

Tone and phonation in Santiago Laxopa Zapotec

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1 Introduction

- Most work on the interaction of tone and phonation has been based on descriptions of southeast and far east Asian languages.
- This lead to strong claims on the interaction between tone and phonation (Masica 1976, Thurgood 2002, Yip 2002, Enfield 2005, Michaud 2012, Brunelle & Kirby 2016).
- Main claim from these authors is that tone and phonation are codependent. This is often referred to as a register system.
 - Meaning that we only observe certain tones with certain phonations.
 - Mandarin Tone 3 is always associated with creaky voice (Duanmu 2007).
- This claim has also been made in the reverse that certain phonation types are associated with specific tonal patterns.
 - Breathy voice stereotypically appears with high pitch and creaky voice sterotypically appears with low pitch (Esling et al. 2019).
 - * TODO: Look for earlier references to these claims.
 - This is often born out with research into register systems.
 - Also found in pathological voice quality (Klatt & Klatt 1990, Titze 2000, Esling et al. 2019).
- Research into Mesoamerican languages, however, shows that these claims are too strong or exaggerated (Suárez 1983, Campbell, Kaufman & Smith-Stark 1986, Silverman 1997, Di-Canio 2008, Esposito 2010, Campbell 2017a,b).

- Most languages of the Oto-Manguean language family exhibits independent tone and phonation.
 - Tone and phonation freely co-occur or exhibit a much freer distribution than what is found in register languages.
 - San Lucas Quiaviní Zapotec is one such example.

Table 1: SLQZ tone and phonation

	High	Low	Falling	Rising
Modal	✓	✓	✓	✓
Breathy	X	✓	✓	X
Creaky	✓	✓	✓	X
Interrupted	✓	✓	✓	X

- This paper adds to this debate by:
- Silverman (1997)

2 Santiago Laxopa Zapotec

- Spoken by approximately 1000 speakers in the municipality of Santiago Laxopa, Ixtlan, Oaxaca, Mexico (Adler & Morimoto 2016, Adler et al. 2018, Foley, Kalivoda & Toosarvandani 2018, Foley & Toosarvandani 2020).
- Member of the Northern Zapotec branch of the Oto-Manguean language family.
- Data for SLZ was collected from two native language speakers of SLZ, who live in Santa Cruz, CA.
 - Based on data from approximately 200 nouns
 - Collected between Spring 2020 and Fall 2022

2.1 Tone in SLZ

- SLZ has five surface tones as represented in Table 2.
- Following discussion from [Brinkerhoff, Duff, & Wax Cavallaro (2022)], these tones are limited in their appearance.
- It is true that all five patterns can surface on a syllable but there is a restriction in what tonal patterns are allowed to surface on words that are larger than bimoraic.

Table 2: SLZ tones

High	a ¹	<i>xha</i>	[za ¹]	‘clothing.POSS’
Mid	a ²	<i>lhill</i>	[riʒ ²]	‘house.POSS’
Low	a ³	<i>yu’</i>	[ɕu ^{ʔ3}]	‘earth’
Rising	a ²¹	<i>yu’u</i>	[ju’u ²¹]	‘quicklime (Sp. cal)’
Falling	a ¹³	<i>yu’u</i>	[ju’u ¹³]	‘house’

- The patterns that we observe on bimoraic nominals are:
 - HL
 - MH
 - LL
- This has the appearance of being a prototypical “word tone” language following Pike’s (1948) categorization.
- However, recent work from Shih & Inkelas (2019) and McPherson (In press) has argued that the “word tone” description is epiphenomenal and can be derived via surface constraints on tone.
- What is important to take away from this is that there are still five distinct tonal patterns that are productive in the speakers.

