual language processing. Permeability extends into grammar, with learners, for instance, being affected by the grammatical gender of nouns in one language even when processing sentences in another (gender congruency effect; Morales et al., 2016). At the same time, there is mixed evidence of cross-linguistic effects at the sentence level. While work on L2 sentence production – mostly from cross-linguistic priming studies – suggests a high degree of interactivity between the L1 and L2 also at a structural level (e.g., Hartsuiker & Bernolet, 2017), research on L2 sentence comprehension often reports that L2 comprehenders demonstrate analogous processing patterns despite L1 differences (see Hopp, 2022 for a review). Such absence of cross-linguistic effects has been interpreted as reflecting an overall tendency among adult L2 learners to underuse syntactic information in L2 real-time comprehension (e.g., Clahsen & Felser, 2006, 2018).

This general observation of cross-linguistic influence at the lexical level and its comparative absence at the syntactic level – together with a general underreliance on syntax – has spurred research to consider how lexical and syntactic processing may interact in L2 adults. According to the Shared Syntax model for language production (Hartsuiker & Bernolet, 2017), L2 grammatical representations are initially lexically specific (i.e., tied to particular lexical items), and learners only gradually abstract grammatical structure. At a higher proficiency, learners connect abstract structural properties across languages, which leads to cross-linguistically shared syntax. In this way, lexical acquisition paves the way to L2 syntax. Other approaches have focused on how lexical processing can impede target sentence processing. For instance, the Lexical Bottleneck Hypothesis (Hopp, 2018) stipulates that incomplete parsing arises partially from greater demands on lexical processing in bilinguals, as evidenced by slowdowns in lexical access (e.g., Hopp, 2016; Miller, 2014) and cross-linguistic influence in lexical processing (Hopp & Lemmerth, 2018).

The present study investigates the interaction between syntactic and lexical gender congruency in Spanish as the L1 and German as the L2, that is, two languages with a different number of gender classes. We developed a self-paced reading task in German where we manipulated lexical and syntactic cross-linguistic overlaps in Spanish and German with a particular focus on attributive adjectives. To investigate syntactic congruency, attributive adjectives appeared either pre- or postnominally within the noun phrase (NP). While postnominal adjectives are grammatical in Spanish, they are ungrammatical in German, as the language requires attributive adjectives to appear prenominally. To investigate lexical congruency, the grammatical gender of the nouns in the NPs was either congruent between Spanish and German, incongruent (e.g., Spanish masculine-German feminine), or neuter in German. We examine (a) how lexical gender and syntactic overlap interact during L2 sentence processing; (b) whether the type of L1-L2 mappings of gender affects L2 sentence processing (i.e., whether the gender has an analogous value in the L1); and (c) whether L2 proficiency plays a role. The findings demonstrate that lexical gender congruency interacts with incremental sensitivity to syntactic ungrammaticality, in that L1 Spanish learners of German only show slowdowns for sentences with ungrammatical Spanish-like postnominal attributive adjectives if the gender of the nouns in the NPs is congruent with Spanish. For gender-incongruent nouns, only higher proficiency learners come to be sensitive to the ungrammaticality of Spanish NP word order in German.

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Background

Interactions between lexical and syntactic processing

When reading or listening to sentences in the L2, late learners often demonstrate attenuated, slower, or absent reflexes of syntactic structure building compared to native speakers. These are manifested in difficulties or delays in the resolution of syntactic ambiguities or lower and delayed sensitivity to ungrammatical syntax during real-time comprehension (for a review, see Roberts, 2013).

Many approaches relate these difficulties in processing L2 morphosyntax to lower degrees of the availability of grammar to L2 learners as compared to L1 speakers (Clahsen & Felser, 2006, 2018), stronger interference from competing information (e.g., Cunnings, 2017), or lower degrees of integration of morphosyntactic information in a late-learnt L2 (e.g., Jiang, 2007). Yet others have raised the possibility that some of these difficulties may be natural consequences of bilingualism; that is, the distribution of language use across two languages and the concurrent activation of all languages during bilingual language processing (see Hopp, 2018 for a review).

On the one hand, bilinguals divide their time across two languages such that they have less experience with either language than a monolingual speaker of that language. Consequently, they encounter words and sentences in each language less frequently. As argued by the Weaker Links (or frequency lag) hypothesis by Gollan and colleagues (e.g., Gollan et al., 2008), less use translates into larger frequency effects in lexical retrieval, with bilinguals suffering delays in word recognition, particularly for lower-frequency words. Several studies have examined potential consequences of slower lexical processing for sentence comprehension.

One line of work manipulates lexical processing by item-level factors, such as the lexical frequency of words in the sentences. As in L1 processing (Tily et al., 2010), L2 readers show earlier evidence of structure building with high-frequency than with low(er)-frequency nouns (Hopp, 2017; Miller, 2014). Another line of work relates individual differences in lexical processing at the participant level to differences in sentence processing. For instance, L2 learners with faster lexical decoding skills demonstrate more target-like processing of ambiguous sentences, while less efficient lexical decoders are not sensitive to L1-L2 structural differences in sentence processing (Cheng et al., 2021; Hopp, 2014). Such findings extend to the processing of grammatical gender (Hopp, 2013), suggesting that efficient lexical access is a prerequisite for target grammatical processing. In turn, when lexical processing is slower and more taxing in an L2 compared to an L1, it may have knock-on effects on syntactic structure-building operations in real time. These operations can only be successfully executed once the lexical items incorporated in the parse have been processed to some degree.

On the other hand, the integrated (or non-selective) nature of lexical access in bilinguals can impact sentence processing. As bilinguals automatically activate all of the languages in their lexicon – including grammatical information such as grammatical gender – this spreading activation can lead to different, more diffuse, or delayed use of grammatical information in sentence comprehension. In a series of studies with Russian-German bilinguals, Hopp and Lemmerth (2018; Lemmerth & Hopp, 2019) examined how the predictive processing of grammatical

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gender agreement in an L2 is affected by gender congruency with the L1. In a visual-world eye-tracking study, they studied whether Russian-German bilinguals could use grammatical gender marked on articles (e.g., $der_M/die_F/das_N$) or adjectives ($blauer_M/blaues_N$ "blue") to anticipate a following noun (e.g., $Tisch_M/Lampe_F/Haus_N$). Of note, the study contrasted the gender congruency of the German nouns with Russian such that nouns and their translation equivalents were either gender-congruent ($Lampe_F$-$lampa_F$ "lamp") or gender-incongruent ($Haus_N$-dom_M "house"). In addition, the conditions varied as to whether they were syntactically congruent (i.e., both German and Russian have gender marking on prenominal adjectives), or syntactically incongruent (i.e., only German marks gender on articles since Russian does not have articles). The results show that, for intermediate adult L2 learners, lexical and syntactic congruency interacted: they could only use gender for predictive agreement processing in the syntactically incongruent condition (articles) if the nouns were gender-congruent between German and Russian, even when target knowledge of the nouns and their genders was controlled (see also Weber & Paris, 2004). For successive bilingual Russian-German children, Lemmerth and Hopp (2019) also found that gender congruency was a prerequisite for target syntactic prediction according to gender agreement. These findings indicate that lexical gender congruency effects observed in predictive processing interact with syntactic processing, leading to delayed and less robust referent identification when the gender of the nouns implicated in the agreement relation does not overlap between L1 and L2.

This body of evidence led to the formulation of the *Lexical Bottleneck hypothesis* (LBH; Hopp, 2018), arguing that incomplete parsing in an L2 can partially arise from slowdowns at the lexical level and the non-language-selective nature of lexical access in bilinguals. Lexical processing constitutes a bottleneck, in that lexical retrieval consumes time and resources that then cut short the subsequent target computation of syntax or lead to differences in the activation of grammatical information in bilinguals. In this paper, we test the scope of the Lexical Bottleneck hypothesis in the processing of word order violations in NPs containing L1-L2 gender-congruent, incongruent, or neuter nouns. In this way, we investigate whether the effects of lexical gender congruency observed in predictive L2 processing of gender agreement – where incongruency in gender leads to less successful referent identification – can also be seen in slower processing of non-target syntax in the L2 when the latter corresponds to licit word orders in the L1.

Interplay between L1-L2 gender mapping and lexical congruency effects

Previous work from individual word production and processing has further shown that it is not simply a matter of whether gender is cross-linguistically congruent or incongruent, but that the nature of the gender mapping impacts L2 lexical access. Most of the studies that have examined gender interactions in asymmetric systems, where there is no straightforward mapping for one of the gender classes (e.g., German neuter for Spanish-German bilinguals), yield different findings for incongruent versus asymmetric gender classes.

Testing bilinguals with a three-gender L1 and a two-gender L2, Manolescu and Jarema (2015) conducted an L2 picture naming task and a timed L2 translation task

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with L1 Romanian-high proficient L2 French adults. In naming, reaction times (RTs) were significantly faster for both congruent and neuter nouns (i.e., Romanian neuter and masculine/feminine in French) compared to incongruent (masculine-feminine mismatched) nouns. The same pattern of results was found in the translation task, though in this case neuter did not differ statistically from incongruent. In a similar vein, Paolieri and colleagues (2019) examined gender representation in L1 Russian-high proficient L2 Spanish adults using two timed L2 translation tasks. Bare noun translation revealed significantly faster RTs for congruent than incongruent, for neuter than incongruent, and also for congruent than neuter nouns (with only the latter differing from findings with L1 Romanian-L2 French speakers). NP (article+noun) translation offered a similar pattern of results, though the difference between incongruent and neuter nouns was not significant.

Focusing on bilinguals with a two-gender L1 and a three-gender L2, Klassen (2016b) conducted a timed binary choice NP (article+noun) grammaticality judgment task with L1 French-intermediate L2 German adults. Results showed significantly faster RTs for congruent nouns compared to incongruent ones, with no significant difference between incongruent and neuter or congruent and neuter. Finally, in the most relevant previous study, L1 Spanish-intermediate L2 German adults completed an L2 picture naming task (Klassen 2016a). RTs were significantly faster with congruent than incongruent and with neuter than incongruent, while there was no significant difference between congruent and neuter nouns.

Across studies, there is a trend for faster RTs for neuter nouns than incongruent ones, although technically both of these conditions consist of gender mismatches between the L1 and L2.

