Title: Disentangling grammar and experience: On the role of environmental exposure to Spanish-English code-switching

Authors: Hannah G. Treadway[a], Josh L. Higdon[a], Jorge R. Valdés Kroff[a]

Affiliation: University of Florida[a]

Introduction: In offline judgment tasks, late Spanish learners of L1 English reliably intuit the acceptability of intrasentential Spanish-English code-switches, i.e., codeswitches between languages within the complementizer phrase[1]. Are these felicitous intuitions mirrored in adult L2 online processing? We investigate this question and determine whether environmental exposure to code-switching (CS) facilitates its comprehension.

Experiment 1: CS processing is subject to modulation not only by language internal properties, but also by extralinguistic factors, including the distributional patterns of bilingual language production specific to a given bilingual community[2]. To tease apart the roles of grammar and experience in CS processing, a group of advanced L1 English, L2 Spanish learners (n=39) immersed in an environment with ubiquitous code-switching participated in a reading-while-eye-tracking experimental task in which Spanish-English CS production asymmetries that differ on their regional use and frequency were tested. Spanish-English code-switchers from this region of immersion demonstrate a robust preference for code-switches between the auxiliary verb *estar* and an English present participle (*estar* + V_{Prog}) relative to switches between the light verb *hacer* and an English lexical infinitive (*hacer* + V_{Inf}), despite the latter's syntactic plausibility and attestation in other Spanish-English bilingual communities[3]. Code-switchers from the same region also suspend the use of masculine Spanish determiners (e.g., *el*) as predictive cues in determiner-noun switches; facilitative processing is only observed for English nouns with feminine Spanish translation equivalents preceded by feminine Spanish determiners (*la*$_{FEM}$ *house*$_{FEM}$, $Det_{SPA,FEM}$ + $N_{ENG,(FEM)}$), while English nouns with masculine Spanish translation equivalents are categorically not produced with feminine Spanish determiners[4]. Critical compound verb switches (n=24) were manipulated for auxiliary type and switch location, while critical determiner-noun switches (n=24) were manipulated for target noun gender and determiner-noun gender congruence (Table 1).

Linear mixed-effects models performed for measures of total reading time revealed that L2 learners are sensitive to the distributional production frequencies of code-switching present in their interactive context during online processing (Figure 1). This sensitivity persists even when the lower frequency switch is syntactically plausible (Figure 2), suggesting that learners are not solely reliant on their grammatical knowledge, but also on (non-)exposure to particular code-switched structures in their immersive environment, during real-time CS processing. However, the onset of these effects is somewhat delayed, materializing in total reading time measures for the spillover regions. This would seem to indicate that the impact of environmental production frequencies may surface during later stage processing for L2 learners.

Experiment 2: To ensure that the time course for environmental frequency effects is distinct from that of ungrammaticality for L2 learners, a follow-up study is under way (n=43) in which the syntactically plausible bilingual compound verb of the form *estar* + V_{Prog} is being tested against the structurally disallowed switch *haber* + V_{Perf} (Table 1). If L2 learners show differential online sensitivity to grammatical violations and effects of environmental frequency, then the processing cost for the ungrammatical *haber* + V_{Perf} form should emerge earlier than that for the syntactically plausible, but environmentally lacking, *hacer* + V_{Inf} switch.

References: [1] Koronkiewicz, B. (2018). Acquiring L1-English L2-Spanish Code-Switching: The Role of Exposure to Language Mixing. *Languages*, *3*(26); [2] Guzzardo Tamargo, R. E., Valdés Kroff, J. R., & Dussias, P. E. (2016). Examining the relationship between comprehension and production processes in code-switched language. *Journal of Memory and Language*, *89*, 138–161; [3] Balam, O., Parafita Couto, M., & Stadthagen-González, H. (2020). Bilingual verbs in three Spanish/English code-switching communities. *International Journal of Bilingualism*, *24*(5-6), 952–967; [4] Valdés Kroff, J. R., Dussias, P., Gerfen, C., Perrotti, L., & Bajo, M. T. (2017). Experience with code-switching modulates the use of grammatical gender during sentence processing. *Linguistic Approaches to Bilingualism*, *7*(2), 163–198.

