Perceived accent impacts sentence processing of bilingual code-switching

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Background: Code-switching (CS), the conversational alternation between languages common in many bilingual communities, has been historically characterized as costly [1]. However, this is seemingly contradicted by the ubiquity of CS in bilingual contexts [2]. Recent work reveals that bilinguals leverage (extra-)linguistic cues [3, 4] to dynamically adapt their expectation of CS, thereby attenuating CS processing costs. These findings support the Adaptive Predictability hypothesis [2], which posits that habitual code-switchers update predictive strategies during sentence processing based on their experience with distributional patterns of a community or speaker type. The present study builds on this proposal by investigating whether Spanish-English bilingual code-switchers use speaker accent as a cue to modulate the weighting of predictive strategies associated with unilingual Spanish, Spanish-English CS, and CS-sparse bilingual Spanish, associated with Peninsular, Caribbean, and L2 Spanish, respectively. We ask whether speaker accent can serve as an index of bilingual language experience that dynamically conditions how listeners weight distributional regularities during online prediction.

Methods: Early Spanish-English bilinguals (*n*=74) completed a visual world eye-tracking task. Participants viewed two images that (mis)matched in grammatical gender while listening to sentences containing a switch between a gendered Spanish determiner and an English noun whose Spanish translation equivalent aligned in grammatical gender with the determiner (e.g., *Encuentra la*$_{FEM}$ flag$_{FEM}$ 'Find the flag'; *n*=10 trials per condition). In Spanish-English CS, feminine determiners remain reliably predictive of feminine nouns while masculine determiners may precede English nouns with masculine or feminine translation equivalents [5]. In a between-participant manipulation, participants heard sentences produced by speakers of either Caribbean, Peninsular, or L2 Spanish. We predicted that cue weighting would shift toward CS-like asymmetry for the Caribbean accent, toward symmetric canonical weighting for the Peninsular accent, and occupy an intermediate position for the L2 accent.

Results: A linear mixed-effects model predicting the empirical logit of fixations to the target image in the critical time window (beginning 200ms post-determiner onset to allow for sufficient time to program a saccade) with fixed effects of Context (same, different), Gender (masculine, feminine), Accent (Peninsular, Caribbean, L2), their interaction(s), and random intercepts for items and participants, was fit. The model revealed a robust main effect of Context [b=0.2, SE=0.004, p<0.001]; looks to target were significantly greater when the distractor was of a different gender class. This was especially the case for different trials with feminine determiners [b=0.45, SE=0.002, p<0.001]. Participants hearing the L2 accent exhibited significant predictive use of both feminine [b=0.54, SE=0.02, p<0.001] and masculine [b=0.12, SE=0.02, p<0.001] determiners in different relative to same contexts. A similar Context effect emerged for feminine items in both the Peninsular [b=0.55, SE=0.02, p<0.001] and (to a lesser extent) Caribbean [b=0.31, SE=0.02, p<0.001] accents; however, predictive looks to target were significantly fewer for Peninsular masculine items in different relative to same contexts [b=-0.08, SE=0.02, p<0.001], while no significant difference in predictive effect was observed for Caribbean masculine items in different relative to same contexts [b=0.006, SE=0.02, p=0.77] (Figure 1).

Discussion: Bilinguals adjust gender-based prediction based on speaker accent, suggesting a flexible deployment of predictive mechanisms based on sociolinguistic cues [2]. Across accents, asymmetric cue weighting reflecting the predictive integrity of the feminine determiner type in CS was attested, while the magnitude of this asymmetry varied by of speaker accent. Unexpectedly, the Caribbean group exhibited overall attenuated prediction, potentially a favorable adaptation in habitual CS contexts to avoid excessive revision [6]. A novel GAMM-based method [7] will be used to determine the time course of predictive deployment by accent.

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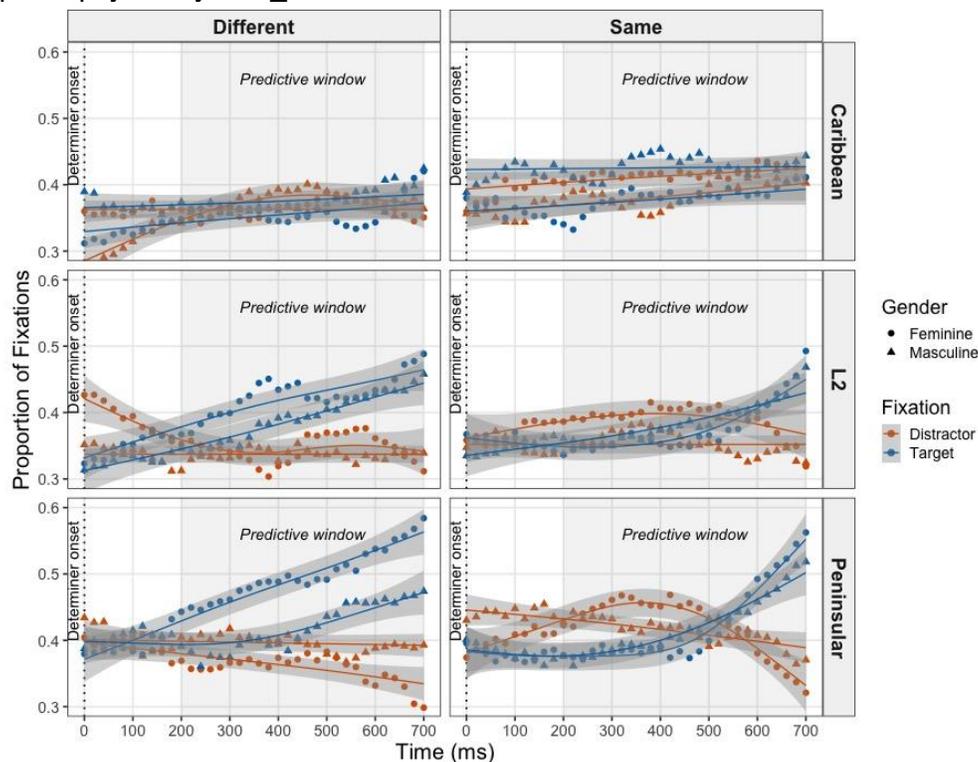
Figure 1. *Average proportion of fixations to either the target or distractor image by Context, Gender, and Accent. The dotted line indicates determiner onset; the shaded box indicates the predictive window. Trials in which images had different gender classes are on the left, and trials in which images had the same gender class are on the right. Fixations to the target image are in blue, while fixations to the distractor image are in orange. Trials for which a feminine determiner preceded the critical noun are marked by circular points, while trials for which a masculine determiner preceded the critical noun are marked by triangular points. Dark shaded regions represent 95% confidence intervals. Average proportion of fixations for the participant group that listened to a Caribbean Spanish accent are presented at the top, that for the participant group that listened to an L2 Spanish accent are in the middle, and that for the participant group that listened to a Peninsular Spanish accent are presented at the bottom of the figure.*