Klassen (2016a,b) argues that the asymmetry between neuter and incongruent nouns can be accounted for by the language-specific nature of the neuter gender node in a system where symmetric genders across the L1 and L2 have a shared representation. Within this L1-L2 integrated representation (Salamoura & Williams, 2007), the activation of masculine and feminine gender nodes that are common to both the L1 and the L2 – as is the case with incongruent nouns – creates interference in the response. This interference arises due to the competition for selection between the shared nodes, as the mismatching genders of the lexical items conflict symmetrically. In other words, the masculine gender of a word presented in the task interferes with lexical selection, as its translation equivalent in the other language has feminine gender. In contrast, with neuter nouns, neuter gender does not interfere with lexical selection, since it does not compete with a node available in the other language. Compared to congruent nouns (in which selection is facilitated by the L1 and L2 both activating the same shared gender node), and incongruent nouns (where selection is symmetrically inhibited), neuter nouns lead to asymmetric, one-sided interference only, which generates lower levels of response interference due to the gender class that is unique to the L2 (Figure 1). To examine whether this pattern of results emerging from lexical access studies extends beyond words produced and processed in isolation, this study also examines the role of neuter nouns in sentence processing in Spanish-German learners.

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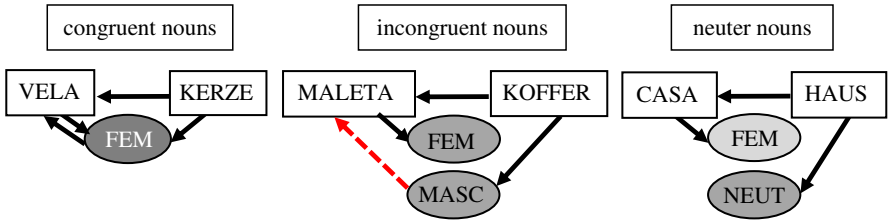

Figure 1. Illustration of Gender Node Activation for Congruent (Spanish Feminine-German Feminine; "candle"), Incongruent (Spanish Feminine-German Masculine; "suitcase"), and Neuter (Spanish Feminine-German Neuter; "house") Nouns.

Gender and the NP in Spanish and German

Both Spanish and German instantiate grammatical gender, with Spanish making a two-way distinction between masculine and feminine, while German displays the three-way distinction masculine, feminine, and neuter. Approximately half of the nouns in each of the languages are assigned to masculine gender, with the remaining half constituting either feminine or feminine and neuter (for Spanish: 52% masculine, 45% feminine (Bull, 1965); for German: 50% masculine, 30% feminine, 20% neuter (Bauch, 1971)).

Spanish is considered to have a largely transparent gender system: approximately two-thirds of nouns end in *-o* or *-a* – corresponding to masculine or feminine, respectively, in more than 96% of instances (Teschner, 1987) – while the remaining third end in *-e* or a consonant (Harris, 1991). Gender is similarly transparently marked on articles and adjectives. In contrast, German gender marking is rather opaque and non-predictable, offering only some probabilistic semantic or morphophonological regularities (e.g., Köpcke & Zubin, 1996). However, there are so many exceptions that L2 speakers must typically learn each noun gender individually. For this reason, gender is only clearly marked on articles and attributive adjectives, even though the transparency of gender marking is compromised by high levels of syncretism among case, number, and gender.

Of particular relevance to the present study are indefinite articles and attributive adjectives in nominative case. Spanish marks gender on these elements transparently and with unique entries in each instance, while German displays syncretism between masculine and neuter with indefinite articles, but unique adjectival endings by gender. These paradigms are illustrated in Table 1.

In addition, Spanish and German differ syntactically in the realization of attributive adjectives with respect to the relative order of the noun and adjective within the NP. Canonically, attributive adjectives appear postnominally in Spanish (Bosque & Picallo, 1996) but prenominally in German (Behaghel, 1923). As seen in Table 1, there is no overlap in the syntactic realization of adjectives between Spanish and German, while there can be lexical overlap in the gender of nouns for gender-congruent nouns. In addition, nouns can differ cross-linguistically with respect to gender in two ways: on the one hand, German nouns can have the opposite gender of their translation equivalent in Spanish; on the other hand, they can have an asymmetric (neuter) gender which is not available in Spanish.

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Table 1. Indefinite article forms and attributive adjective endings in nominative case for Spanish and German

	Indefinite articles		Adjective endings		NP example		
	Spanish	*German*	*Spanish*	*German*	*Spanish*	*German*	Translation
masculine	un	ein	-o	-er	un anillo **hermoso**	ein **schöner** Ring	a **beautiful** ring
feminine	una	eine	-a	-e	una bolsa **amarilla**	eine **gelbe** Tüte	a **yellow** bag
neuter		ein		-es		ein **blaues** Hemd	a **blue** shirt

The present study

Research questions

Against this backdrop, the present study investigates possible connections between lexical and syntactic processing. Specifically, we focus on the following research questions:

RQ1: How do lexical gender and syntactic congruency interact during sentence processing in an L2?

As suggested by the Lexical Bottleneck Hypothesis, we expect to find that interactions of lexical and syntactic processing extend to the processing of ungrammatical sentences during reading to the extent that less taxing lexical processing will facilitate target syntactic processing. Specifically, non-target syntax, that is, postnominal attributive adjectives in German, should be easier to detect when the nouns are congruent in lexical gender class.

RQ2: Does the type of L1-L2 mappings of gender affect sentence processing?

Given the results emerging from studies on words processed in isolation (e.g., Klassen, 2016a,b), we expect that neuter nouns, for which there is no analogue in Spanish, will be processed differently from feminine and masculine incongruent nouns, given the contrast in the nature of cross-linguistic competition between masculine and feminine and the competition between masculine/feminine and the asymmetric gender with no representation in the L1 (neuter). Hence, ungrammaticality detection should be easier for neuter nouns than incongruent nouns.

RQ3: How does L2 proficiency affect the processing of cross-linguistic overlap?

On the basis of previous research on word recognition and sentence processing, we expect that learners at lower proficiency levels will show greater congruency effects (e.g., Hopp & Lemmerth, 2018; Sá-Leite et al., 2020), since the L1 affects L2 processing to a greater extent at lower proficiency. Larger effects of gender congruency will attenuate or delay their sensitivity to ungrammaticality during sentence processing (e.g., Hopp, 2006; Jackson, 2008). As a consequence, we explore effects of proficiency in the present study by adding proficiency as a continuous predictor variable.

Design

To address these research questions, we developed a self-paced reading task in German in which lexical and syntactic cross-linguistic overlaps in Spanish (L1) and German (L2) were manipulated. In the experimental items, target manipulations focused on the gender of nouns at the lexical level and the relative order of attributive adjectives and nouns in NPs at the syntactic level. The manipulations at the level of syntactic overlap resulted in grammatical and ungrammatical sentences in German. Attributive adjectives appear prenominally in German, but

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Table 2. Participant information

	L1 German (n=35)		L2 German (n=60)	
	Mean (SD)	Range	Mean (SD)	Range
age	37.6 (11.3)	18–66	31.5 (11.7)	18–50
gender	19 female 16 male		44 female 15 male 1 unknown	
proficiency			54.7% (14%)	23.3–90.0%

postnominally in Spanish – with few exceptions. Thus, sentences that were grammatical in German (Adj-N) would be ungrammatical in Spanish, and those that were ungrammatical in German (N-Adj) would be grammatical in Spanish.

With respect to lexical gender overlap, nouns were either congruent between German and Spanish (masculine or feminine in both L1 and L2; MM & FF), incongruent (masculine-feminine mismatches between L1 and L2; MF & FM), or neuter (masculine or feminine in L1 and neuter in L2; MN & FN).

Participants

In total, 122 adults participated in this study: L1 Spanish speakers who were L2 learners of German (n=86) and L1 German speakers as the control group (n=36). Participants were recruited through German-teaching colleagues in Spain and via the authors' networks in both Spain and Germany. Due to travel restrictions at the time of testing, all participants completed the study over the internet, using the Gorilla Experiment Builder platform (Anwyl-Irvine et al., 2019).

All L2 German participants were adult L2 learners with no significant exposure to another language with grammatical gender. Prior to data analysis, we excluded L2 participants who had L1s in addition to Spanish (n=3), who did not complete the post-task (n=15), and who did not adhere to the instructions in the experiment (n=2). Table 2 shows the age and gender information for all remaining participants, as well as the proficiency means for the L2 group. Proficiency was assessed by a standardized 30-item written placement test of German (Goethe-Institut, 2010).

All speakers in the L1 control group were living in Germany at the time of testing and did not have any knowledge of Spanish. From the 36 native speakers, we excluded one participant who had an additional L1 to German.

Materials

For the reading study, we created 48 pairs of experimental items, as in (1), which contained a complex NP as a subject in an embedded clause. The main clause always consisted of a predicative adjective, followed by the conjunction *denn* ("because"), the NP, a copula verb, and two prepositional phrases (PPs), serving as spillover regions[1]. The order of nouns and adjectives was either grammatical (prenominal adjectives as in (1a)) or ungrammatical (postnominal adjectives as in (1b)) in German.

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(1a) Ich bin dankbar, denn eine neue Schule ist in dem Altbau
I am thankful, because a new school is in the old-building
am Marktplatz.
at-the market-square
"I am grateful because there is a new school in the old building on the market square."

(1b) *Ich bin dankbar, denn eine Schule neue ist in dem Altbau
I am thankful, because a school new is in the old-building
am Marktplatz.
at-the market-square

The nouns in the NP were manipulated by gender congruency. Forty-eight target nouns were selected from Klassen's (in prep) 96-word list of inanimate, non-cognate nouns according to gender congruency in Spanish and German. Sixteen of these nouns were gender-congruent (8 MM & 8 FF), 16 were incongruent (8 MF & 8 FM), and 16 were neuter (8 MN & 8 FN). Across conditions, target nouns were matched as closely as possible according to word frequency (TenTen, Jakubíček et al., 2013), number of letters, and number of syllables. In addition, 48 adjectives were selected and paired with the target nouns, also matching them as closely as possible by frequency, number of letters, and number of syllables across conditions (Appendix A). None of the adjectives selected were typically prenominal in Spanish. Subsequently, a total of 48 experimental sentences were created from the noun-adjective pairings, each with a grammatical (1a) and ungrammatical (1b) version.

The task also included 16 grammatical filler sentences containing grammatical (postnominal) predicative adjectives (2) that served to mitigate possible task effects created by the ungrammaticality of postnominal attributive adjectives in the experimental items. There were a further 8 grammatical and 8 ungrammatical sentences containing negation. In all, the task consisted of 80 sentences, 48 (60%) of which were grammatical and 32 ungrammatical (40%) (Appendix B).

