

Interaction of tone and phonation in Santiago Laxopa Zapotec

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1 Introduction

2 Tone and Phonation

Tone, as a linguistic phenomenon, is very wide spread and is present in many of the world's languages (yipTone2002). Most of the tonal languages that have received the most attention are languages from Africa and Asia with languages of the America's receiving some attention (pikeToneLanguagesTechnique1948, silvermanLaryngealComplexityOtomanguean1997, campbellOtomangueanHistoricalLinguistics2017a, campbellOtomangueanHistoricalLinguistics2017). Because of the focus on mostly African and Asian tonal languages certain assumptions are commonly held about what is possible for tonal languages. One of the assumptions that is made is that tone and phonation are heavily dependent on each other (andruskiPhonationTypesProduction2000, yipTone2002, garellekVoiceQualityTone2013, brunelleTonePhonationSoutheast2016, weePhonologica hymanToneSystems2020, garellekPhoneticsWhiteHmong2021). For example, Mandarin tone three, which is produced as a dipping tone in careful speech and a falling tone in rapid speech, has creakiness throughout the vowel. This creakiness is often the sole clue to differentiate it from a normal falling tone (duanmuPhonologyStandardChinese2007, kuangCovariationVoiceQuality2017).

Oto-Manguean languages from Mexico clearly show that the behavior between tone and phonation in Asia is not the only way in which tone and phonation can interact. In fact, Oto-Manguean languages have what silvermanLaryngealComplexityOtomanguean1997 calls "laryngeally complex" vowels. These laryngeally ccomplex vowels are ones where tone and phonation are entirely independent from one another. This means that any tone can co-occur with any phonation type. Some work has been done that adequately shows this such as avelinobecerraTopicsYalalagZapotec2004, chavez-peonInteractionMetricalStructure2010, dicanioCoarticulationToneGlottal2012, uchiaraTone. One of the more detailed of these studies is chavez-peonInteractionMetricalStructure2010 who investigates the phonetic cues to tone, stress, and phonation in San Lucas Quiaviní Zapotec (SLQZ) a Valley Zapotec variety. chavez-peonInteractionMetricalStructure2010 shows how tone and phonation are mostly independent from each other with a notable exception being the restriction of Rising tone in SLQZ which can only appear with modal phonation. The distribution of tone and phonation type is presented in Table ??.

My qualifying paper will add to this lesser studied area of phonetics and phonology by inves-

Table 1: SLQZ tone and phonation

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

titigating the interaction of tone and phonation in Santiago Laxopa Zapotec.

3 Overview of Santiago Laxopa Zapotec

Santiago Laxopa Zapotec (SLZ) is a variety of Sierra Norte Zapotec, a member of the Oto-Manguean language family, and spoken by approximately 800 to 1200 people in the municipality of Santiago Laxopa, Oaxaca, Mexico (**adlerDerivationVerbInitiality2018**, **sichelPronounsAttractionSierra2020**).

Similar to other Oto-Manguean languages, SLZ exhibits **silvermanLaryngealComplexityOtomanguean1997** (**silvermanLaryngealComplexityOtomanguean1997**) “laryngeally complex vowels”. In addition to its five-vowel inventory, SLZ makes further distinctions with the addition of breathy, checked,¹ and laryngealized² phonations. There are many words that are differentiated by only by phonation in SLZ. The words for *snake* and *fish* are only distinguished by the presence of breathy phonation as seen in (??).

- (1) a. *behl* ‘snake’
b. *bel* ‘fish’

In addition to phonation, SLZ exhibits five different surface tonal patterns

4 Methods and materials

Two SLZ speakers who live in Santa Cruz, CA were

¹There are two ways in which this vowel can be analyzed. One is the traditional way where the glottal stop is considered inseparable from the vowel. The other is to treat this as a consonant which is restricted to only reside in codas (similar to how the sound /ŋ/ is restricted to codas in English). This second approach is the one taken by **avelinobecerraTopicsYalalagZapotec2004**. I will follow the traditional way of analyzing these vowels through this paper.

²Previous descriptions of the the vowel system of closely related languages have used various different terms for this vowel including broken, rearticulated, interrupted, and creaky (**longDiccionarioZapotecoSan2005**, **avelinoAcousticElectroglottographicAnalyses2010**, **avelinobecerraTopicsYalalagZapotec2004**, **sonnenscheinDescriptiveGrammarSan2005**, **adlerAcousticsPhonationTypes2016**). In order to avoid confusion, I will use the term laryngealized following **avelinoAcousticElectroglottographicAnalyses2010**.

Table 2: SLZ tones

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

5 Laryngeal Articulator Model

6 Conclusion