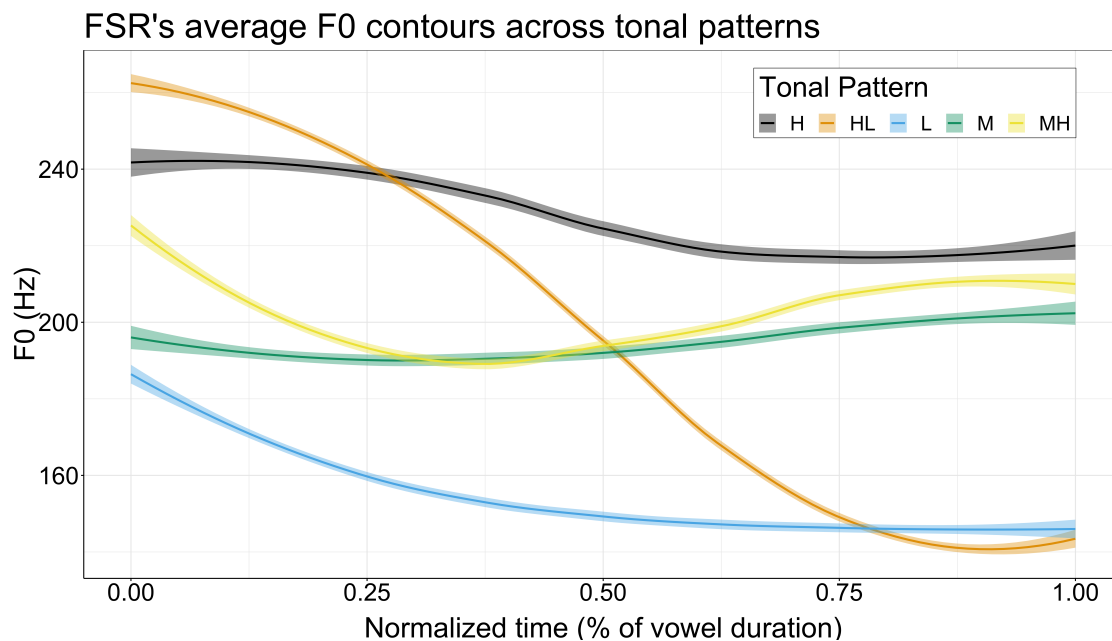


Figure 1: Tonal contrasts for FSR averaged and time normalized.