(2) Ich bin besorgt, denn die Wolke ist dunkel und gewaltig.
I am worried, because the cloud is dark and huge
"I am worried because the cloud is dark and huge."

To ensure that the L2 speakers had sufficient knowledge of German gender, a gender assignment task including all German nouns in the experimental items was carried out following the reading task. In this 48-item post-task, participants selected the correct nominative definite article form (*der*$_{M}$, *die*$_{F}$ or *das*$_{N}$) for each of the target nouns.

Procedure

Two lists were created such that each participant saw either the grammatical or ungrammatical version of each of the experimental sentences (1a vs 1b) in addition to the grammatical and ungrammatical filler items. In total, each participant was presented with a total of 48 grammatical and 32 ungrammatical sentences, preceded

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by five practice sentences to familiarize participants with the task. Sentences were segmented by phrases as in (3)[2] and presented as a noncumulative, moving-window self-paced reading task programmed using Gorilla Experiment Builder (Anwyl-Irvine et al., 2019). All sentences were presented in 18-pt Open Sans font.

(3) a. Experimental sentences

Ich bin dankbar,	denn	eine neue Schule	ist	in dem Altbau
1	2	3	4	5

am Marktplatz.
6

b. Negation filler sentences

Ich bin verzweifelt,	denn	Jakob	spielt nicht	mit dem Ball	auf dem Hof.
1	2	3	4	5	6

Each trial began with a fixation cross and the first segment appeared after 500ms, with the participants using the spacebar to advance through the segments. Following each sentence, either a yes/no comprehension question targeting the first PP (segment 5) appeared (for 28 out of 80 trials) or a blank screen displayed for 1000ms. All sentences were randomized for each participant by the software, and participants were offered a break at the midpoint in the task.

The experimental session was completed via the internet by each participant using their personal computer. Technical (timeouts) and attention (intermittent instructions to click a specific button) checkpoints were included in the programming in order to ensure the quality of remotely collected data. Participants who scored less than 75% on the attention checks prior to the reading task as well as those who took less than 3 or more than 30 minutes to complete the proficiency task were automatically prevented from continuing the experiment.[3] Participants provided informed consent, completed the proficiency test, the self-paced reading task, and the gender assignment task. Finally, they filled out a language background questionnaire. The entire session lasted approximately 45 minutes, and participants were sent 20 Euro gift cards upon completion.

Results

We excluded participants in the L2 group who had fewer than two correct gender assignments in at least one condition in the post-task (n=6). We used the data from the post-task to exclude participants based on the number of data points in each condition – that is, participants had to have at least 2 correct gender assignments per condition – rather than excluding specific sentences for which the individual participant did not assign the correct gender, since target assignment is not relevant for gender congruency effects. L2 learners can link whatever gender of the noun is given in the input (i.e., the target German gender) to the gender of the Spanish translation equivalent, irrespective of whether they have target knowledge of German gender. Since the L2 participants are native Spanish speakers, we can be confident they know the gender of the Spanish translation equivalents. So if they see a German noun with feminine gender, they can link it to the translation equivalent in Spanish, which is either congruent or incongruent in gender. The congruency

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Table 3. Mean reading times by condition and group (in milliseconds). Standard error appears in parentheses.

	Congruent		Incongruent		Neuter	
Segment	*Grammatical*	*Ungrammatical*	*Grammatical*	*Ungrammatical*	*Grammatical*	*Ungrammatical*
L1 (n = 35)						
1	889 (52)	888 (67)	863 (50)	898 (53)	800 (37)	860 (50)
2	548 (23)	548 (25)	556 (29)	551 (24)	542 (31)	569 (31)
3	844 (51)	1015 (64)	870 (52)	1032 (65)	895 (50)	1143 (73)
4	573 (19)	659 (30)	585 (23)	698 (36)	595 (25)	692 (34)
5	708 (34)	709 (31)	718 (32)	748 (42)	695 (38)	721 (40)
6	944 (63)	932 (68)	927 (60)	908 (70)	904 (68)	956 (61)
L2 (n = 60)						
1	983 (85)	1043 (90)	966 (90)	954 (71)	970 (79)	908 (68)
2	514 (29)	509 (26)	524 (32)	515 (25)	515 (27)	538 (36)
3	1053 (70)	1081 (66)	1049 (71)	1065 (65)	1114 (74)	1141 (73)
4	542 (37)	610 (43)	580 (44)	590 (38)	570 (47)	599 (45)
5	787 (61)	803 (61)	845 (62)	794 (56)	798 (60)	786 (55)
6	761 (51)	792 (53)	774 (51)	743 (52)	781 (59)	800 (61)

effects arising from this mapping are independent of whether the participants have a target representation of German gender. Data for the remaining 60 adult L2 learners of German and the 35 native speakers were analyzed.

In the gender assignment task, gender accuracy among the L2 speakers varied across gender classes, with feminine nouns having higher accuracy (77%) than masculine (67%) and neuter (65%) nouns. Gender accuracy did not vary by gender congruency, with congruent nouns showing similar accuracy (68%) to incongruent nouns, including neuter items (70%). In all, the L2 group demonstrated considerably above-chance (> 33%) gender knowledge of the critical nouns used in the experimental sentences.

For the analysis of the reading times, we excluded all segments with reading times below 200 ms and above 5000 ms. In total, these exclusions removed less than 7.2% of the data. We then log-transformed the reading times (natural logarithm) to adjust for the skewness of their distribution, since the Box–Cox procedure (Box & Cox, 1964) confirmed that a log transformation was appropriate. Table 3 shows the mean reading times by conditions and group.

To address RQ1 about effects of gender congruency, we first compared the reading times of the congruent conditions (FF & MM) with those in the incongruent conditions (FM & MF). Figure 2 plots the reading times by condition and group per segment for the L1 group, and Figure 3 plots the reading times for the L2 group.

Using linear mixed-effects models in R, version 4.0.3 (R Core Team, 2015), including the lme4 package version 1.1-26 (Bates et al., 2015) and the lmertest

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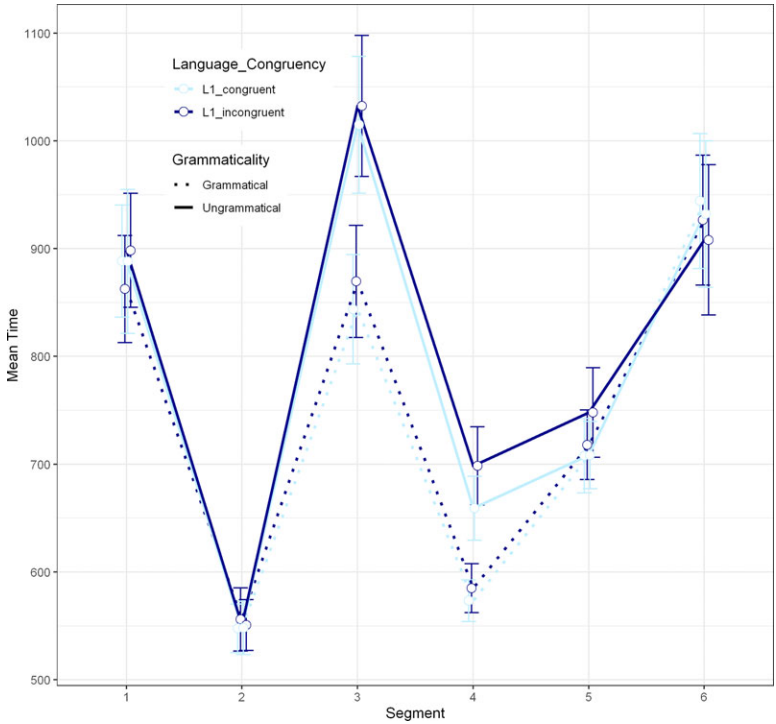

Figure 2. L1 Group (n = 35): Reading Times (in milliseconds) by Segment for the Congruent and Incongruent Conditions by Group and Grammaticality (Error Bars Show Standard Error of the Mean).

package (version 3.1-3), we fitted one model for each segment with Grammaticality (ungrammatical [−0.5] vs. ungrammatical [0.5]), Congruency (incongruent [−0.5] vs. congruent [0.5]), and Group (L1 [−0.5] vs. L2 [0.5]) as contrast-coded fixed effects to segments 3 to 6, including their interactions. In addition, we added noun frequency (web measures from the TenTen corpus, Jakubíček et al., 2013) as a scaled fixed effect. Since reading times in self-paced reading are subject to spillovers from one segment to the next, we also added the RTs of the previous segment as a fixed effect. Initially, we estimated models with a maximal random effects structure containing random slopes for Grammaticality, Congruency, and Frequency and their interactions on the random intercept of participants and random slopes for Grammaticality and Group and their interaction on the item intercept. We then used the "order" command in the buildmer package (version 2.3; Voeten, 2021) to obtain the maximal models that converge. The final models are reported by segment in Table 4.

