Articulatory complexity in Spanish: Developing a hierarchy of difficulty
Matthew Patience
University of Toronto

To master the sounds of a foreign language, a speaker must learn to articulate (e.g., successful combination of gestures, vocal cord vibration) the new segments. While we know that certain segments are more difficult to acquire due to a greater degree of articulatory difficulty (e.g., Yavas, 1997; Colantoni & Steele, 2008), no L2 theory can account for this difficulty. The objective of my research is to contribute to our understanding of the role of articulatory difficulty (AD) in L2 acquisition by investigating the production of Spanish by L1 English speakers. To analyze the role of AD, it is first necessary to quantify the AD of Spanish segments that are not present in English, which is the goal of the present paper: to create a hierarchy of difficulty of the Spanish segments /β, ɣ, ɾ, n, t/.

AD has been approached primarily through research on markedness (e.g., Jakobson, 1968) and on phonetic constraints (e.g., Ohala, 1983; 1997). While marked sounds are often considered to be more articulatorily complex than unmarked sounds, markedness is the product of a combination of factors (e.g., salience, frequency), and therefore does not specifically reflect AD (Hume, 2011). Research on phonetic constraints can rank sounds that contrast by a certain feature (e.g., voiced vs. unvoiced), but is limited in that it cannot rank sounds that are unrelated (e.g., a voiced retroflex stop vs. a voiceless alveolar sibilant). Lindblom & Maddieson (1988; henceforth L&M) proposed a ranking of AD based on phonetic principles, but the scale is limited due to the fact that they grouped all sounds into only three categories, and the scale was never tested empirically. Due to the aforementioned limitations, the present study was designed to experimentally test AD using a task that involved a high degree of complexity, thus revealing which segments were more difficult to produce.

Five L1 Spanish speakers were asked to repeat a V.CV sequence at an increasingly rapid rate until they began to deviate from the target production. The fastest rate at which the speaker could accurately produce three repetitions of the target sequence was recorded for each segment. The segment with the fastest rate of production was considered to be the easiest segment, while the segment produced with the slowest rate was considered to be the most difficult. Fourteen V.CV sequences were tested; each one consisted of a vowel (/e, o/) and one of the five target segments (/β, ɣ, ɾ, n, t/) or /m, t/, which were included as a baseline because stops are considered to have a low difficulty rating (L&M, 1988). The 14 sequences were presented twice to participants in random order. All productions were recorded and subsequently analyzed in Praat, in order to determine when the productions were no longer target-like. This was achieved by analyzing changes in f0, intensity, and formant structure.

Preliminary results indicate that, as expected, both stops /m, t/ were produced with the fastest rates (3.9x/sec), indicating that they were the least complex. This is consistent with findings of phonetic constraints (Ohala, 1983) and markedness (Maddieson, 1984). The segments /ɾ, n, β/ had the next fastest rates of production (3.7x, 3.6x, 3.5x/sec, respectively), whereas the segments with the slowest rates of production were the two velars /ɣ/ and /x/ (at 3.3x and 3x/sec). These results suggest that a velar place of articulation is more complex compared to more anterior places of articulation, and are consistent with phonological theories (e.g. the emergence of the unmarked) that treat coronals as the unmarked segment. The rapid rate of production of the trill was somewhat unexpected, as the /t/ is considered to have a high degree of articulatory difficulty (due to the precise phonetic conditions required for its production, and the
fact that even some native speakers are unable to produce it (Solé, 2002)). However, the results indicate that production of the trill is not necessarily complex for a speaker is who accustomed to producing the sound, when they are actively focusing on its successful production.

References


