CHAPTER 8

Pitch and Glottalization as Cues to Contrast in Yucatec Maya

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1 Introduction

Yucatec Maya (a Mayan language of Mexico, henceforth abbreviated as YM) is one of the few Mayan languages to use a tonal contrast. Long vowels are produced with either low tone (e.g. /miis/ cat) or high tone (e.g. /miis/ sweep). There is also a third type of long vowel used in YM; glottalized vowels are produced with initial high pitch and with creaky voice. The results of production experiments show that high tone and glottalized vowels differ in several phonetic dimensions: glottalized vowels tend to have higher initial pitch, to have a larger pitch span, to be produced with more creaky voice, and to be longer than high tone vowels. The fact that multiple phonetic dimensions are at play in this phonological contrast has implications for what strategies listeners use in differentiating the contrast as well as for how to model the phonological grammar and its relation to phonetics. These implications are explored in this chapter via two perception experiments conducted in Yucatan, Mexico.

It has been demonstrated for various phonemic contrasts that the same phonetic properties that distinguish different phonemes in production are used by the listener as cues to perceiving the contrast. For example, both F1 and duration systematically differ in the productions of tense and lax vowels in English (Peterson and Barney 1952; Peterson and Lehiste 1960), though the reliability of such cues varies by dialect. Escudero and Boersma (2004) show that speakers of different dialect groups attend to those cues that are

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the most correlated with the contrast in that dialect: Scottish English speakers distinguish /i/ from /ɪ/ primarily by F1 and only minimally by duration, whereas duration is predominantly used by Southern British English speakers. As another example, the average VOT (for both voiced and voiceless stops) is greater in English than in Spanish, and when performing a discrimination task, the crossover point (the point on the VOT continuum that begins to elicit more ‘voiceless’ responses than ‘voiced’ responses) has a higher VOT value for English listeners than for Spanish listeners (Liberman et al. 1958; Lisker and Abramson 1964, 1970; Cho and Ladefoged 1999).

Given the above facts, one would expect YM listeners to make use of all available phonetic dimensions—pitch, glottalization, and vowel duration—when distinguishing between HIGH TONE and GLOTTALIZED vowels. This expected result is confirmed when listeners respond to natural stimuli produced by native speakers. This result is also in line with experimentation that shows that perception strategies are dependent on the specific phonetic productions of a language and thus must be accounted for with language-specific perception grammars, and particularly with bidirectional grammars, in which the production and perception grammars mirror each other.

Listeners reacted differently to manipulated stimuli by attending to glottalization alone and ignoring pitch. I argue that the manipulated stimuli forced participants to focus on only one phonetic dimension, and so listeners made use of the phonetic cue that is the most reliable at distinguishing the contrast between HIGH TONE and GLOTTALIZED vowels. This means that the grammar of a language must not only account for how listeners use multiple cues in ‘ideal’ language situations but also how they focus on the most useful cue in ‘degraded’ language situations.

This chapter proceeds as follows. In §2, I present the phonological properties of the vowel system of Yucatec Maya and the results of production experiments that show how different phonetic properties indicate a contrast between HIGH TONE and GLOTTALIZED vowels. Two perception experiments are discussed in §§3–4.1 The first perception experiment used natural stimuli to test how accurate listeners are at discriminating between HIGH TONE and GLOTTALIZED vowels and to determine which phonetic dimensions listeners use to make their choice. The second perception experiment used manipulated

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1 The methodology and results of all production and perception experiments are presented in my dissertation (Frazier 2009); the results of production experiment 1 are also reported in Frazier (2011). In this chapter, I focus on the data most relevant to the discussion at hand, and, as such, I present data pooled from different speakers and different tokens than those reported in previous work.