On top of main effects of reading times on the previous segment, frequency, group, and grammaticality, the model returned significant interactions of group and grammaticality in segments 3 and 4, with this interaction being qualified by a three-way interaction between group, grammaticality, and congruency in segment 4. In light of the interactions with group, we performed separate analyses of segments 3 and 4 for the L1 group and the L2 group. For the analyses of the L2 group,

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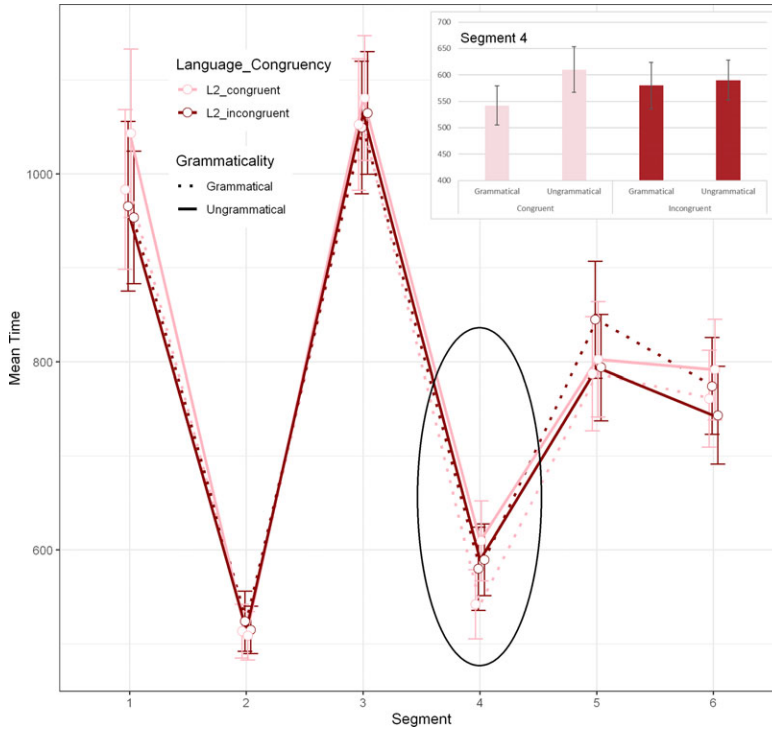

Figure 3. L2 Group (n = 60): Reading Times (in milliseconds) by Segment for the Congruent and Incongruent Conditions by Group and Grammaticality (Error Bars Show Standard Error of the Mean).

we added the proficiency score as a scaled fixed effect, including its interactions with grammaticality and congruency. For segment 3, analyses by group revealed that the L1 speakers demonstrated a highly significant main effect of grammaticality ($\beta = -0.069$; $SE = 0.012$; $z = -5.611$, $p < .001$), while the L2 group did not demonstrate a main effect of grammaticality ($\beta = -0.013$; $SE = 0.011$; $z = -1.211$, $p = .226$) or any interactions with it. No further effects or interactions reached significance in segment 3. For segment 4, Table 5 lists the models by group and by congruency for the L2 group. The L1 group did not show any significant effects beyond the main effect of grammaticality, while the L2 group demonstrated a main effect of grammaticality qualified by an interaction with congruency. As the subsequent comparisons by congruency show, the L2 group only evinced a main effect of grammaticality for sentences with congruent NPs, while there was no significant effect of grammaticality for sentences with incongruent NPs. For the latter, there was a trend for more highly proficient learners to make a difference between grammatical and ungrammatical sentences, as suggested by the marginally significant interaction of grammaticality and proficiency. In sum, the analyses suggest that the L2 group is less sensitive to the difference between grammatical and ungrammatical sentences than the L1 group, in that the L2 group only shows effects of grammaticality on segment 4 for sentences with gender-congruent NPs.

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Table 4. Comparison between sentences with congruent and incongruent NPs. Both groups (n = 95).

Segment 3 (NP)					Segment 4 (copula)				Segment 5 (PP1)				Segment 6 (PP2)			
Predictors	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p
(Intercept)	4.462	0.154	28.836	<**0.001**	6.107	0.082	74.717	<**0.001**	4.958	0.121	41.009	<**0.001**	4.597	0.118	38.866	<**0.001**
RT previous segment	0.366	0.024	15.257	<**0.001**	0.03	0.011	2.646	**0.008**	0.247	0.018	13.403	<**0.001**	0.306	0.018	17.393	<**0.001**
Grammaticality	0.043	0.009	4.758	<**0.001**	0.041	0.007	6.132	<**0.001**	−0.009	0.006	−1.479	0.139	−0.006	0.007	−0.809	0.419
Group	−0.033	0.043	−0.759	0.448	0.072	0.028	2.534	**0.011**	−0.027	0.033	−0.804	0.421	0.101	0.029	3.543	<**0.001**
Frequency	−0.011	0.009	−1.185	0.236	0.014	0.007	1.911	0.056	−0.017	0.006	−2.934	**0.003**	−0.015	0.006	−2.332	**0.020**
Congruency	−0.004	0.015	−0.233	0.816	−0.012	0.011	−1.115	0.265	−0.031	0.012	−2.584	**0.01**	0.024	0.014	1.753	0.080
Grammaticality *Group	0.029	0.009	3.346	**0.010**	0.017	0.007	2.599	**0.009**	0.002	0.006	0.442	0.658	0.001	0.007	0.070	0.944
Grammaticality *Congruency	0.003	0.015	0.186	0.852	0.010	0.011	0.921	0.357	0.003	0.012	0.276	0.783	0.038	0.013	0.286	0.775
Group* Congruency	−0.002	0.015	−0.125	0.901	−0.008	0.011	−0.719	0.472	0.015	0.012	1.283	0.200	−0.006	0.013	0.286	0.775
Group* Grammaticality* Congruency	−0.003	0.015	−0.164	0.870	−0.028	0.011	−2.480	**0.013**	−0.007	0.012	−0.587	0.558	0.005	0.013	0.376	0.707

Formula. logRT ~ 1 + logRT_previous + Group + Grammaticality + Group:Grammaticality + scale(Frequency) + Congruency + Grammaticality:Congruency + Group:Congruency + Group:Grammaticality: Congruency + (1 + scale(Frequency) + Grammatical | Participant) + (1 + Grammatical | Item)

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Table 5. Congruency comparison by group for Segment 4 in the experimental sentences.

	Segment 4 (copula) – L1 group (n = 35)				**Segment 4 (copula) – L2 group (n = 60)**				Segment 4 (copula) – L2 group – congruent items				Segment 4 (copula) – L2 group – incongruent items			
Predictors	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p
(Intercept)	6.408	0.154	41.581	<**0.001**	5.888	0.096	61.342	<**0.001**	5.888	0.128	45.970	<**0.001**	5.681	0.128	44.324	<**0.001**
RT previous segment	−0.005	0.022	−0.248	0.804	0.053	0.013	4.034	<**0.001**	0.053	0.018	2.935	**0.003**	0.084	0.018	4.655	<**0.001**
Frequency	−0.002	0.009	−0.175	0.861	0.019	0.104	1.872	0.061	−0.003	0.010	−0.295	0.768	0.036	0.016	−2.430	**0.025**
Grammaticality	−0.061	0.012	−5.330	<**0.001**	0.023	0.008	2.838	**0.005**	−0.043	0.012	−3.64	<**0.001**	0.001	0.010	0.035	0.972
Congruency	−0.019	0.018	−1.061	0.289	−0.004	0.014	−0.299	0.765								
Grammaticality * Congruency	0.017	0.017	1.008	0.314	0.042	0.014	2.960	**0.003**								
Proficiency					−0.036	0.039	−0.928	0.353	−0.027	−0.039	−0.671	0.500	−0.033	0.038	−0.873	0.383
Grammaticality * Proficiency					0.011	0.008	1.428	0.153	−0.006	0.012	−0.522	0.602	−0.019	0.010	−1.827	**0.068**
Congruency * Proficiency					−0.002	0.014	−0.155	0.877								
Grammaticality * Congruency * Proficiency					−0.012	0.014	−0.841	0.400								

Formula (for L2 group). logRT ~ 1 + logRT_previous + scale(Frequency) + scale(ProficiencyScore) + Grammaticality + scale(ProficiencyScore):Grammaticality + Congruency + Grammaticality: Congruency + scale(ProficiencyScore):Congruency + scale(ProficiencyScore):Grammaticality:Congruency + (1 + scale(Frequency) + Grammaticality | Participant) + (1 + Grammaticality | Item)

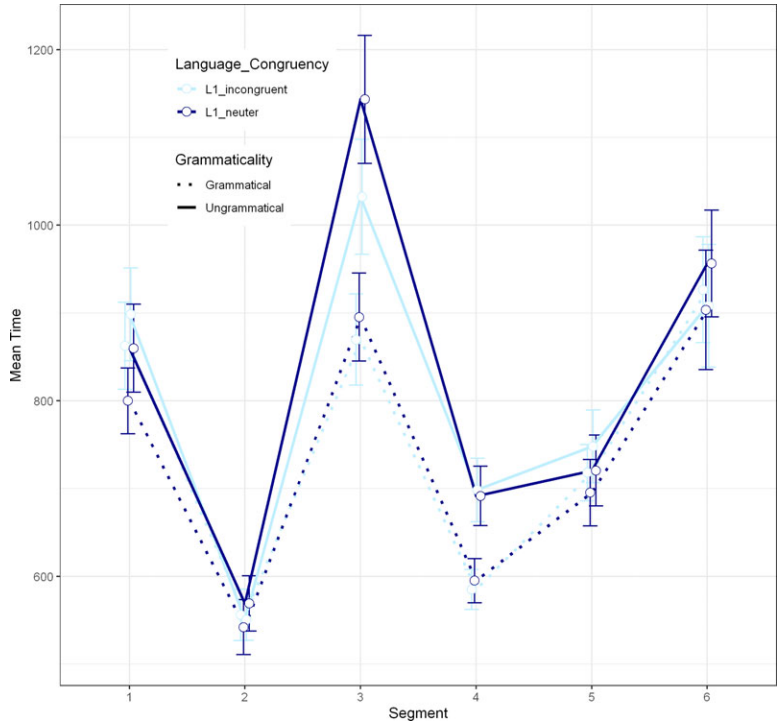

Figure 4. L1 Group (n = 35): Reading Times by Segment for the Neuter and Incongruent Conditions by Group and Grammaticality (Error Bars Show Standard Error of the Mean).

In order to answer RQ2 regarding the type of L1-L2 mappings, we compared sentences in the neuter condition with those containing incongruent nouns on the basis of our hypothesis that neuter nouns behave differently from incongruent nouns for L2 learners. Figure 4 graphs the reading times for neuter and incongruent nouns for the L1 group, and Figure 5 does so for the L2 group. As can be seen for the L2 group, the reading time differences are largely similar for neuter and incongruent nouns.

We fitted the same omnibus model as above to the data, the only difference being that the fixed effect of Congruency was defined as neuter (0.5) vs incongruent (−0.5). Table 6 shows the model output.

