

## The modular interaction hypothesis: When the exponent of gender is an unstressed vowel

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Phonological categories are the foundation for learner's acquisition of gender.<sup>1</sup> In general, features of the phonetic context constrain child acquisition of functional categories.<sup>2,3,4</sup> Not only does phonetic context determine comprehension and production accuracy in children,<sup>5,6,7</sup> but dialects with variable realization of final-*s* have overall later age of acquisition of Spanish plurals.<sup>8</sup> The present study explores the hypothesis that the vulnerability of gender agreement in heritage Spanish children<sup>9</sup> can be partially accounted for by cross-linguistic influence in the vowel inventories of Spanish and English.<sup>10</sup> Unlike English, Spanish retains the same vowel inventory in unstressed syllable, and unstressed vowels do not undergo reduction.<sup>10</sup>

Short narratives were elicited from twenty-one (N=21) school-aged children (ages of 6;01 and 11;09; median 9;07) from West Lafayette (IN) and Albuquerque (NM) using an illustrated version of the *Little Red Riding Hood* fairytale. Most children's parents were of Mexican background; all but two were born in the US. In addition to the narrative task, children were also administered standardized vocabulary tests in both languages, and parents completed language background questionnaires. All lexical NPs were extracted for grammatical analysis (N=517); word-final vowels were further sub-selected for acoustic analysis (vowel quality and duration) in Praat.<sup>11</sup> Results of auditory transcriptions revealed that about half the children produced some gender agreement errors, although overall most NPs were classed as error-free (94%). Analyses of the lexical and morphological distribution of gender errors showed no differences between plural vs. singular nouns, but significant asymmetries in the distribution of errors with lexical type of noun (Figure 1): That is, errors concentrated on inanimate nouns, and on masculine nouns. This is contrary to previous results in which Spanish heritage children are reported to overuse the masculine form in feminine contexts.<sup>9,12</sup> Preliminary acoustic analysis of the data offers a plausible explanation to discrepancies with previous research. Indeed, children's vocalic space appears to be occupied by a mid-central vowel (Figure 2) that ranges in quality from [a] to [ə] (F1<sub>mean</sub>=794Hz; SD=104; F2<sub>mean</sub>= 1777Hz; SD=304), with very few children having a delimited vocalic space for [o]. Whether the noun had a gender counterpart (e.g., *caso/casa*) had no impact on perceived accuracy but preliminary analyses suggest there may be differences in vowel quality depending on the lexical item. For example, F1 values for /a/ ranged from monolingual-like values in the *casa* 'house' to [ə] values in *comida* 'food'. This points to the possibility that some children may have not acquired gender but just phonetically idiomatic vocabulary. Additionally, a high number of errors appeared in sentences with prenominal adjectives ([*un roja*] *chamarra que estaba roja* 'A red coat that was red'), matching previous work suggesting that bilingual effects impact both NP internal word order as well as the gender system.<sup>12</sup> Finally, perceived accuracy was highest with words ending in the transparent word-marker (-a/-o). Nonetheless, previous work indicating that transcribers tend to annotate the expected vowel even when acoustic evidence points into a schwa realization suggests an alternative interpretation; namely, that transcribers might misperceive underspecified realizations as accurate.<sup>13</sup> If children are indeed producing [ə] instead of the underlying /a, o/ vowels, we find preliminary support for the hypothesis of a phonetic underpinning of heritage gender loss/divergence.

Figure 1. Mosaic plots showing the distribution of gender errors and targets for lexical class (human, animate, concrete, abstract), for number (Sg, Pl) and for intended gender of noun (m,f). Significant positive residuals (>2.4SDs) were obtained for animates and for masculine nouns.

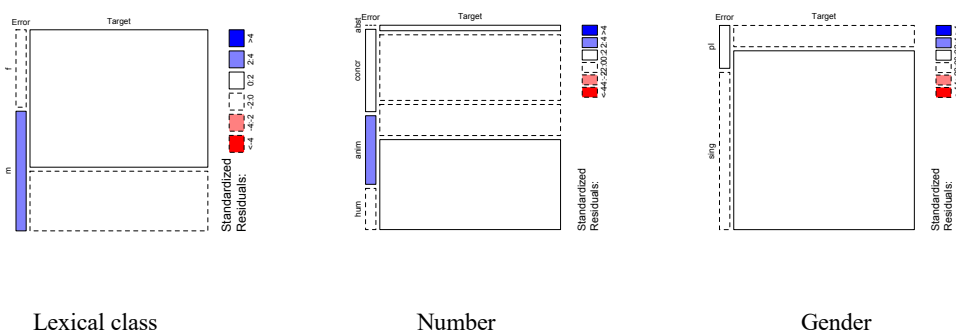
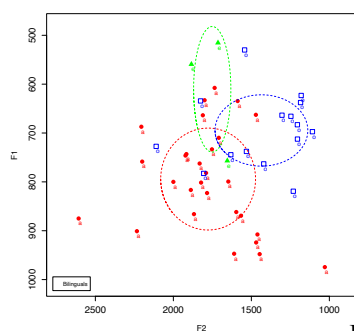


Figure 2. F1-F2 values of word-final vowels produced by Spanish-English heritage children. Ellipses enclose values that are 1SD from the mean



## References

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