Experience-driven adaptation in Spanish-English code-switching processing

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Background: Despite its ubiquity among bilinguals, code-switching (CS), or the alternation between languages in conversation, has historically increased processing costs in time-based psycholinguistic studies of bilingual comprehension [1]. This context-cognition paradox may result from a mismatch between experimental task and CS ecology: when CS experimental paradigms approximate its naturalistic use, habitual code-switchers demonstrate processing cost reductions commensurate with a switched structure's distributional frequency [2, 3]. In Spanish-English, this is evidenced by the processing of bilingual compound verbs (BCVs). Perfect BCVs comprising the auxiliary *haber* 'have' and an English past participle seldom appear within the verbal complex (i.e., *haber* + V_{Perf}; *el científico* ***ha*** **tested** … 'the scientist has …'), whereas progressive switches between the Spanish auxiliary *estar* 'be' and an English present participle (i.e., *estar* + V_{Prog}; *el científico* ***está*** **testing** … 'the scientist is …') are comparatively frequent. Unattested switch types (i.e., *haber* + V_{Perf}) are found to yield greater processing costs [4, 5].
However, these findings alone are not sufficient to adjudicate between syntactically- and experientially-driven accounts of CS cost attenuation given the cross-community evidence of this asymmetry, nor do they address the impact of interindividual variability in CS engagement. The present study examines whether bilingual groups with distinct CS exposure profiles (i.e., late Spanish L2 speakers [Experiments 1 & 2] and Spanish heritage speakers [Experiment 3]) demonstrate online sensitivity to grammatically permissible but regionally unattested light verb BCVs (i.e., *hacer* + V_{Inf}; *el científico* ***hace*** **test** … 'the scientist tests …') [6].

Methods: In three experiments, Spanish L2 speakers (Experiment 1: n=39; Experiment 2: n=43) and Spanish heritage speakers (Experiment 3: n=41) from the southeast U.S. completed a reading-while-eye-tracking paradigm in which auxiliary type (*estar* + V_{Prog}, Experiments 1, 2, & 3; *haber* + V_{Perf}, Experiment 2; *hacer* + V_{Inf}, Experiments 1 & 3) and switch location (at auxiliary or at participle/lexical infinitive) were manipulated (n=6 per condition). Individual difference measures corroborated incidental CS exposure in L2 speakers and active CS participation in heritage speakers [7].

Results: Linear mixed-effects models revealed significantly increased processing costs for unattested light verb switch across groups. Heritage speakers showed marginal effects in first-pass reading times of the spillover region and robust effects in the total reading time of the critical region, whereas L2 learners only demonstrated such effects in total reading time measures of the critical and spillover regions. The effect of the ungrammatical switch type was comparatively weak, with L2 learners only displaying a marginal effect in total reading time of the critical region.

Discussion: Bilinguals exhibited online sensitivity to the distributional production frequencies of CS specific to their bilingual community, even when these switches were attested in other bilingual communities. However, sensitivity to unattested BCVs scaled with cumulative experience with CS, suggesting that both community- and individual-level experience-based constraints impact the temporal dynamics of bilingual comprehension. These findings support an

experientially driven account of CS costs that highlights the role of both incidental and active exposure to CS [8], contributing to a socially embedded model of bilingual processing.