Beyond main effects of reading times on the previous segment, frequency, congruency, grammaticality, and group, the models returned two-way interactions between grammaticality and group on segments 3 and 4. Subsequent by-group models demonstrate that the main effects of grammaticality became significant for the L1 group in both segments (S3: $\beta = -0.080$; $SE = 0.013$; $z = -6.183$; $p < .001$; S4: $\beta = -0.066$; $SE = 0.0149$; $z = -4.445$; $p < .001$). In contrast, the L2 group did not show an effect of grammaticality in segment 3 ($\beta = -0.010$; $SE = 0.013$; $z = -0.777$; $p = .437$) and only a trend towards a main effect of grammaticality in segment 4 ($\beta = -0.013$; $SE = 0.007$; $z = -1.791$; $p = .0733$), which was qualified by an interaction with proficiency ($\beta = -0.016$; $SE = 0.007$; $z = -2.237$; $p = .0253$). Figure 6 plots the model output for the interaction between proficiency and the grammaticality effect in the L2

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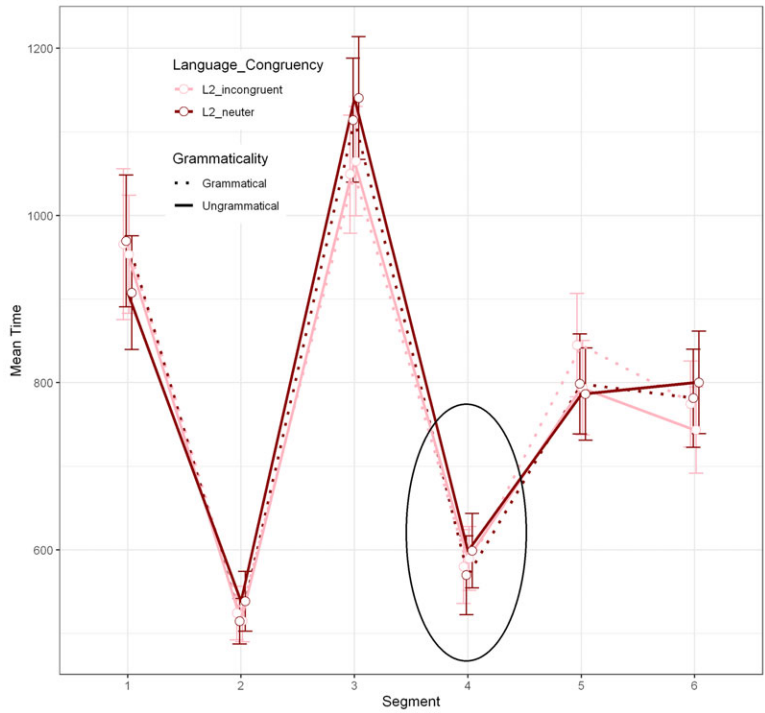

Figure 5. L2 Group (n = 60): Reading Times by Segment for the Neuter and Incongruent Conditions by Group and Grammaticality (Error Bars Show Standard Error of the Mean).

group across neuter and incongruent items in segment 4. It shows that more proficient L2 learners begin to make a difference between grammatical and ungrammatical sentences, while lower proficiency learners are not sensitive to grammaticality for sentences containing incongruent and neuter nouns.

As regards RQ3, then, the study finds an interaction between grammaticality and proficiency for sentences with incongruent and neuter NPs. This interaction illustrates that more highly proficient L2 learners tend to demonstrate longer reading times on segment 4 for ungrammatical versus grammatical sentences containing NPs that differ in gender between Spanish and German in being either of opposite or asymmetrical gender cross-linguistically.

Discussion

The aim of the current study was to investigate lexical gender effects in L2 syntactic processing. We manipulated the type of gender mapping between German and Spanish at the lexical level, as well as the syntactic grammaticality in the relative order of the noun and adjectives. We found that gender congruency interacts with the detection of syntactic ungrammaticality. L2 learners demonstrated grammaticality effects in processing sentences containing congruent nouns compared to those comprising incongruent nouns (RQ1). Second, there were no significant differences

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Table 6. Comparisons between sentences with neuter and incongruent NPs. Both groups (n = 95).

Segment 3 (NP)					Segment 4 (copula)				Segment 5 (PP1)				Segment 6 (PP2)			
Predictors	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p	Estimates	std. Error	Statistic	p
(Intercept)	4.760	0.147	32.413	<**0.001**	6.050	0.080	75.287	<**0.001**	5.174	0.118	43.762	<**0.001**	4.534	0.117	38.699	<**0.001**
RT_previous segment	0.323	0.023	14.326	<**0.001**	0.039	0.011	3.512	<**0.001**	0.212	0.018	11.801	<**0.001**	0.314	0.017	18.096	<**0.001**
Grammaticality	0.045	0.010	4.493	<**0.001**	0.039	0.007	5.718	<**0.001**	−0.005	0.007	−0.710	0.478	0.004	0.007	0.514	0.607
Group	−0.029	0.044	−0.654	0.513	0.081	0.029	2.776	**0.006**	−0.029	0.033	−0.860	0.390	0.099	0.028	3.488	<**0.001**
Frequency	0.007	0.008	0.870	0.384	0.013	0.008	1.588	0.112	−0.020	0.006	−3.246	<**0.001**	−0.014	0.007	−2.006	**0.045**
Congruency	−0.024	0.008	−3.103	<**0.001**	0.003	0.006	0.597	0.551	0.017	0.006	2.910	**0.010**	−0.012	0.007	−1.739	0.082
Grammaticality * Group	0.035	0.009	3.770	**0.010**	0.022	0.007	3.300	<**0.001**	0.007	0.007	1.117	0.264	−0.001	0.007	−0.113	0.901
Grammaticality * Congruency	−0.006	0.008	−0.822	0.411	−0.002	0.006	−0.407	0.684	−0.004	0.007	−0.722	0.470	−0.010	0.007	−0.113	0.910
Group * Congruency	−0.004	0.008	−0.577	0.564	−0.004	0.006	−0.728	0.466	0.015	−0.003	0.006	−0.523	0.003	0.007	0.487	0.626
Group * Grammaticality * Congruency	−0.006	0.008	−0.724	0.469	0.008	0.006	1.424	0.154	0.001	0.006	0.156	0.876	−0.001	0.007	−0.192	0.848

Formula. logRT ~ 1 + logRT_m1 + Group + Grammaticality + scale(Frequency) + Group: Grammaticality + Congruency + Grammaticality:Congruency + Group:Congruency + Group:Grammaticality: Congruency + (1 + scale(Frequency) + Grammaticality | Participant) + (1 | Item)

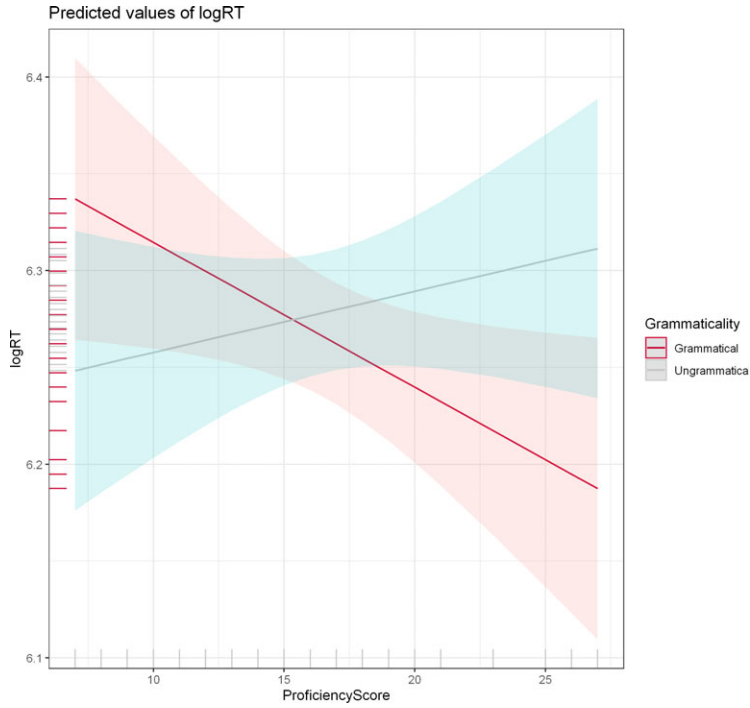

Figure 6. L2 Group: Interaction between Proficiency and Grammaticality in the Incongruent and Neuter Sentences on Segment 4; Model Output (n = 60).

in the processing of neuter nouns compared to incongruent nouns (RQ2). For both incongruent and neuter nouns, grammaticality effects emerged only at higher L2 proficiency levels (RQ3).

With respect to RQ1, the study found that L2 learners demonstrate earlier and stronger slowdowns for ungrammatical sentences comprising congruent as compared to incongruent nouns, while there was no such effect for the monolingual controls. Hence, the difference between conditions likely reflects effects of the L1, in that the activation of the same gender node by both Spanish and German appeared to speed up the integration and detection of the syntactic ungrammaticality of postnominal attributive adjectives in German. For gender-congruent nouns, learners demonstrated slowdowns associated with ungrammatical syntax on the segment following the NP, unlike the native control group that evinced the effects on both the NP and the following segment. Such a delay in incremental reading effects is common among L2 learners, especially at less than near-native proficiency levels (e.g., Hopp, 2010). Overall, this finding of congruency effects suggests that L2 learners are more sensitive to mismatches between L1 and L2 word order during L2 sentence comprehension when the nouns embedded within the ungrammatical segment match in gender between the L1 and the L2.

In principle, these lexical effects of gender are consistent with gender congruency effects reported in word recognition and production (e.g., Lemhöfer et al., 2008; Paolieri et al., 2010) and extend these findings to sentence contexts. Crucially, in this

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study, lexical congruency interacts with syntactic grammaticality detection. These results underscore that gender congruency has consequences for syntactic processing.

This pattern of results cannot be exhaustively accommodated by gender-integrated approaches to the bilingual mental lexicon. If gender congruency was limited to lexical co-activation of both languages due to non-selective access to the lexicon, congruent nouns should lead to globally faster reading times compared to incongruent nouns, irrespective of grammaticality differences. While compatible with gender-integrated models, the finding that gender congruency had specific effects for the detection of ungrammaticality requires additional explanation, as for instance, that provided by the Lexical Bottleneck Hypothesis (LBH). According to the LBH, fast lexical access leaves more time and resources for syntactic computations in real-time sentence processing, while greater demands on lexical processing can delay or attenuate syntactic structure building in real time among L2 learners. The present findings are compatible with this account, in that gender-congruent nouns are processed with greater ease, and thus, readers show sensitivity to syntactic ungrammaticality. Gender-incongruent nouns, in contrast, consume greater lexical processing resources, as learners need to inhibit the concurrent activation of the mismatching gender node in L1 Spanish as they process the German noun. As a consequence, reading slowdowns for ungrammatical versus grammatical word orders are attenuated or absent compared to congruent nouns and give rise to non-native syntactic processing.

In this respect, the findings are broadly similar to the ones reported for predictive gender processing among L1 Russian learners of German by Hopp and Lemmerth (2018). In their study, high-intermediate L2 learners showed predictive use of gender only for lexically congruent nouns in the syntactically incongruent (article) condition, while there were no effects of lexical congruency for gender agreement processing in syntactically congruent contexts, that is, gender marking on prenominal adjectives. The authors account for this asymmetry by arguing that L2 learners' use of inflection is limited when the syntactic realizations of agreement differ between the L1 and L2 (see also Tokowicz & MacWhinney, 2005). However, lexical gender congruency can ease agreement processing by lowering the processing demands associated with the non-overlapping syntax.

