Are native and non-native speakers differentially sensitive to agreement attraction?

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Subject-verb agreement violations like "The key are on the table" immediately disrupt processing in native (L1) comprehenders. But these disruptions can be attenuated if a plural modifier is added to the sentence, as in "The key to the cabinets are on the table", an effect called "agreement attraction". While it is known that non-native (L2) speakers typically show reduced sensitivity to agreement violations [1,2], it is less clear whether their attraction effects differ from those of L1 speakers, which is important to understand the processes involved in L2 parsing. We address this question using a self-paced reading paradigm to directly compare: (a) L1 vs. L2 speakers' sensitivity to agreement violations (henceforth, "grammaticality effect"); (b) L1 vs. L2 speakers' sensitivity to agreement attraction.

One explanation for the agreement attraction effect is that comprehenders wrongly retrieve the plural modifier "cabinets" (henceforth "attractor") as the licensor of the verb, making the number violation less likely to be noticed than when a singular modifier precedes the verb ["retrieval interference"; 3,4]. It has been proposed that L2 speakers make more retrieval errors due to noisier L2 memory representations [5]. If so, L2 comprehenders should show larger attraction effects than L1 comprehenders. Furthermore, if L2 agreement processing is subject to crosslinguistic influence, comprehenders with richer L1 agreement morphology (e.g. Spanish) may be better at processing agreement than comprehenders with impoverished agreement morphology (e.g. English). To address this possibility, we compared the agreement profiles of Spanish and English speakers who were proficient learners of L2 German.

METHOD. L1 and L2 speakers of German (*L1 group*: 71 German; *L2 group*: 58 Spanish and 67 English) read German sentences in a self-paced reading task with a 2×2 design. We used German object relative clauses (RC) that varied the number of the attractor (singular/plural) and whether the RC subject and verb agreed in number (grammatical/ungrammatical, **Table 1**). In contrast with previous studies, the RC verb was kept identical across conditions, thus avoiding a confound between grammaticality and verb number [3,4,6]. Reading times at the word immediately after the RC verb were analyzed with Bayesian mixed-effects models. To quantify the GRAMMATICALITY EFFECT, we examined whether the ungrammatical condition showed longer reading times than the grammatical condition in the singular attractor condition (i.e. in the absence of a plural attractor). To quantify the ATTRACTION EFFECT, we examined whether the ungrammatical conditions with a plural attractor showed processing facilitation compared to the ungrammatical condition with a singular attractor. The focus was on whether these effects differed in L1 vs. L2 speakers and also between the L2 groups.

RESULTS AND DISCUSSION. With regard to ungrammaticality, L2 speakers showed smaller reading disruptions than L1 speakers (**Figure 1**), which was reflected in a group×grammaticality interaction (posterior mean -18 ms, 95% credible interval [-39, 3] ms). There was no indication that the two L2 groups differed in their sensitivity to ungrammaticality, as both showed similar disruptions after the ungrammatical verb (*L1 Spanish*: 21 [-3, 46] ms; *L1 English*: 18 [-1, 37] ms). With regard to attraction, German speakers showed processing facilitation in ungrammatical sentences with a plural attractor: -6 [-22, 9] ms. While the joint L2 groups did not differ from the L1 group, Spanish speakers showed a larger attraction effect than English speakers (*L1 Spanish*: -21 [-47, 3] ms; *L1 English*: 9 [-11, 30] ms). These findings demonstrate that L2 speakers are less sensitive than L1 speakers to agreement violations during processing. However, our results do not provide evidence that L2 speakers are more prone to attraction than L1 speakers, which is unexpected for the claim that L2 comprehenders make more retrieval errors. Finally, the comparison of the two L2 groups suggests that a morphologically rich L1 does not necessarily help learners detect L2 agreement violations. Rather, comprehenders with rich L1 agreement morphology may be particularly susceptible to agreement attraction effects in L2 processing [7].

TABLE 1. Sample item set. The plural attractor (bolded) was the head of the relative clause. Verb number was kept constant across conditions to avoid a confound between ungrammaticality and plural verb number. Based on previous studies, the region of interest was the word following the RC verb (verb+1 region, underlined). Each participant saw 24 experimental and 56 filler trials. SG = singular, PL = plural.

