Prosodic structure mediates voiced stop lenition in Colombian heritage Spanish

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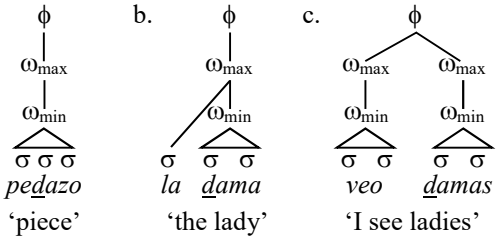
Recent research on Spanish bilinguals in the U.S. context has brought a sharper empirical focus on the sound system of heritage Spanish. Rao (2020) summarizes a range of descriptive phonetic studies and further encourages researchers "to include mainstream generative frameworks such as OT in their work as a way increasing our understanding of the phonological grammars" of heritage Spanish speakers (447). Acoustic studies of postvocalic voiced stop lenition in bilingual U.S. Spanish have included heritage speakers (Rao 2015, Blaire & Lease 2021), L2 learners (Cabrelli Amaro 2017), and both groups in comparison (Amengual 2019). At the same time, recent proposals in theoretical phonology have shifted the locus of explanation for certain types of consonant lenition from the speaker to the listener. Traditionally, the approximantization of postvocalic voiced stops is analyzed as stricture assimilation or reduction driven by speaker-based effort minimization, but an alternative view is that the alternation between domain-initial [b,d,g] and domain-medial spirant approximants [β̞,ð̞,ɣ̞] is perceptually motivated as a strategy for signaling the location of prosodic domain boundaries to the listener (Keating 2006, Kingston 2008, Katz 2016).

In this talk, we present new experimental data from Spanish speakers of Colombian heritage, historically the largest immigrant group from South America in the U.S. (Migration Policy Institute 2015), to investigate the relationship between prosodic structure and voiced stop lenition. Sixteen participants spanning three generations and residing in Florida and New Jersey were recorded in a controlled frame-sentence reading task and a semi-directed conversation dyad. Independent variables included phoneme, stress, task type, and, as exemplified in (1), prosodic domain. Following Rao (2015) and Blaire & Lease (2021), tokens were classified by audiovisual inspection of VCV sequences in Praat, based on the intensity difference between the minimum dB value of C and the maximum dB value of the following V, assuming three dependent variable categories: pure or tense approximant (PA, TA) or voiced stop (ST). Compared to other dialects, highland Colombian Spanish shows a 'conservative' prevalence of voiced stop allophones (Amastae 1995, Harper 2014). By investigating U.S. Spanish of Colombian heritage, we leveraged both this dialectal feature and the potential for negative transfer from North American English, which lacks systematic voiced stop lenition, to encourage sufficient variation in the dependent variable in order to reveal potential effects of prosodic boundary strength. Higher-intensity allophones were predicted to be more frequent at smaller domain boundaries, and lesser-intensity allophones to be more frequent at larger domain boundaries. Figure 1 gives the observed frequencies for three domain-initial contexts: the syllable (1a) and the minimal (1b) and maximal (1c) prosodic words. Generalized linear mixed-effects models were run in R Studio with the *lme4* package's *glmer* function (Bates et al., 2015). Pair-wise comparisons revealed significant differences among each of the three contexts, but only for PAs, which were more frequent across lower prosodic boundaries. STs trended in the opposite direction, becoming more frequent across higher boundaries, with TAs occupying the middle ground. In the talk, we also discuss the effects of phoneme, stress, and task type.