The present findings suggest that these facilitative effects of lexical congruency attested for the predictive use of gender information in syntactic agreement processing extend to identifying ungrammaticalities in syntactic processing, even if these do not involve mismatches in grammatical gender agreement between the L1 and L2. Instead, gender congruency at the lexical level facilitates the sensitivity to word order differences between the L1 and L2. From a broader perspective, the study adds to previous findings that L1-L2 lexical overlap, for example, by virtue of cognates, leads to more target-like L2 sentence processing (e.g., Miller, 2014) and reduces the interference of the L1 syntax (Hopp, 2017). As such, it highlights interdependencies between lexical and syntactic processing during L2 sentence comprehension.

As regards RQ2, this study goes beyond previous research on L2 sentence processing by addressing the question of how the presence (or absence) of an analogous L1 gender for the gender class in the L2 affects syntactic processing. Masculine and feminine are present in both Spanish and German and can be straightforwardly mapped onto each other, while there is no clear mapping for the German neuter

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given the absence of a third gender class in Spanish.[4] In this study, there were no differences in reading times for sentences with neuter nouns compared to those with incongruent nouns. For both incongruent and neuter nouns, effects of grammaticality detection only surfaced at higher proficiency levels, which suggests that the lexical bottleneck posed by lexical incongruency in gender class widens with more experience and greater facility in the L1. As can be seen in Figure 6, as proficiency rises, the reading times for grammatical sentences tend to reduce. This seems to indicate that, as proficiency rises, the lexical competition between different gender classes in the L2 and L1 can be resolved more easily, which in turn allows the parser to integrate syntactic ungrammaticality signals incrementally. When the effects of lexical competition abate, evidence of target syntactic processing emerges.

The finding that neuter nouns pattern with incongruent nouns is inconsistent with Klassen's (2016a,b) findings for words processed in isolation. In an L2 picture naming task, L2 German learners of Spanish showed significantly less response interference arising from the co-activation of the Spanish gender when asked to produce bare nouns or NPs containing neuter nouns compared to incongruent feminine or masculine nouns. To the best of our knowledge, the present study is the first to examine the effect of such an asymmetry in the L1 and L2 gender systems at the level of L2 sentence processing. Unlike isolated picture naming, in the present study, processing does not differ for neuter and incongruent nouns in sentence contexts in terms of affecting L2 learners' ability to detect syntactic violations. This could be due to the fact that more processes are involved in the sentences presented to participants in this reading experiment as compared to picture naming, which is largely limited to lexical retrieval. Further research is required to determine the precise locus of the asymmetric neuter effect in word recognition and its possible replication with other asymmetric gender language pairings.

Overall, the interactions between lexical and syntactic processing observed in the present study attest that the creation of syntactic structure in real-time L2 comprehension is sensitive to the lexical properties of the elements involved therein, even when these properties are not relevant for building the structure as such (see also Hopp, 2016; Miller, 2014; for L1 processing, see Tily et al., 2010). In L2 processing, lexical aspects unique to bilingualism, for example, cross-linguistic gender congruency effects, impact the time-course and degree of ungrammaticality detection in word order. In this respect, they also underscore that non-native-like processing signatures in syntax are not necessarily rooted in problems with using syntax in real time (e.g., Clahsen & Felser, 2006), but may be caused by difficulties at processing stages that precede and subserve syntactic processing. Accordingly, the present findings highlight the need for an integrated study of the bilingual language system, encompassing both the lexicon and the grammar, in order to delineate aspects of adult L2 grammatical processing that are natural consequences of bilingualism from those that may reflect maturational constraints on late L2 acquisition.

A potential limitation of this study is the collection of data via the internet with participants using their personal computers. While recent analyses of online versus laboratory data collection have shown reliable results with both methods (e.g., Anwyl-Irvine et al., 2020), we further minimized risks associated with unsupervised participation by controlling the type of device permitted by the software (computers only), introducing technical and attentional checkpoints into the programming, and

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imposing strict inclusion criteria on the data in the analyses (see the Participants and Results sections for details). Even with discarding data from 27 participants, our study included a large sample (n = 95) that found robust effects comparable to laboratory-based experiments.

Another potential limitation lies in the fact that we only tested one bilingual group and that we therefore cannot definitively tie the findings to effects coming from L1 Spanish. However, given that the native German control group did not show congruency effects, noun and adjective frequency were controlled across conditions, and the congruent and incongruent nouns were indistinguishable in gender assignment accuracy in the post-task, there is no reason to believe that the different pattern of results across the conditions reflects item-level differences. Hence, we confidently relate the differential results between congruent, incongruent, and neuter nouns to L1 effects. Nevertheless, a further study could test a different L1 group whose L1 has prenominal adjectives to explore if similar effects of gender congruency on syntactic ungrammaticality detection can be observed, even if the ungrammatical word order in the L2 does not map to a licit word order in the L1.

Conclusion

In sum, this study reveals lexical gender effects in bilinguals' detection of ungrammatical word order in L2 sentence processing. It suggests that lexical bottlenecks in L2 sentence processing reduce sensitivity to ungrammatical syntax. These findings not only advance the state of the art but also open new avenues for further research at the crossroads between lexical gender and syntactic congruency in bilinguals.

Notes

1. *Denn* was chosen in order to avoid verb-final word order in the embedded clause.

2. The mean number of letters and syllables in critical and spillover regions was balanced across sentences according to gender congruency and grammaticality conditions.

3. The minimum time to complete the proficiency test was based on the fastest native speaker completion times in piloting, and a maximum was established in order to prevent participants from stopping frequently to search for answers on the internet.

4. Considerable evidence from 2L1 children's code-switches between the article and the noun shows that pre-school-age children draw connections between masculine and feminine across Romance and Germanic languages. Findings such as those in Cantone and Müller (2008) and Eichler, Hager and Müller (2012) illustrate that in spontaneous speech, 2L1 Spanish-German, Italian-German, and French-German children have a general tendency to produce code-switched NPs in which there is cross-linguistic gender agreement between the article and the noun (e.g., $una_{SP\text{-}fem}$ $Schlange_{GER\text{-}fem}$ "a snake").

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Replication package. All research materials, including stimuli sentences, analysis code, and raw data, are available in the Tromsø Repository of Language and Linguistics (TROLLing), https://doi.org/10.18710/YUTP35.

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Appendix A

A1. Frequency data for nouns (means) by language and condition.

Condition	German	Spanish
Frequency per million (log10)		
congruent (MM)	1.3	1.2
congruent (FF)	1.1	1.4
incongruent (MF)	1.4	0.9
incongruent (FM)	1.2	1.2
neuter (MN)	1.6	1.5
neuter (FN)	1.5	1.5
Number of letters		
congruent (MM)	5.1	6.3
congruent (FF)	5.6	5.4
incongruent (MF)	6.0	6.4
incongruent (FM)	5.3	5.8
neuter (MN)	5.1	5.8
neuter (FN)	5.5	6.3
Number of syllables		
congruent (MM)	1.6	2.6
congruent (FF)	2.0	2.4
incongruent (MF)	2.1	2.9
incongruent (FM)	1.4	2.5
neuter (MN)	1.3	2.5
neuter (FN)	1.5	3.0

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A2. Frequency data for adjectives (means) by language and condition.

Condition	German
Frequency per million (log10)	
congruent (MM)	1.7
congruent (FF)	1.7
incongruent (MF)	1.3
incongruent (FM)	1.9
neuter (MN)	1.9
neuter (FN)	1.5
Number of letters	
congruent (MM)	5.5
congruent (FF)	4.9
incongruent (MF)	5.9
incongruent (FM)	4.6
neuter (MN)	6.8
neuter (FN)	7.4
Number of syllables	
congruent (MM)	1.3
congruent (FF)	1.5
incongruent (MF)	1.6
incongruent (FM)	1.3
neuter (MN)	1.6
neuter (FN)	2.3

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Appendix B

B1. Experimental sentences from self-paced reading task.

Item	Sentence	Translation
Spanish masculine-German masculine nouns (MM)		
1a	Ich bin beschwingt, denn **ein wilder Garten** ist in der Stadt in New York.	I am elated because a wild garden is in the city of New York.
1b*	Ich bin beschwingt, denn **ein Garten wilder** ist in der Stadt in New York.	
2a	Ich bin entzückt, denn **ein schmaler Gürtel** ist in der Kiste im Abstellraum.	I am delighted because a narrow belt is in the box in the storage room.
2b*	Ich bin entzückt, denn **ein Gürtel schmaler** ist in der Kiste im Abstellraum.	
3a	Ich bin neugierig, denn **ein nützlicher Hut** ist im Schaufenster in der Altstadt.	I am curious because a useful hat is in the shop window in the old town.
3b*	Ich bin neugierig, denn **ein Hut nützlicher** ist im Schaufenster in der Altstadt.	
4a	Ich bin entzückt, denn **ein schöner Ring** ist im Kaufhaus in Düsseldorf.	I am delighted because a beautiful ring is in the department store in Düsseldorf.
4b*	Ich bin entzückt, denn **ein Ring schöner** ist im Kaufhaus in Düsseldorf.	
5a	Ich bin schockiert, denn **ein roter Saft** ist auf dem Teppich im Wohnzimmer.	I am shocked because a red juice is on carpet in the living room.
5b*	Ich bin schockiert, denn **ein Saft roter** ist auf dem Teppich im Wohnzimmer.	
6a	Ich bin beschwingt, denn **ein schicker Schuh** ist im Angebot auf der Webseite.	I am elated because a fancy shoe is on offer on the website.
6b*	Ich bin beschwingt, denn **ein Schuh schicker** ist im Angebot auf der Webseite.	
7a	Ich bin angespannt, denn **ein harter Sessel** ist beim Zahnarzt im Wartezimmer.	I am tensed because a hard armchair is at the dentist in the waiting room.
7b*	Ich bin angespannt, denn **ein Sessel harter** ist beim Zahnarzt im Wartezimmer.	
8a	Ich bin interessiert, denn **ein glänzender Spiegel** ist in der Galerie in Sevilla.	I am interested because a shiny mirror is in the gallery in Seville.
8b*	Ich bin interessiert, denn **ein Spiegel glänzender** ist in der Galerie in Sevilla.	
Spanish feminine-German feminine nouns (FF)		
9a	Ich bin überrascht, denn **eine saure Ananas** ist im Obstsalat im Kaffeehaus.	I am surprised because a sour pineapple is in the fruit salad at the coffee house.
9*	Ich bin überrascht, denn **eine Ananas saure** ist im Obstsalat im Kaffeehaus.	

