Testing the Laryngeal Complexity Hypothesis: Evidence from Santiago Laxopa Zapotec

Introduction: Most descriptions about the interaction between tone and phonation are based on South East and East Asian languages (e.g., Masica 1976, Thurgood 2002, Michaud 2012, Brunelle & Kirby 2016, Kuang 2017). These descriptions have lead to widespread claims about what is possible in languages with tone and phonation, specifically that tone and phonation are co-dependent. This means that certain tones will bear specific phonations or that certain phonation types only appear with certain tones. For example, Mandarin's tone 3 is associated with creaky voice (Hockett 1947) and Vietnamese's low falling tone is associated with breathy voice (Thurgood 2002). This, however, is not the true for Oto-Manguean languages where tone and phonation are independent from one another (Silverman 1997).

The Laryngeal Complexity Hypothesis: Despite being independent from one another, tone and phonation need to interact in a way that is perceptually salient. This need for perceptual saliency led to the proposing of the Laryngeal Complexity Hypothesis (LCH; Silverman 1997, Blankenship 1997, 2002). The LHC's basic premise is that for tone and phonation to be best perceived there needs to be an ordering or phasing between the gestures for tone and phonation. If there was no strict ordering of the gestures for tone and phonation then the cues for tone and/or phonation will have interference, see Figure 1 for a graphical illustration. DiCanio's (2012) study exploring the LCH in Itunyoso Trique found exactly this interference. DiCanio showed that when there is a large overlap between the gestures for tone and phonation that the f0 signal is perturbed by the glottal gestures for phonation.

This paper investigates the LCH's role in Santiago Laxopa Zapotec (SLZ), an understudied Oto-Manguean language spoken by approximately 1000 people in the municipality of Santiago Laxopa in the Sierra Norte of Oaxaca, Mexico.

Description of SLZ tone : SLZ, like other Oto-Manguean languages, contains a robust systems of both tone and phonation which are independent from each other. SLZ has five surface tonal patterns on syllables: three level tones H(igh), M(id), L(ow) and two contour tones HL and MH. Vowels in SLZ, additionally have four phonations types: Modal, Breathy, Checked, and Laryngealized. These different tones and voice qualities are allowed to appear essentially independent from one other in the nominal domain, as seen in Table 1.

Methodology: Data was collected from 18 native SLZ consultants living in Santa Cruz, CA in person and in Santiago Laxopa, Ixtlán, Oaxaca, Mexico (11 female). Consultants were recorded repeating three times the phrase *shnia' WORD chone las.* 'I say WORD three times' with each of the 77 target words. Vowels were extracted from the resulting audio files and spectral-tilt measurements were generated for each third of the vowel using VoiceSauce (Shue, Keating & Vicenik 2009) following Garellek & Keating (2011). The results were then analyzed in R (R Core Team 2021) using lmer with speaker and word being random variables.
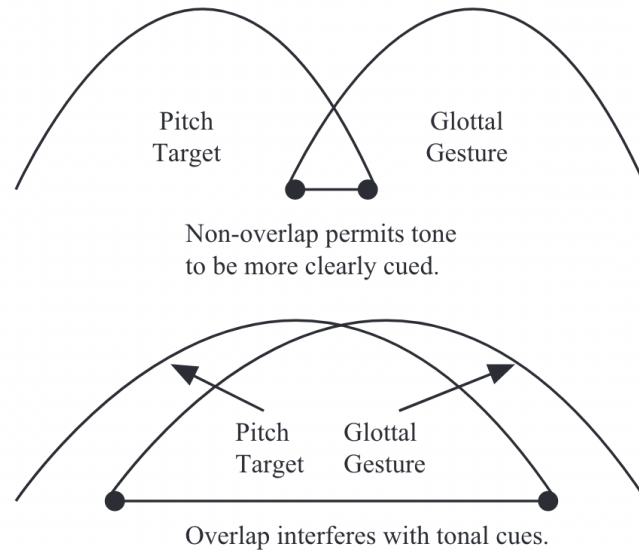
Upshot:

Figures and Tables

Figure 1: Representation taken from DiCanio (2012).

Table 1: Distribution of tone and phonation in SLZ

	Modal	Breathy	Checked	Laryngealized
H	✓	–	✓	✓
M	✓	✓	✓	✓
L	✓	✓	✓	✓
HL	✓	✓	✓	✓
MH	✓	✓	–	✓

COVID Impact

Due to COVID, the pueblo of Santiago Laxopa closed itself to the outside world until a few months ago. Fortunately, I was able to elicit preliminary data from two SLZ speakers that were living in California. However, this was insufficient data to adequately assess the interaction between tone and phonation, but provided me with some preliminary results, which were presented in this abstract. I am currently, at the time of submitting this abstract, in Santiago Laxopa finishing eliciting data from additional SLZ speakers (6 male; 10 female) to verify the validity of the results of the two SLZ speakers form California.