Proficiency and between-language congruency interact in L2 gender acquisition

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An open question in second language (L2) research is how the properties of a native (L1) system affect learners' acquisition of an L2 gender system. Previous picture naming studies have found that both the availability of a gendered L1 and its similarity with the L2 play a role [1,2]. For example, L2 Dutch learners with L1 German (whose gender system is similar to Dutch) assign gender more accurately in naming tasks than L1 Romance speakers, whose gender systems are more dissimilar to Dutch. In turn, L1 Romance speakers are more accurate than L1 English speakers, who lack grammatical gender [1]. This suggests that Romance and German speakers benefit from having L1 gender, but that German speakers additionally profit from a gender transfer strategy due to L1-L2 item-to-item gender congruency. Further, reaction time studies show that the congruency advantage decreases as speakers become more proficient in the L2 [3]. However, it is unknown how much congruency is needed for an L1 to affect L2 acquisition. A precise quantification of congruency was difficult in previous research, partly because Romance speakers of different L1s were involved, such that congruency could not be numerically operationalized on an item-to-item basis [1]. We address this issue using experimental and modelling evidence that show that proficiency and crosslinguistic congruency interact in the acquisition of L2 gender.

NAMING TASK. Native speakers of English (no L1 gender system) and Spanish (L1 gender system but dissimilar to German) performed a picture naming task in L2 German (see Materials). We varied the gender of the target nouns (congruent or incongruent between Spanish and German) and learners' L2 proficiency. Accuracy was analyzed using a mixed-effects logistic regression model with the predictors L1, Congruency (congruent/incongruent) and L2 proficiency (effects considered significant at .05 alpha-level). Our results showed a two-way interaction between congruency and proficiency, but this effect had different directions between the groups. Spanish speakers were more accurate on congruent nouns compared to incongruent nouns, but only at lower proficiency levels (Figure 1). By contrast, there was no effect of congruency or an interaction with proficiency in the English group. These results show that the L1-L2 congruency effect observed in Spanish speakers decreases at higher L2 proficiencies. We tried to model this relationship using the Tolerance Principle (TP).

TOLERANCE PRINCIPLE. The TP calculates the productivity of a grammatical rule from its number of exceptions [4,5]. We created a corpus of the 500 most frequent German nouns, coded for their gender congruency with Spanish (see *Materials*). The TP allowed quantifying how the productivity of a gender transfer rule may change with L2 proficiency, as vocabulary grows—under the assumption that more frequent nouns are acquired earlier, i.e., at lower proficiencies. Our analysis showed that for Spanish learners of German, a gender transfer rule would become unproductive early on, after learning only 18 German nouns (Table 1).

DISCUSSION. We show that L1-L2 gender congruency effects in Spanish speakers decrease at increasing L2 proficiencies. But there is an interesting misalignment between our empirical and TP modelling results: while the TP predicts that an L1 gender transfer rule should become unproductive for Spanish speakers early in acquisition, the interaction between congruency and proficiency in the naming task was observed in intermediate-to-advanced L2 learners, whose vocabulary likely exceeds the 18-word threshold posited by the TP. One possible explanation for the misalignment may be in our assumption that word frequency appropriately reflects the vocabulary available at early L2 acquisition stages. While this assumption may hold for naturalistic/informal L2 acquisition, our participants also had formal exposure to German, which may affect the type of words they were exposed to. An alternative explanation is that the TP, which was originally proposed to model the acquisition of grammatical rules, may not be appropriate to model a gender transfer rule. Instead, the rule may be driven by processing pressures different from those involved in the application of grammatical rules.

Materials

NAMING TASK. Participants were 54 Spanish and 63 English adult learners of L2 German, matched in their overall self-rated proficiency and age of acquisition (learners were all intermediate-to-advanced). They saw 85 pictures and were asked to name them using a determiner + noun. The gender of approximately 18% of the nouns was incongruent between German and Spanish (e.g., 'the key': German *der Schlüssel*.MASC vs. Spanish *la llave*.FEM).

TOLERANCE PRINCIPLE. The corpus consisted of the 500 most frequent German nouns, as calculated by their lemma frequency in SUBTLEX-DE [6]. Nouns were translated to Spanish and manually coded for whether their gender was congruent between Spanish and German. Word pairs containing German neuter nouns were coded as incongruent. The TP evaluates whether a rule is productive by providing a threshold of tolerated exceptions to a rule. A rule is productive if the number of exceptions (e) is less or equal to a certain threshold (θ_N) [4, 5]. We investigated the existence of a Spanish-to-German gender transfer rule, under which L2 learners apply the Spanish gender to the corresponding German lexical item (e.g., assuming that "*Schlüssel*" is feminine in German). Each newly acquired noun with incongruent gender represents an exception to the rule. The threshold states the maximum possible number of incongruent nouns before the gender transfer rule becomes unproductive.

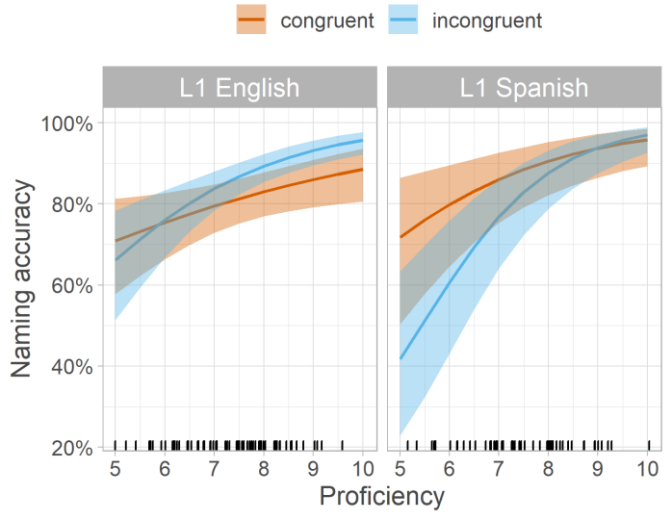

Figure 1. Model-predicted effects of proficiency and congruency on naming accuracy in English and Spanish learners of L2 German. Lines represent the predicted mean values and the ribbons display 95% confidence intervals. The x-axis shows L2 proficiency self-ratings on a scale from 1–10 (all learners were intermediate-to-advanced). The vertical bars represent the number of participants at each proficiency level.

Number of words (N)	Number of exceptions (e)	Threshold (θ_N)	Productive?
5	2	3	Yes
10	4	4	Yes
18	6	6	Yes
19	7	6	No
50	23	13	No
150	65	30	No
300	135	53	No
500	216	80	No

Table 1. Productivity of an L1 gender transfer rule as a function of the number of words whose gender is known by L2 speakers. According to the TP, the rule should become unproductive for Spanish learners after encountering 18 German nouns. According to the TP, a rule is productive if the number of exceptions is less or equal than a threshold (θ_N):

$$\theta_N = \frac{N}{lnN}$$

References

[1] Sabourin et al. (2006) *Second Lang Res* **[2]** Ellis et al. (2012) *SPiL* **[3]** Sá-Leite et al. (2020) *Psychon Bull Rev* **[4]** Yang (2016) *MIT press* **[5]** Yang (2018) *Linguist Approaches Biling* **[6]** Brysbaert et al. (2011) *Exp. Psychol.*