

The acoustics of phonation in Santiago Laxopa Zapotec

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1 Introduction

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2 Background

3 Santiago Laxopa Zapotec

- Santiago Laxopa Zapotec (SLZ), endonym *Dille'xhunh Laxup*, is a Northern Zapotec language spoken by approximately 1000 people in the municipality of Santiago Laxopa, Ixtlán, Oaxaca, Mexico and in diaspora communities in Mexico and the United States (Adler & Morimoto 2016, Adler et al. 2018, Foley, Kalivoda & Toosarvandani 2018, Foley & Toosarvandani 2020).
- Closely related to San Bartolomé Zoogocho Zapotec (Long & Cruz 2005, Sonnenschein 2005) and shares a high level of mutual intelligibility with it.

- SLZ is similar to other Zapotecan languages in distinguishing lenis and fortis consonants (e.g., Nellis & Hollenbach 1980, Jaeger 1983, Uchihara & Pérez Báez 2016).

Table 1: Consonant inventory for Santiago Laxopa Zapotec

		bilabial	alveolar	post- alveolar	retroflex	palatal	velar	labio- velar	uvular
stop	lenis	b	d				g	g ^w	
	fortis	p	t				k	k ^w	
fricative	lenis		z	ʒ	ʐ				ʁ
	fortis		s	ʃ	ʂ	ç			
affricate	lenis		dz						
	fortis		ts		tʃ				
nasal	lenis		n						
	fortis	m:	n:						
lateral	lenis		l						
	fortis		l:						
trill			r						
approximate								w	

- SLZ has a standard five vowel inventory.

Table 2: Vowel qualities in Santiago Laxopa Zapotec.

	front	central	back
high	i		u
mid	e		o
low		a	

- These five vowels, additionally, appear with one of four different phonation types which will be discussed in greater detail in Section 3.2.

3.1 Tone in Santiago Laxopa Zapotec

- Similar to other Otomanguean languages, SLZ is tonal (Suárez 1983, Campbell, Kaufman & Smith-Stark 1986, Silverman 1997, Campbell 2017a,b).
- SLZ has five distinct tonal patterns that appear on the syllables of nouns, see Table 3.

Table 3: Examples of the five tonal patterns observed in the Santiago Laxopa Zapotec words.

High	a ^H	<i>xha</i>	[ɬa ^H]	‘clothing.POSS’
Mid	a ^M	<i>lhill</i>	[liɜ ^M]	‘house.POSS’
Low	a ^L	<i>yu’</i>	[ɕu ^L]	‘earth’
Rising	a ^{MH}	<i>yu’u</i>	[ɕu ^u u ^{MH}]	‘quicklime (Sp. cal)’
Falling	a ^{HL}	<i>yu’u</i>	[ɕu ^u u ^{HL}]	‘house’

- These five tonal patterns are illustrated in Figures ?? and ?? for two different SLZ speakers.
- Figures ?? and ?? shows the five tonal contrasts averaged for each tonal contrast from the onset to ending of the vowel.
- We can ignore the first 20-25% of the measure due to the influence of transitions out of the consonantal onsets.

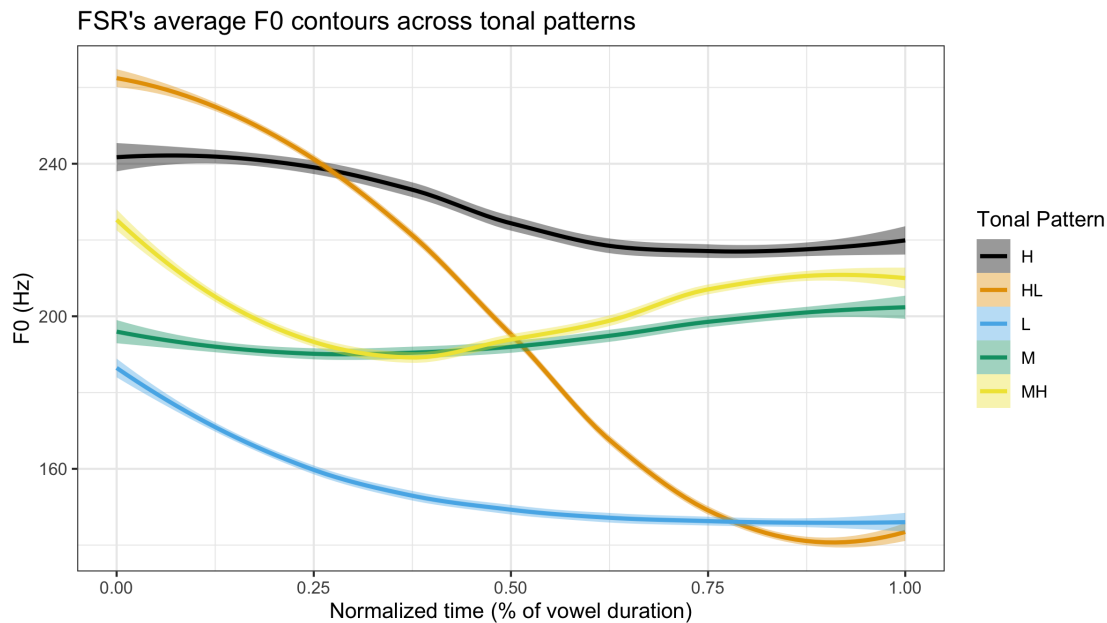


Figure 1: Tonal contrasts for FSR averaged and time normalized. Each line in this graph represents the average of approximately 10 syllables for each tonal pattern.