Figures:

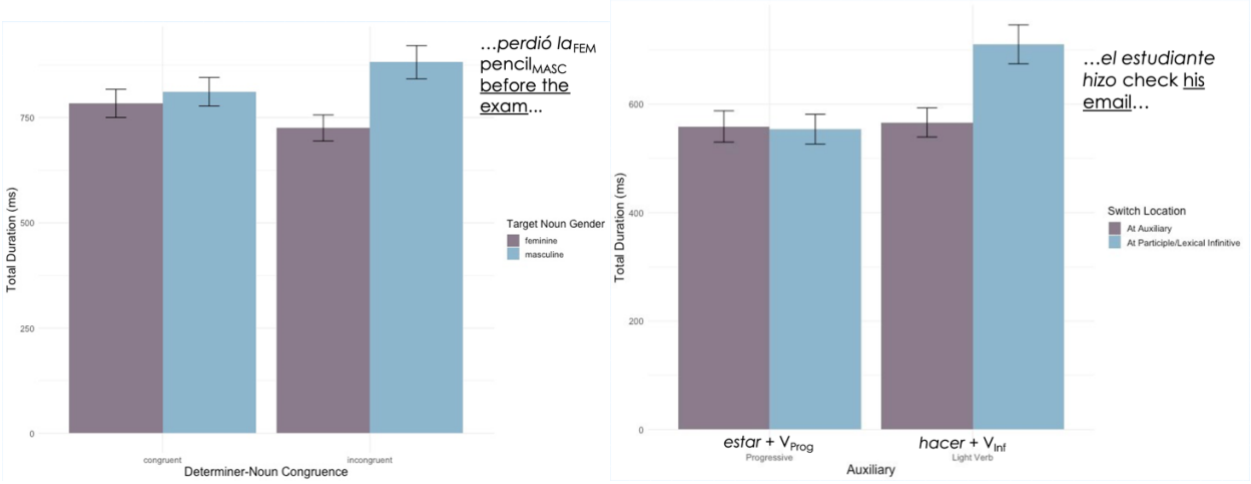

Figure 1 (left): Mean total reading time for determiner-noun switches (spillover region). Masculine target nouns incongruently paired with feminine determiners had significantly longer reading times, Gender x Congruency interaction: [b=131.8, SE=60.0, p=0.02].
Figure 2 (right): Mean total reading time for compound verb switches (spillover region). The spillover region was significantly longer to process for light verb switches occurring at the lexical infinitive, Auxiliary x Switch Location interaction: [b= 156.6, SE=72.5, p=0.04].

Table 1: Experimental item conditions by switch type

Bilingual compound verb switches		
Condition	Extract from sample stimulus	Translation
Progressive, switch at Aux	"…*el estudiante* is checking…"	"…the student…"
Progressive, switch at VP	"…*el estudiante está* checking…"	"…the student is…"
Light verb, switch at light verb	"…*el estudiante* did check…"	"…the student…"
Light verb, switch at infinitive	"…*el estudiante hizo* check…"	"…the student did…"
Perfect, switch at Aux	"…*el estudiante* had checked…"	"…the student…"
Perfect, switch at VP	"…*el estudiante ha* checked…"	"…the student had…"
Determiner-noun switches		
Condition	Extract from sample stimulus	Translation
DET_{MASC} + N_{MASC}	"…*perdió el* pencil…"	"…lost the…"
DET_{MASC} + N_{FEM}	"…*miró el* moon…"	"…looked at the…"
DET_{FEM} + N_{FEM}	"…*miró la* moon…"	"…looked at the…"
DET_{FEM} + N_{MASC}	"…*perdió la* pencil…"	"…lost the…"