Gender congruency effects in bilingual language processing: an eye-tracking study with Spanish-Russian children

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Background. In heritage bilinguals with two grammatical gender systems, predictive processing is shaped by cross-linguistic co-activation, as gender features from both languages interact during real-time comprehension [1, 2]. Previous studies have reported facilitation for gender-congruent nouns and interference for incongruent ones, although evidence from child bilinguals remains mixed [3, 4]. The present study investigates whether simultaneous Spanish-Russian bilingual children can use gender-marked cues – adjectival endings in Russian and articles in Spanish – to anticipate upcoming nouns, and whether this process is modulated by gender congruency across languages.

Method. Thirty-nine children (aged 5;9-15;3) residing in Spain participated in a visual-world eye-tracking experiment. The experimental items included 20 masculine and 20 feminine nouns that were congruent (*čaška*.F vs. *taza*.F 'cup') or incongruent (*list*.M vs. *hoja*.F 'leave') in Russian and Spanish. Trials were divided into two conditions: match and mismatch (see Tables in (1)). Participants listened to sentences containing gender-marked adjectives in Russian and gender-marked articles in Spanish while viewing visual displays (see (2)).

Results. Growth-curve analyses showed that the children engaged in predictive processing in both languages ($p < 0.05$), Figure 1. Cluster-based permutation analyses did not reveal reliable congruency effects in the match condition in either language, and only non-significant trends in the mismatch condition, occurring between 2800-3100ms in Spanish and 3000-3200ms in Russian, Figures 2-3.

Discussion. While bilingual children showed evidence of predictive processing, contrary to previous studies reporting facilitation for gender-congruent items [3], the present results provide limited evidence for a gender congruency effect, suggesting that cross-linguistic activation in early bilinguals may be efficiently regulated during real-time processing. We propose that the absence of gender congruency effects in the present study reflects efficient language control mechanisms that regulate cross-language co-activation in simultaneous, rather than autonomous gender representations or a lack of cross-linguistic interaction.

References

[1] Natalia Lemmerth & Holger Hopp. Gender processing in simultaneous and successive bilingual children: Cross-linguistic lexical and syntactic influences – *Language Acquisition*, 2018.
[2] Zuzanna Fuchs & Wenqi Zeng. Facilitative Processing of Grammatical Gender in Heritage Speakers with Two Gender Systems. *Heritage Language Journal*, 2024.
[3] Jasmine E. Bosch & Francesca Foppolo. Predictive processing of grammatical gender in bilingual children: the effect of cross-linguistic incongruency and language dominance. *Lingue e linguaggio*, 2022.

Figures and Tables

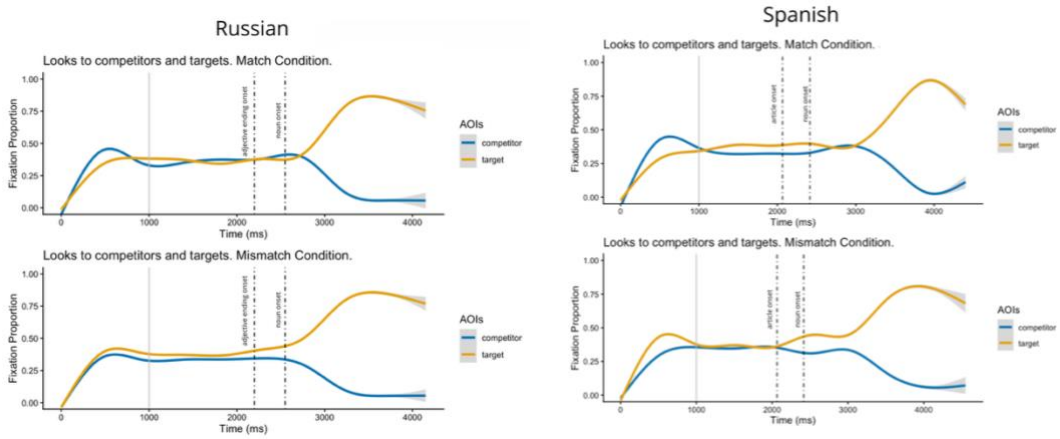

Figure 1. Time course analysis. Match vs. mismatch condition in Russian and Spanish. Gender-marked segment is indicated in dashed lines

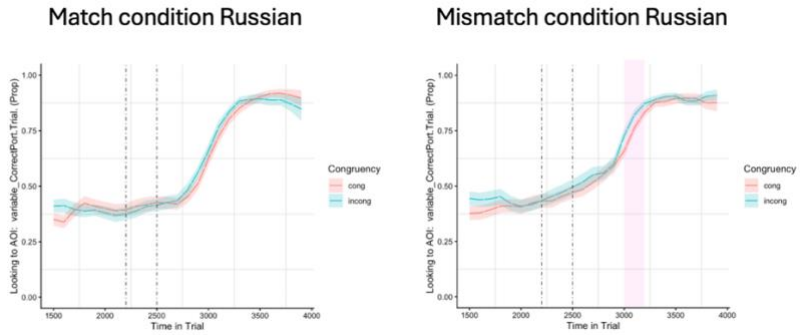

Figure 2. Congruent vs. incongruent condition in Russian. Shaded pink areas represent clusters where areas of interest diverge

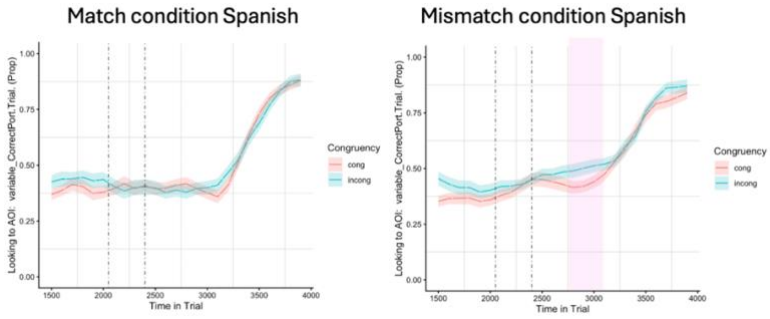

Figure 3. Congruent vs. incongruent condition in Spanish. Shaded pink areas represent clusters where areas of interest diverge

Optional Supplemental Information

Use this optional page for additional technical details if needed.

(1) Design of the VWP experiment

Target gender: **feminine**		Match		Mismatch	
		Target	Distractor	Target	Distractor
Russian gender		F	F	F	M
Spanish	Congruent	F	F	F	M
	Incongruent	M	M	M	F

Target gender: **masculine**		Match		Mismatch	
		Target	Dstractor	Target	Distractor
Russian gender		M	M	M	F
Spanish	Congruent	M	M	M	F
	Incongruent	F	F	F	M

(2) Auditory prompts

a. posmotri kakoj/kakaja + [Noun] RUS
   'look at this.$_{M/F}$ + Noun'

b. mira, dónde está el/la + [Noun] SPA
   'look, where is the.$_{M/F}$ + Noun'