Grammatical SG attractor	*Der Vertrag,* [$_{RC}$ *den DIE DIPLOMATEN feierlich unterzeichneten bei der Konferenz*], …
Grammatical PL attractor	***Die Verträge***, [$_{RC}$ *die DIE DIPLOMATEN feierlich unterzeichneten bei der Konferenz*], …
Ungrammatical SG attractor	*Der Vertrag,* [$_{RC}$ *den DER DIPLOMAT feierlich *unterzeichneten bei der Konferenz*], …
Ungrammatical PL attractor	***Die Verträge***, [$_{RC}$ *die *DER DIPLOMAT feierlich *unterzeichneten bei der Konferenz*], …
*The treaty/**treaties** that the DIPLOMATS/*DIPLOMAT solemnly signed.$_{PL}$ at the conference, had many pages.*	

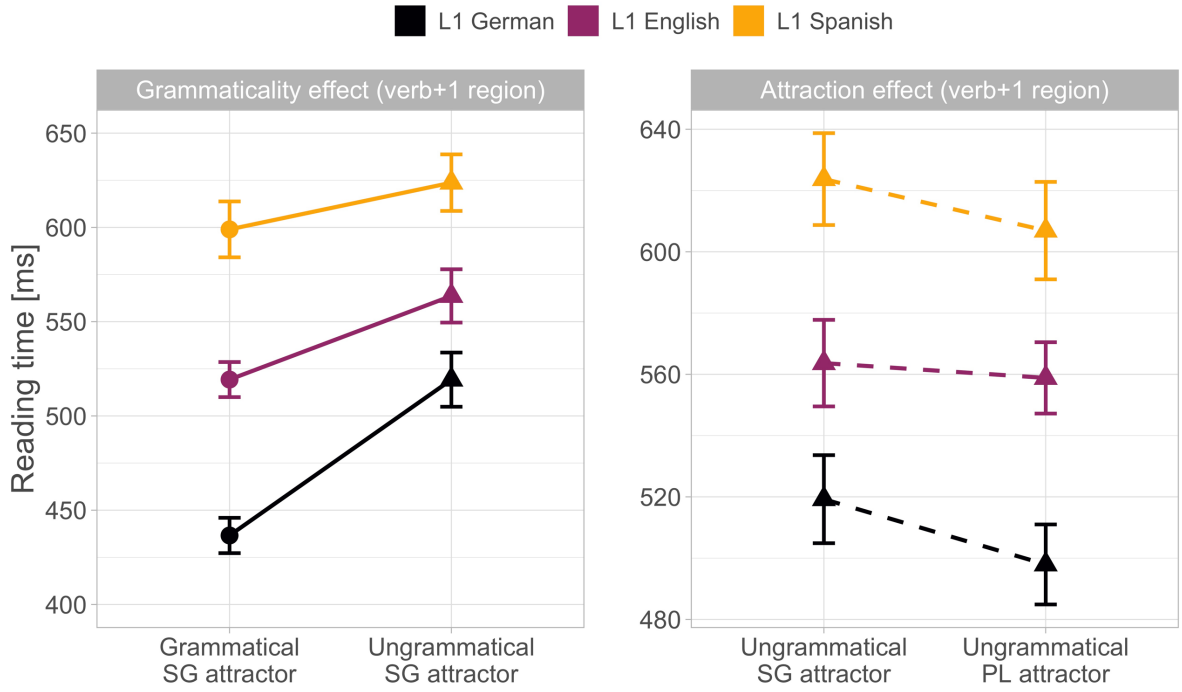

FIGURE 1. Descriptive summaries of the raw/untransformed data at the word following the RC verb (e.g. *"bei"* in Table 1). Ungrammatical conditions are depicted with triangles. *Grammaticality effect*: German L1 comprehenders show larger processing disruptions than L2 comprehenders after ungrammatical vs. grammatical verbs (in the absence of a plural attractor). *Attraction effect:* there was some indication of processing facilitation in the L1 German group. Within the L2 group, Spanish speakers showed larger attraction effects than English speakers.

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