(*Continued*)

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B1. (*Continued*)

Item	Sentence	Translation
10a	Ich bin glücklich, denn **eine billige Birne** ist auf dem Markt in Marrakesch.	I am happy because a cheap pear is at the market in Marrakech.
10b*	Ich bin glücklich, denn **eine Birne billige** ist auf dem Markt in Marrakesch.	
11a	Ich bin entsetzt, denn **eine braune Flasche** ist auf dem Platz im Stadion.	I am horrified because a brown bottle is on the square in the stadium.
11b*	Ich bin entsetzt, denn **eine Flasche braune** ist auf dem Platz im Stadion.	
12a	Ich bin schockiert, denn **eine goldene Kerze** ist auf dem Ofen in der Sauna.	I am shocked because a gold candle is on the stove in the sauna.
12b*	Ich bin schockiert, denn **eine Kerze goldene** ist auf dem Ofen in der Sauna.	
13a	Ich bin zufrieden, denn **eine warme Milch** ist auf der Karte im Stadtcafé.	I am satisfied because a warm milk is on the menu at the city café.
13b*	Ich bin zufrieden, denn **eine Milch warme** ist auf der Karte im Stadtcafé.	
14a	Ich bin dankbar, denn **eine neue Schule** ist in dem Altbau am Marktplatz.	I am grateful because a new school is in the old building on the market square.
14b*	Ich bin dankbar, denn **eine Schule neue** ist in dem Altbau am Marktplatz.	
15a	Ich bin verwirrt, denn **eine gelbe Tüte** ist auf der Bank im Stadtgarten.	I am confused because a yellow bag is on the bench in the city garden.
15b*	Ich bin verwirrt, denn **eine Tüte gelbe** ist auf der Bank im Stadtgarten.	
16a	Ich bin überrascht, denn **eine riesige Zwiebel** ist auf dem Feld am Waldrand.	I am surprised because a huge onion is on the field at the edge of the forest.
16b*	Ich bin überrascht, denn **eine Zwiebel riesige** ist auf dem Feld am Waldrand.	
Spanish feminine-German masculine nouns (FM)		
17a	Ich bin dankbar, denn **ein reifer Apfel** ist am Apfelbaum vor dem Haus.	I am grateful because a ripe apple is on the apple tree in front of the house.
17b*	Ich bin dankbar, denn **ein Apfel reifer** ist am Apfelbaum vor dem Haus.	
18a	Ich bin beunruhigt, denn **ein grüner Koffer** ist auf dem Band am Flughafen.	I am worried because a green suitcase is on the belt at the airport.
18b*	Ich bin beunruhigt, denn **ein Koffer grüner** ist auf dem Band am Flughafen.	
19a	Ich bin erleichtert, denn **ein kleiner Löffel** ist auf dem Tablett in der Lounge.	I am relieved because a small spoon is on the tray in the lounge.
19b*	Ich bin erleichtert, denn **ein Löffel kleiner** ist auf dem Tablett in der Lounge.	

(*Continued*)

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B1. (*Continued*)

Item	Sentence	Translation
20a	Ich bin geblendet, denn **ein bunter Rock** ist auf dem Bügel im Schrank.	I am blinded because a colorful skirt is on the hanger in the closet.
20b*	Ich bin geblendet, denn **ein Rock bunter** ist auf dem Bügel im Schrank.	
21a	Ich bin begeistert, denn **ein breiter Schal** ist im Fundbüro in der Stadt.	I am thrilled because a wide scarf is in the lost and found in the city.
21b*	Ich bin begeistert, denn **ein Schal breiter** ist im Fundbüro in der Stadt.	
22a	Ich bin verblüfft, denn **ein einsamer Strand** ist vor dem Hotel in der Türkei.	I am amazed because a lonely beach is in front of the hotel in Turkey.
22b*	Ich bin verblüfft, denn **ein Strand einsamer** ist vor dem Hotel in der Türkei.	
23a	Ich bin erstaunt, denn **ein hoher Stuhl** ist in der Lernecke im Kinderzimmer.	I am amazed because a high chair is in the play corner in the children's room.
23b*	Ich bin erstaunt, denn **ein Stuhl hoher** ist in der Lernecke im Kinderzimmer.	
24a	Ich bin erfreut, denn **ein flacher Tisch** ist im Schlafzimmer auf der Burg.	I am pleased because a flat table is in the bedroom in the castle.
24b*	Ich bin erfreut, denn **ein Tisch flacher** ist im Schlafzimmer auf der Burg.	
Spanish masculine-German feminine nouns (MF)		
25a	Ich bin beunruhigt, denn **eine dunkle Socke** ist im Kinderbett im Landhaus.	I am worried because a dark sock is in the cot in the country house.
25b*	Ich bin beunruhigt, denn **eine Socke dunkle** ist im Kinderbett im Landhaus.	
26a	Ich bin angespannt, denn **eine salzige Gurke** ist auf dem Boden in der Mensa.	I am tensed because a salty pickle is on the floor in the cafeteria.
26b*	Ich bin angespannt, denn **eine Gurke salzige** ist auf dem Boden in der Mensa.	
27a	Ich bin neugierig, denn **eine dreckige Zeichnung** ist im Kursraum an der Uni.	I am curious because a dirty drawing is in the classroom at the university.
27b*	Ich bin neugierig, denn **eine Zeichnung dreckige** ist im Kursraum an der Uni.	
28a	Ich bin geblendet, denn **eine silberne Gabel** ist auf dem Feld vor der Halle.	I am blinded because a silver fork is on the field in front of the hall.
28b*	Ich bin geblendet, denn **eine Gabel silberne** ist auf dem Feld vor der Halle.	
29a	Ich bin erfreut, denn **eine weiche Mütze** ist im Geschäft in Finnland.	I am pleased because a soft hat is in the store in Finland.
29b*	Ich bin erfreut, denn **eine Mütze weiche** ist im Geschäft in Finnland.	

(*Continued*)

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B1. (*Continued*)

Item	Sentence	Translation
30a	Ich bin begeistert, denn **eine schaumige Seife** ist im Ferienhaus in Griechenland.	I am excited because a foamy soap is in the holiday home in Greece.
30b*	Ich bin begeistert, denn **eine Seife schaumige** ist im Ferienhaus in Griechenland.	
31a	Ich bin erleichtert, denn **eine frische Zitrone** ist in der Schüssel im Esszimmer.	I am relieved because a fresh lemon is in the bowl in the dining room
31b*	Ich bin erleichtert, denn **eine Zitrone frische** ist in der Schüssel im Esszimmer.	
32a	Ich bin interessiert, denn **eine alte Zeitung** ist auf der Veranda in Italien.	I am interested because an old newspaper is on the porch in Italy.
32b*	Ich bin interessiert, denn **eine Zeitung alte** ist auf der Veranda in Italien.	
Spanish masculine-German neuter nouns (MN)		
33a	Ich bin entsetzt, denn **ein echtes Haar** ist auf dem Teller im Gasthaus.	I am appalled because a real hair is on the plate at the inn.
33b*	Ich bin entsetzt, denn **ein Haar echtes** ist auf dem Teller im Gasthaus.	
34a	Ich bin glücklich, denn **ein dünnes Heft** ist im Buchladen in Montpellier.	I am happy because a thin notebook is in the bookshop in Montpellier.
34b*	Ich bin glücklich, denn **ein Heft dünnes** ist im Buchladen in Montpellier.	
35a	Ich bin verwirrt, denn **ein schwarzes Kleid** ist im Gefrierfach im Kühlschrank.	I am confused because a black dress is in the freezer in the fridge
35b*	Ich bin verwirrt, denn **ein Kleid schwarzes** ist im Gefrierfach im Kühlschrank.	
36a	Ich bin ängstlich, denn **ein scharfes Messer** ist auf der Treppe im Theater.	I am afraid because a sharp knife is on the stairs at the theater.
36b*	Ich bin ängstlich, denn **ein Messer scharfes** ist auf der Treppe im Theater.	
37a	Ich bin ängstlich, denn **ein schnelles Flugzeug** ist auf der Startbahn am Flughafen.	I am scared because a fast plane is on the runway at the airport.
37b*	Ich bin ängstlich, denn **ein Flugzeug schnelles** ist auf der Startbahn am Flughafen.	
38a	Ich bin empört, denn **ein langweiliges Buch** ist auf der Messe in Frankfurt.	I am outraged because a boring book is at the fair in Frankfurt.
38b*	Ich bin empört, denn **ein Buch langweiliges** ist auf der Messe in Frankfurt.	
39a	Ich bin froh, denn **ein sauberes Glas** ist in der Spüle in der Küche.	I am glad because a clean glass is in the sink in the kitchen.
39b*	Ich bin froh, denn **ein Glas sauberes** ist in der Spüle in der Küche.	

(*Continued*)

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B1. (*Continued*)

Item	Sentence	Translation
40a	Ich bin vorsichtig, denn **ein gefährliches Schiff** ist auf dem Meer vor der Küste.	I am careful because a dangerous ship is in the sea off the coast.
40b*	Ich bin vorsichtig, denn **ein Schiff gefährliches** ist auf dem Meer vor der Küste.	
Spanish feminine-German neuter nouns (FN)		
41a	Ich bin vorsichtig, denn **ein langsames Fahrrad** ist auf der Brücke am Wannsee.	I am cautious because a slow bike is on the bridge at Wannsee.
41b*	Ich bin vorsichtig, denn **ein Fahrrad langsames** ist auf der Brücke am Wannsee.	
42a	Ich bin verwundert, denn **ein bitteres Gemüse** ist in der Suppe im Restaurant.	I am amazed because a bitter vegetable is in the soup at the restaurant.
42b*	Ich bin verwundert, denn **ein Gemüse bitteres** ist in der Suppe im Restaurant.	
43a	Ich bin empört, denn **ein komisches Getränk** ist an der Theke im Nachtclub.	I am outraged because a strange drink is on the counter at the nightclub.
43b*	Ich bin empört, denn **ein Getränk komisches** ist an der Theke im Nachtclub.	
44a	Ich bin zufrieden, denn **ein blaues Hemd** ist in der Tasche im Waschsalon.	I am happy because a blue shirt is in the bag at the laundromat.
44b*	Ich bin zufrieden, denn **ein Hemd blaues** ist in der Tasche im Waschsalon.	
45a	Ich bin beeindruckt, denn **ein gemütliches Bett** ist im Baumhaus in Norwegen.	I am impressed because a cozy bed is in the treehouse in Norway.
45b*	Ich bin beeindruckt, denn **ein Bett gemütliches** ist im Baumhaus in Norwegen.	
46a	Ich bin verwundert, **denn ein einzigartiges Büro** ist am Spielplatz neben dem Fluss.	I am surprised because a unique office is at the playground next to the river.
46b*	Ich bin verwundert, **denn ein Büro einzigartiges** ist am Spielplatz neben dem Fluss.	
47a	Ich bin beruhigt, denn **ein teures Fenster** ist im Neubau in Hamburg.	I am reassured because an expensive window is in the new building in Hamburg.
47b*	Ich bin beruhigt, denn **ein Fenster teures** ist im Neubau in Hamburg.	
48a	Ich bin besorgt, denn **ein herbstliches Blatt** ist auf der Terrasse vor der Wohnung.	I am worried because an autumn leaf is on the terrace in front of the apartment.
48b*	Ich bin besorgt, denn **ein Blatt herbstliches** ist auf der Terrasse vor der Wohnung.	

