

Domain-initial strengthening beyond phrase-initial segments in Spanish and Portuguese

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Experimental studies on the prosody-phonetics interface have shown that prosodic structure influences low-level articulatory properties of segments near prosodic boundaries [1, 2]. For domain-initial boundaries, however, the evidence remains inconclusive regarding three important issues. First, although it is claimed that language-specific phonological contrasts modulate the phonetic marking of initial boundaries, no investigation has directly tested the hypothesis using comparable methods in a cross-linguistic sample. Secondly, the scope of the phonetic effects of domain-initial marking is still unclear, as studies have found mixed results for segments not immediately at the boundary [3, 4]. Thirdly, because most research has investigated lexically or phrasally accented segments [5, 6], the ways in which the marking of prosodic structure affects non-prominent segments at a domain boundary need further clarification. Using similarly constructed stimuli, the present study seeks to address these issues by looking at acoustic differences in the phonetic expression of domain-initial boundaries on unstressed syllables in Spanish and Portuguese, closely related languages that differ considerably in how unstressed segments behave phonetically [7].

Method. Trisyllabic words with penultimate stress were embedded in prenuclear position in meaningful carrier sentences under two experimental conditions: IP-initial and IP-medial (where IP = Intonational Phrase). Target segments consisted of a voiceless stop (/p t k/) and a vowel (/i u a/) in word-initial unstressed CV syllables in both languages (e.g. the segments in the unstressed syllable /ka/ in a word like *capela* ‘chapel’). Fourteen speakers of Mexican Spanish, and 14 speakers of Brazilian Portuguese (N = 28; 19 female) read target sentences three times in pseudo-randomized order between filler sentences in different sets for each language. Approximately 800 tokens were analyzed in the current study. *Acoustic measures.* VOT, and occurrence of a burst release were used to test boundary effects on /p t k/ in target syllables. Acoustic duration, F1 and F2 measures tested for domain-initial strengthening on /i u a/. Pitch was also measured. Control variables included duration of silent pauses before test words, duration of the stressed syllable, and articulation rate. Segmentation at syllable and phone levels was done using an automatic forced aligner [9] in Praat [10], and hand-corrected as needed. VOT and the occurrence of a stop release burst were annotated manually. Praat scripts extracted all the acoustic data, which were subsequently normalized for comparison. Results were evaluated statistically through mixed-effects models for individual variables for each language where appropriate.

Results & Discussion. Spanish and Portuguese patterned similarly for /p t k/, but somewhat differently for vowels. *VOT:* no differences between prosodic contexts were found. Since both languages are true-voicing languages [8], VOT may play a less significant role in distinguishing stops phonologically than in English, for instance. *Burst releases:* burstless stops only occurred in the IP-medial condition in both Spanish and Portuguese, suggesting that domain-initial strengthening may affect at least some acoustic properties of unstressed stops in these languages.

In both Spanish and Portuguese, vowels in unstressed CV syllables manifest enhanced phonetic properties near domain-initial position, suggesting that prosodic strengthening extends beyond the phrase-initial segment in non-prominent syllables in some languages, contrary to previous findings (e.g. [11]). Spanish vowels showed a main effect of duration (Fig. 1), and had significantly higher pitch values phrase-initially, but differences in F1-F2 ratio were not significant ($p=.121$). Portuguese vowels near the phrase-initial boundary were longer (Fig. 1), and less centralized than in phrase-medial position, but differences in pitch were not significant ($p=.352$).

Conclusion. The current results suggest further links between lexical prominence and prosodic structure [12], also domain-initially. Differences found between the languages also support the claim

that domain-initial strengthening operates by enhancing phonetic properties according to language-specific phonology.

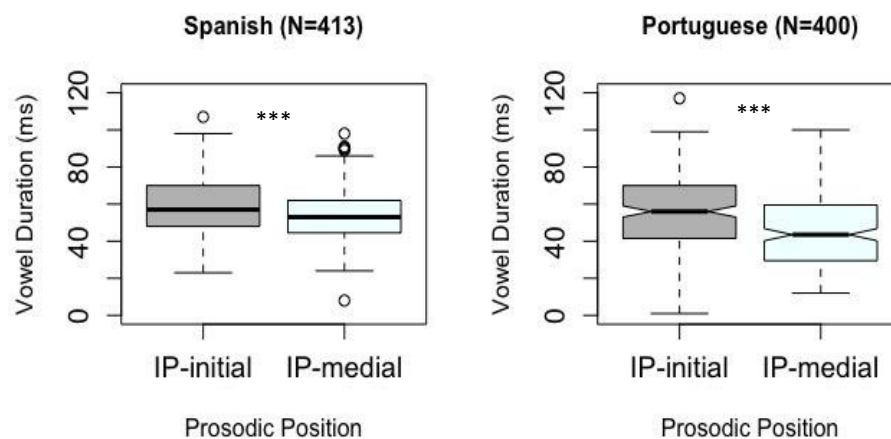


Figure 1. Duration of all tokens of vowels /i a u/ in target CV syllables in Spanish (left) and Portuguese (right) test words (e.g. *capela* ‘chapel’, *pitada* ‘whistle blow’/‘pinch’) as a function of prosodic condition (raw duration in ms). Besides prosodic context, duration of a preceding silent interval and vowel identity were significant factors in both languages.

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