(1)



(σ syllable, ω prosodic word, ϕ phonological phrase)

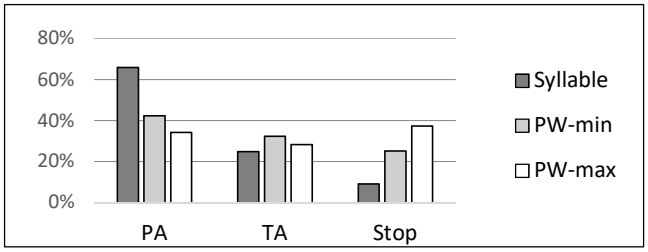


Figure 1: Frequency of /b,d,g/ allophones (n=4008) by prosodic domain in U.S. Spanish of Colombian heritage

Katz (2016) unifies allophonic patterns of consonant approximantization, voicing, and flapping under the rubric of *continuity lenition:* they help maintain a continuous signal of relatively greater intensity inside a given prosodic constituent. Complementary fortition processes align constituent edges with auditory disruptions of lesser intensity, thereby signaling the location of domain boundaries to the listener. Using BOUNDARY-DISRUPTION constraints in phonetically-based OT, Katz formalizes thresholds of consonantal intensity and duration as a function of prosodic boundary strength. We incorporate Rao's three dependent variable categories into Katz's (2016: 57) intensity scale (2a). Focusing on the role of intensity, we define a constraint schema (2b) that optimizes the complementary distribution of medial lenition vs. edge fortition. The schema projects constraints in a stringency hierarchy (de Lacy 2004) that captures two implicational universals: (i) if a consonant C is deemed too disruptive inside some DOMAIN, then so are *all more* disruptive Cs inside that and *all larger* DOMAINS, and (ii) conversely, if C is not disruptive enough at the edge of some DOMAIN, then neither are *all less* disruptive Cs at the edge of that and *all smaller* DOMAINS.

(2) a.

1 p, t, k	2 f, s, x	3 b, d, g (ST)	4 b̪, d̪, g̪ (TA)	5 β̞, ð̞, ɣ̞ (PA)	6 w, j

b. INTENSITY$_{\leq n_{\text{DOMAIN}}}$
Assign a violation for every consonant of intensity ≤*n* that is not edge-adjacent in a prosodic DOMAIN, and for every edge-adjacent consonant in a prosodic DOMAIN that is not of intensity ≤*n*.

c. *TENSEAPPROX (*TA)

d. *PUREAPPROX (*PA)

Using OTSoft (Hayes et al. 2013), we computed the factorial typology of six INTENSITY constraints (INT≤3ϕ, INT≤4ϕ, INT≤3ω_{max}, INT≤4ω_{max}, INT≤3ω_{min}, INT≤4ω_{min}), along with context-free (2c,d). From 40,320 logically possible rankings of eight constraints, there emerged just ten distinct, maximally simple grammars, each consisting of two ranking strata. Table 1 shows the dominant constraints in each grammar and the distributions they optimize (boldface and darker shading denote greater intensity allophones). PAs occupy the lower left quadrant of the typological space and STs, the upper right. We show how this typology is borne out by the allophonic distributions attested in studies of U.S. Spanish and, cross-linguistically, in Judeo-Spanish (Quintana 2006, Hualde 2013).

	dominant constraints	(((V_V)ω_{min})ω_{max})ϕ	((V(_V)ω_{min})ω_{max})ϕ	(((V))ω_{max}((_V))ω_{max})ϕ
G1	*PA, *TA	ST	ST	ST
G2	INT≤3ω_{min}, *PA	**TA**	ST	ST
G3	INT≤3ω_{min}, INT≤4ω_{min}	**PA**	ST	ST
G4	INT≤3ω_{max}, *PA	**TA**	**TA**	ST
G5	INT≤3ω_{max}, INT≤4ω_{min}	**PA**	**TA**	ST
G6	INT≤3ω_{max}, INT≤4ω_{max}	**PA**	**PA**	ST
G7	INT≤3ϕ, *PA	**TA**	**TA**	**TA**
G8	INT≤3ϕ, INT≤4ω_{min}	**PA**	**TA**	**TA**
G9	INT≤3ϕ, INT≤4ω_{max}	**PA**	**PA**	**TA**
G10	INT≤3ϕ, INT≤4ϕ	**PA**	**PA**	**PA**

Table 1: Factorial typology of continuity lenition grammars

Selected references

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