Variable aspiration of Spanish coda /s/: Laboratory evidence and Stochastic OT modeling

Valentyna Filimonova
Indiana University

Kelly Berkson
Indiana University

valefili@indiana.edu

Aspiration is one of the most well-known phenomena in Spanish phonology and dialectology (Hualde, 2005). In aspirating dialects of Spanish, a syllable-final /s/ can be produced faithfully, aspirated (i.e. produced as an [h]), or deleted. This distinctive characteristic of numerous Spanish varieties shows variability triggered by social, stylistic, and individual factors. It is widely assumed that these so-called aspirating dialects differ from non-aspirating ones, where an alternative process of coda /s/ voicing assimilation in pre-consonantal contexts has recently gained research interest (Hualde, 2005; Schmidt & Willis, 2011). What has not yet been investigated, however, is the occurrence of voicing assimilation in aspirating dialects. This study provides empirical evidence of voicing assimilation occurring in Argentinean and Puerto Rican Spanish, two dialects known to be aspirating. Instrumental acoustic analysis reveals that in addition to the variability triggered by sociolinguistic factors, there is also a great deal of phonetic variation that has yet to be fully described. This analysis is coupled with Stochastic Optimality Theoretic modeling to identify and test the effect of multiple constraints as independent and interacting predicting factors. The resulting models of variation found in each dialect not only serve to expand our knowledge of the Spanish coda /s/ aspiration process but also reveal important hierarchical phonological relationships.

This study focuses on the aspirating dialects of Buenos Aires, Argentina, and Caguas, Puerto Rico. Data were elicited from two native Argentineans (a male and a female) and two native Puerto Ricans (a male and a female) who were audio-recorded in a soundproof booth describing a series of visual information cards. This oral picture description task consisted of 48 target items embedded in a provided text string to ensure the fluency and naturalness of pronunciation. All items were limited to a [es+CV-stress] context where the following CV context presented a balanced distribution of voiced and voiceless coronal and dorsal obstruents (/d, t, g, k/) and a coronal nasal (/n/) followed by even numbers of front, central, and back unstressed vowels. Each possible CV combination was elicited 3-4 times in the course of the experiment. Each token of coda /s/ was analyzed acoustically in Praat and coded phonetically as a sibilant, aspiration, or a geminate, and were further classified as voiceless or voiced. The results reveal a considerable amount of variation in coda /s/ production across phonetic contexts, ranging from voiceless and voiced sibilants (both dialects) to voiceless and voiced glottal fricatives (both dialects) to voiced geminate stops (Puerto Rico). These findings add a new phonetic variant to the picture of Spanish aspiration: the voiced glottal fricative [ɦ]. Further, because this variant sometimes occurs before voiceless consonants, the assumption that voicing results from regressive assimilation only is called into question.

A preliminary multivariate GoldVarb analysis identified dialect and the following context as significant predictors of coda voicing in the data. Beyond this, however, the fact that coda /s/ may surface with five different realizations in the same dialect in the same phonological context is suggestive of multiple factors interacting in complex ways. Linguistic phenomena that exhibit such a high degree of variation have been a focus of sociolinguistic studies over the past several decades, and have provided motivation for a growing interest in stochastic modeling (e.g. Boersma & Hayes, 2001; Cardoso, 2007). With this in mind, we propose a Stochastic Optimality Theoretic model of the variation seen in the Argentinean and Puerto
Rican data studied herein. Using the Gradual Learning Algorithm in OTSoft (Hayes, Tesar & Zuraw, 2013), possible output forms were assigned probabilities based on percentages of occurrence from the acoustic study and were assessed against a combination of faithfulness and markedness constraints on place, manner, and voicing features, lacking in previous OT accounts (e.g. Colina, 1997, 2009; Morris, 2000). Two models of categorical and overlapping constraint rankings—one for each dialect—which accurately predict the observed rates of variable coda /s/ production were generated. A clear phonological hierarchy of manner over place over voicing constraints emerged, with each constraint tier characterized by dominance of markedness over faithfulness constraints. Taken together with the fine-grained acoustic analysis presented herein—which contributes to a more nuanced understanding of the output forms produced by the process of aspiration—the stochastic modeling proves to have important explanatory and predictive power and helps shed light on the way in which constraints interacting at the interface of phonetics and phonology may lead to this complex pattern of variation.

References