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Acoustic Analysis of Spanish Vowels in Native Spanish and English Speakers

Spanish and English differ greatly in their vowel inventories, with Spanish only having five vowel phonemes /a/, /e/, /i/, /o/ and /u/, and English having more than double this vowel inventory (12 vowels). Compared to their English counterparts, Spanish vowels are shorter in duration, do not vary in duration based on stress type (unlike English, where stressed vowels are lengthened and unstressed vowels are reduced), are higher or lower in F1 (depending on the vowel), and are higher in F2 (Cobb & Simonet, 2015; Colantoni et al., 2015; Hualde, 2014; Menke & Face, 2010; Schwegler et al., 2010).

Previous research has found that, in L1 English/L2 Spanish speakers, F1 and F2 of Spanish vowels may progress toward native speaker targets with increased proficiency. However, F1 and F2 of stressed vowels may be higher or lower than for unstressed vowels, depending on the vowel (Cobb & Simonet, 2015; Menke & Face, 2010). L1 English/L2 Spanish speakers may perceptually assimilate Spanish vowels to their English counterparts, and may substitute the English counterpart of each vowel for the target Spanish vowel (Menke, 2010; Morrison, 2003).

This study aimed to determine whether there may be differences in duration, F1 and F2 of Spanish vowels between L2 Spanish learners with L1 English and L1 Spanish speakers. It was hypothesized that, compared to L1 Spanish speakers: (1) L2 learners, especially those with lower proficiency, would produce stressed /e/, /i/, /o/ and /u/ with longer duration, and unstressed /a/ with shorter duration. (2) They would produce Spanish /a/, /o/ and /u/ (unstressed and stressed) with a higher F1 and /e/ and /i/ (unstressed and stressed) with a lower F1. (3) They would produce all five Spanish vowels, /a/, /e/, /i/, /o/ and /u/ (unstressed and stressed) with a higher F2.

Corpus data from the *University of Toronto Romance Phonetics Database* (Colantoni & Steele, 2004), for all five Spanish vowels, were collected for six participants (three L2 Spanish learners with L1 English: one intermediate, one advanced and one near-native; and three L1 Latin American Spanish speakers) chosen from 30 participants (15 L2 Spanish-L1 English, 15 L1 Latin American Spanish) living in Toronto. These participants produced 300 vowel tokens (50 per participant, 10 per vowel, five stressed and five unstressed) in a word list reading task.

Results, analyzed using Praat (Boersma & Weenink, 1992/2015), showed that, for L2 learners, compared to L1 Spanish speakers: (1) Differences in (i.e., longer) duration may only occur for stressed /a/ (at all proficiency levels). (2) Differences in F1 and F2 may occur for all vowels (stressed and unstressed, at all proficiency levels), with F1 and F2 being higher or lower for L2 learners than native speakers, depending on vowel, stress, and proficiency level. (3) At the intermediate level, improvement in F1 may occur beyond (higher than) native speaker levels for /e/ and /i/ (unstressed and stressed) and beyond (lower than) native speaker levels for /u/ (unstressed). (4) At the advanced level, improvement in F1 may occur beyond (lower than) native speaker levels for /a/ and /o/ (unstressed and stressed) and /u/ (stressed). (5) At the intermediate level, improvement in F2 may occur beyond (lower than) native speaker levels for /u/ (unstressed). (6) At the advanced level, improvement in F2 may occur beyond (lower than) native speaker levels for /a/ (stressed) and /e/ and /i/ (unstressed and stressed).

An important implication of this study is that for L2 Spanish vowels in learners with L1 English, target-like production may be achieved more easily and more quickly on some parameters (duration, F1) than on others (F2). The parameters where target-like production is more challenging may require additional practice for native speaker targets to be achieved.

References for Abstract:

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