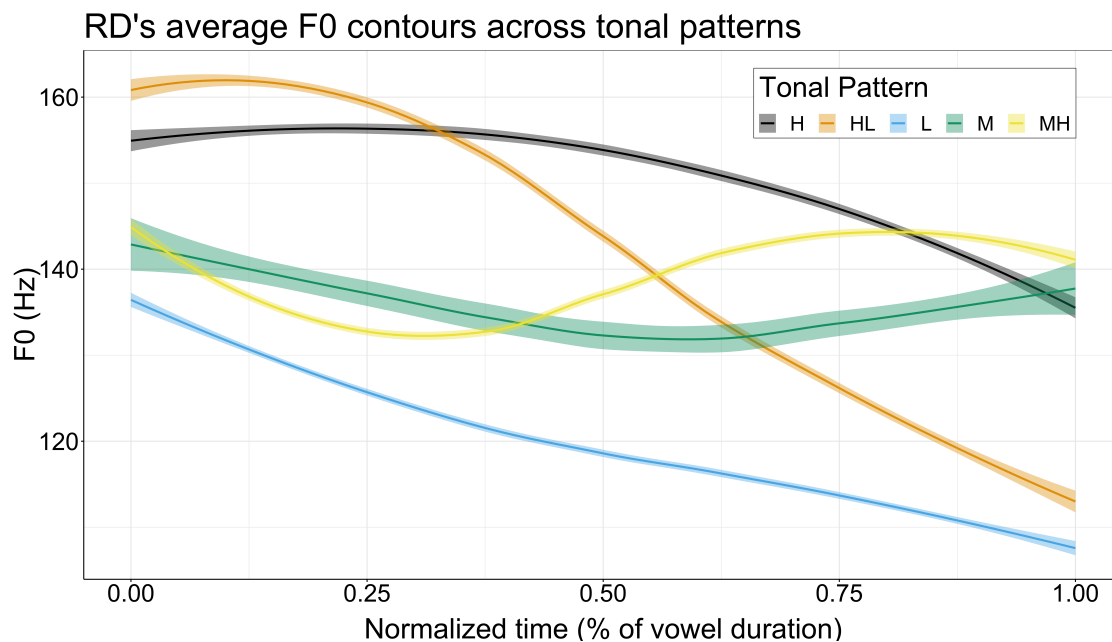


Figure 2: Tonal contrasts for RD averaged and time normalized.

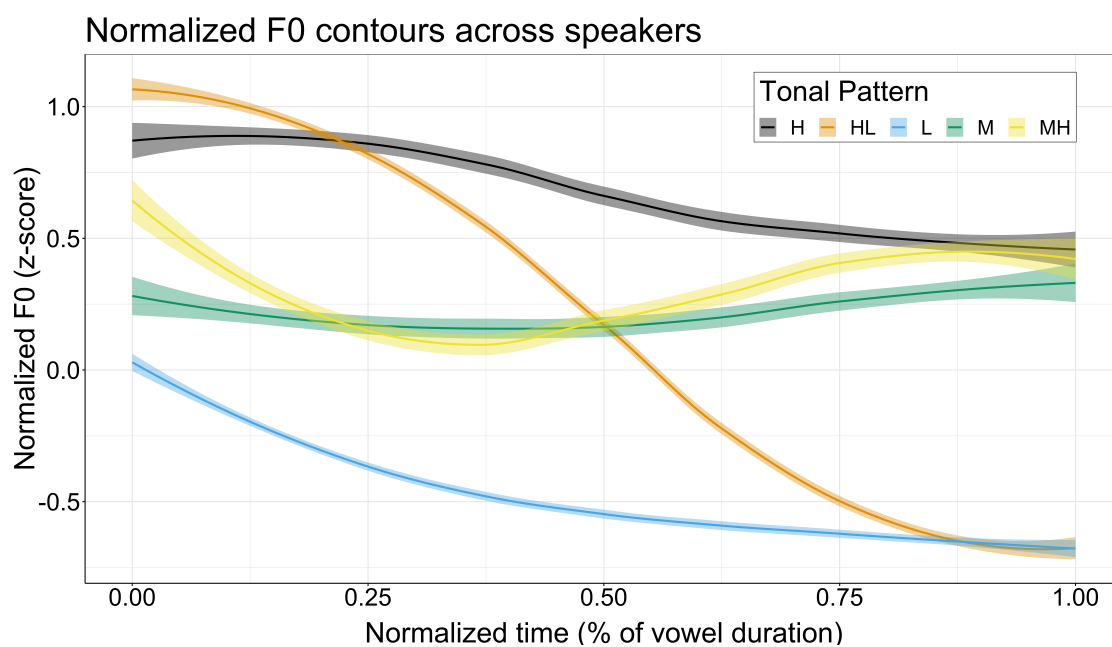


Figure 3: Tonal contrasts for FSR and RD normalized for f0 and time.

2.2 Phonation in SLZ

- SLZ has four different contrastive phonation types on the vowels.
 1. Modal: [a] <a>
 2. Breathy: [ʌ] <ah>

3. Checked: [a'] <a'>
 4. Laryngealized: [a'a] <a'a>
- Even though all of these contrastive phonation involve varying degrees of laryngealization, different configurations of the larynx, I choose to use the term laryngealized to refer to one of the phonation contrasts following the arguments from Avelino (2010).
 - Laryngealized vowels do not have one consistent production of

3 Interaction of Tone and Phonation

- Table 3 shows the observed patterns between tone and phonation in SLZ.

Table 3: Distribution of tone and voice quality in SLZ on a syllable

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

- The striking observations that we find is that

4 Acoustic Measurements

- One way to investigate these interactions

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