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B2. Filler sentences from self-paced reading task.

Item	Sentence	Translation
49a	Ich bin beunruhigt, denn Anja **lernt nicht** an der Uni auf dem Campus.	I am worried because Anja does not study at the university on the campus.
49b*	Ich bin beunruhigt, denn Anja **nicht lernt** an der Uni auf dem Campus.	
50a	Ich bin zögernd, denn David **arbeitet nicht** in der Werkstatt diesen Monat.	I am hesitant because David does not work in the garage this month.
50b*	Ich bin zögernd, denn David **nicht arbeitet** in der Werkstatt diesen Monat.	
51a	Ich bin empört, denn Dennis **schreibt nicht** an die Tafel im Unterricht.	I am outraged because Dennis does not write on the blackboard in class.
51b*	Ich bin empört, denn Dennis **nicht schreibt** an die Tafel im Unterricht.	
52a	Ich bin verzweifelt, denn Jakob **spielt nicht** mit dem Ball auf dem Hof.	I am desperate because Jakob does not play with the ball in the yard.
52b*	Ich bin verzweifelt, denn Jakob **nicht spielt** mit dem Ball auf dem Hof.	
53a	Ich bin neidisch, denn Johanna **schläft nicht** im Kinderbett heute Nacht.	I am jealous because Johanna does not sleep in the crib tonight.
53b*	Ich bin neidisch, denn Johanna **nicht schläft** im Kinderbett heute Nacht.	
54a	Ich bin besorgt, denn Noah **geht nicht** auf die Party am Wochenende.	I am worried because Noah does not go to the party this weekend.
54b*	Ich bin besorgt, denn Noah **nicht geht** auf die Party am Wochenende.	
55a	Ich bin skeptisch, denn Sabine **tanzt nicht** mit Freunden auf Parties.	I am skeptical because Sabine does not dance with friends at parties.
55b*	Ich bin skeptisch, denn Sabine **nicht tanzt** mit Freunden auf Parties.	
56a	Ich bin kritisch, denn Sandra **trainiert nicht** auf dem Feld vor der Halle.	I am critical because Sandra does not train on the field in front of the hall.
56b*	Ich bin kritisch, denn Sandra **nicht trainiert** auf dem Feld vor der Halle.	
57a	Ich bin überrascht, denn Christian **singt nicht** unter der Dusche im Landhaus.	I am surprised because Christian does not sing in the shower at the country house.
57b*	Ich bin überrascht, denn Christian **nicht singt** unter der Dusche im Landhaus	
58a	Ich bin traurig, denn Clara **fährt nicht** ins Ferienhaus nach Frankreich.	I am sad because Clara does not go to the vacation house in France.
58b*	Ich bin traurig, denn Clara **nicht fährt** ins Ferienhaus nach Frankreich.	

(*Continued*)

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B2. (*Continued*)

Item	Sentence	Translation
59a	Ich bin traurig, denn Ingrid **liegt nicht** auf der Veranda in der Sonne.	I am sad because Ingrid does not lie on the porch in the sun.
59b*	Ich bin traurig, denn Ingrid **nicht liegt** auf der Veranda in der Sonne.	
60a	Ich bin beruhigt, denn Katrin **schreit nicht** beim Zahnarzt diese Woche.	I am reassured because Katrin does not scream at the dentist this week.
60b*	Ich bin beruhigt, denn Katrin **nicht schreit** beim Zahnarzt diese Woche.	
61a	Ich bin erleichtert, denn Liam **läuft nicht** durch den Park im Dunkeln.	I am relieved because Liam does not walk through the park in the dark.
61b*	Ich bin erleichtert, denn Liam **nicht läuft** durch den Park im Dunkeln.	
62a	Ich bin erstaunt, denn Martin **kocht nicht** für die Kinder nach der Arbeit.	I am amazed because Martin does not cook for the children after work.
62b*	Ich bin erstaunt, denn Martin **nicht kocht** für die Kinder nach der Arbeit.	
63a	Ich bin wütend, denn Melanie **übt nicht** am Nachmittag vor dem Konzert.	I am mad because Melanie does not practice the afternoon before the concert.
63b*	Ich bin wütend, denn Melanie **nicht übt** am Nachmittag vor dem Konzert.	
64a	Ich bin gestresst, denn Oskar **bleibt nicht** im Kursraum für das Seminar.	I am stressed because Oskar does not stay in the classroom for the seminar.
64b*	Ich bin gestresst, denn Oskar **nicht bleibt** im Kursraum für das Seminar.	
65	Ich bin froh, denn **die Blume ist rosa** und nicht orange.	I am happy because the flower is pink and not orange.
66	Ich bin beeindruckt, denn **der Korb ist schlicht** und sehr elegant.	I am impressed because the basket is plain and very elegant.
67	Ich bin enttäuscht, denn **die Hose ist lang** und zu eng.	I am disappointed because the pants are long and too tight.
68	Ich bin frustriert, denn **die Puppe ist einzigartig** und schon kaputt.	I am frustrated because the doll is unique and already broken.
69	Ich bin froh, denn **der Knopf ist lila** und stilvoll.	I am glad because the button is purple and stylish.
70	Ich bin verblüfft, denn **die Tür ist offen** und nicht abgeschlossen.	I am amazed because the door is open and not locked.
71	Ich bin besorgt, denn **die Wolke ist dunkel** und gewaltig.	I am worried because the cloud is dark and huge.
72	Ich bin frustriert, denn **die Wurst ist lecker** und leider ungesund.	I am frustrated because the sausage is delicious and unfortunately unhealthy.
73	Ich bin ängstlich, denn **das Boot ist schnell** und sehr laut.	I am anxious because the boat is fast and very noisy.

(*Continued*)

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B2. (*Continued*)

Item	Sentence	Translation
74	Ich bin genervt, denn **das Brot ist alt** und nicht appetitlich.	I am annoyed because the bread is old and not appetizing.
75	Ich bin beeindruckt, denn **das Ei ist frisch** und köstlich.	I am impressed because the egg is fresh and delicious.
76	Ich bin verwundert, denn **der Berg ist steil** und hügelig.	I am amazed because the mountain is steep and hilly.
77	Ich bin begeistert, denn **das Geschenk ist toll** und wirklich praktisch.	I am thrilled because the gift is great and really practical.
78	Ich bin erfreut, denn **der Schrank ist modern** und originell.	I am delighted because the cabinet is modern and original.
79	Ich bin beruhigt, denn **das Spiel ist leicht** und wirklich lustig.	I am reassured because the game is easy and really fun.
80	Ich bin enttäuscht, denn **das Zelt ist grau** und nicht lila.	I am disappointed because the tent is gray and not purple.

Note: *indicates ungrammatical sentences

B3. Comprehension questions.

Item	Question	Translation	Target response
4	Ist das Kaufhaus in Valencia?	Is the department store in Valencia?	no
5	Ist der Teppich im Wohnzimmer?	Is the carpet in the living room?	yes
7	Ist das Wartezimmer beim Hausarzt?	Is the waiting room at the general practitioner?	no
10	Ist der Markt in Marrakesch?	Is the market in Marrakech?	yes
14	Ist der Altbau neben der Bibliothek?	Is the old building next to the library?	no
15	Ist die Bank vor dem Museum?	Is the bench in front of the museum?	no
17	Ist der Apfelbaum vor dem Haus?	Is the apple tree in front of the house?	yes
21	Ist das Fundbüro in der Stadt?	Is the lost and found in town?	yes
22	Ist das Hotel in Spanien?	Is the hotel in Spain?	no
23	Ist die Lernecke im Kinderzimmer?	Is the play corner in the children's room?	yes
26	Ist die Gurke auf dem Boden?	Is the pickle on the floor?	yes
29	Ist die Mütze unbequem?	Is the hat uncomfortable?	no
37	Ist das Flugzeug in der Luft?	Is the airplane in the air?	no
39	Ist das Glas in der Küche?	Is the glass in the kitchen?	yes
41	Ist die Brücke am Wannsee?	Is the bridge at Wannsee?	yes

(*Continued*)

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B3. (*Continued*)

Item	Question	Translation	Target response
44	Ist die Tasche an der Universität?	Is the bag at the university?	no
46	Ist der Spielplatz neben dem Fluss?	Is the playground next to the river?	yes
48	Ist das Blatt im Schwimmbad?	Is the leaf in the swimming pool?	no
49	Lernt Anja zu Hause?	Does Anja study at home?	yes
54	Bleibt Noah am Wochenende zu Hause?	Does Noah stay at home this weekend?	yes
55	Tanzt Sabine mit Freunden?	Does Sabine dance with friends?	no
57	Singt Christian zu Hause unter der Dusche?	Does Christian sing in the shower at home?	yes
61	Läuft Liam durch den Park im Dunkeln?	Does Liam walk through the park in the dark?	no
70	Ist die Tür abgeschlossen?	Is the door locked?	no
71	Ist die Wolke dunkel?	Is the cloud dark?	yes
72	Ist die Wurst gesund?	Is the sausage healthy?	no
77	Ist das Geschenk praktisch?	Is the present practical?	yes
78	Ist der Schrank alt?	Is the cabinet old?	no

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