3.2 Phonation in Santiago Laxopa Zapotec

- Zapotecan languages commonly make use of contrastive phonation on vowels (e.g., Avelino 2004, Long & Cruz 2005, Avelino 2010, López Nicolás 2016, Chávez-Peón 2010).
- SLZ is no different and has four contrastive phonation types: modal /a/, breathy /a̤/, checked /a̰/, and laryngealized /a̰a/.

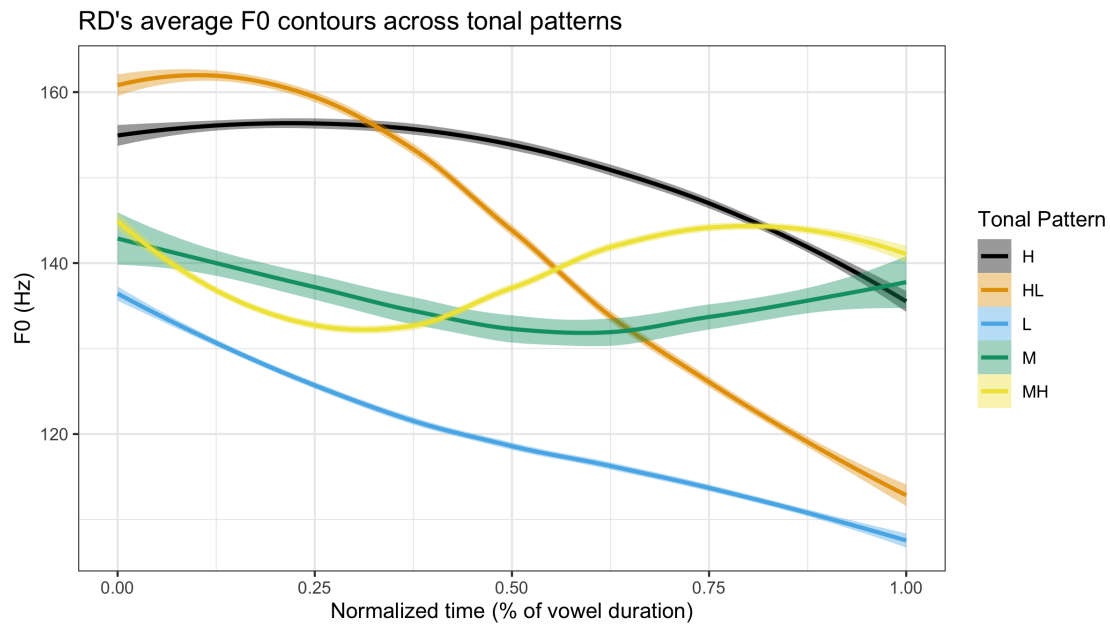


Figure 2: Tonal contrasts for RD averaged and time normalized. Each line in this graph represents the average of approximately 10 syllables for each tonal pattern.

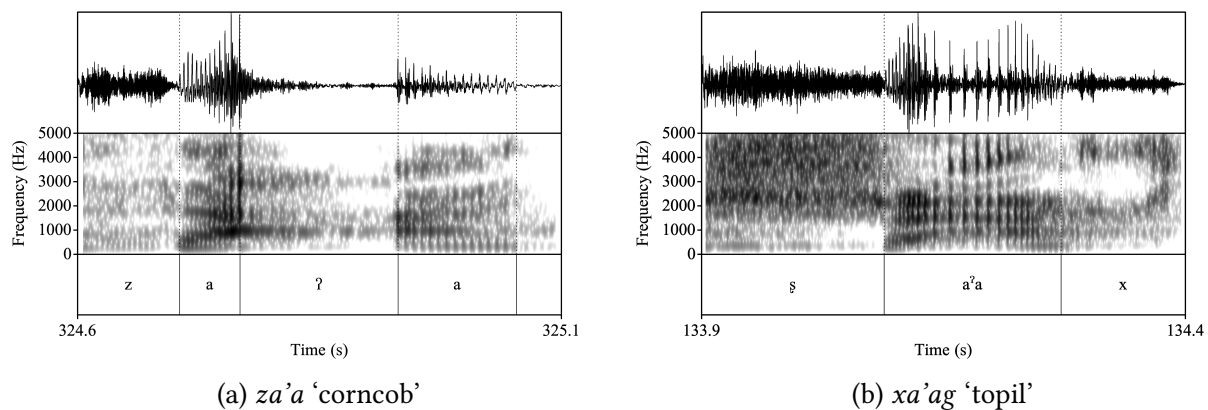


Figure 3: Comparison of FSR's laryngealized vowels in *za'a* 'corncob' and *xa'ag* 'topil'

3.3 Interaction of tone and phonation in Santiago Laxopa Zapotec

4 Methodology

5 Results

5.1 H1-H2 spectral-tilt

5.2 H1-A3 spectral-tilt

5.3 Cepstral Peak Prominence

6 Discussion

6.1 Laryngeal Complexity Hypothesis

- Silverman (1997) and Blankenship (1997, 2002)

7 Conclusion

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