Phonetic Realization and Phonological Representation of Voice Quality in Santiago Laxopa Zapotec

Mykel Loren Brinkerhoff

1 Proposal

My dissertation addresses how phonology and phonetics account for differences in voice quality. Voice quality describes how the larynx can be manipulated during speech to affect how the sounds are produced. Most commonly, in speech, these manipulations have a breathy or creaky voice quality (Esling et al. 2019). In some languages, like English, the amount of breathiness or creakiness produced when we speak does not significantly affect what we say. However, this is different in other languages across the world. For example, in many Mesoamerica and Southeast Asian indigenous languages, voice quality differences can drastically change a word's meaning (Esposito & Khan 2020). In the endangered Zapotec language Santiago Laxopa Zapotec (SLZ) spoken by approximately 1000 speakers in the municipality of Santiago Laxopa, Ixtlán, Oaxaca, Mexico (Adler & Morimoto 2016, Adler et al. 2018, Brinkerhoff, Duff & Wax Cavallaro 2021, Foley, Kalivoda & Toosarvandani 2018, *Santiago Laxopa* 2022, Sichel & Toosarvandani 2020, Silva–Robles et al. 2022) there are four unique voice qualities breathy, checked, rearticulated, and modal. Breathy vowels are realized with a breathy voice during any point of the vowel. Checked and rearticulated vowels are realized with creaky voice but in different locations within the vowel (i.e., checked vowels have creakiness at the end while rearticulated vowels have creakiness at the middle). Modal vowels, or the default vowel, do not have any laryngeal modification.

My dissertation will address several questions about how these voice quality distinctions are produced and what they can tell us about how these sounds are organized in the sound system of SLZ. The first concerns the phonetic realization or how SLZ makes these sounds. Initial investigations into these voice qualities by Adler & Morimoto (2016) and Brinkerhoff & McGuire (In Preparation) have revealed some information about this question, mainly what acoustic mea-

sures best capture the contrasts between these qualities. Adler & Morimoto (2016) showed that spectral tilt can account for the four voice quality distinctions in SLZ. This acoustic measure looks at the speech signal's relative amplitude of sound waves (Fischer-Jørgensen 1968). Adler & Morimoto found that two different spectral tilt measures can capture the distinctions. However, recent work in Brinkerhoff & McGuire (In Preparation) on ten SLZ speakers shows that most spectral tilt measures are not good at capturing the voice quality distinctions. Instead, we found that most spectral tilt measures could only catch some differences. Instead, the acoustic measure called Strength of Excitation, which measures how strongly the vocal folds are vibrating (Murty & Yegnanarayana 2008, Mittal, Yegnanarayana & Bhaskararao 2014), and a new acoustic measure proposed by Chai & Garellek (2022), Residual H1, better capture the voice quality contrasts in SLZ. This aligns with more recent work by Chai & Garellek (2022) and Zhang (2016a,b), where they show and discuss how spectral tilt measures are not as robust as previously thought. My dissertation expands on this discussion about why spectral tilt measures fail to capture the contrasts in SLZ and the role that Strength of Excitation, residual H1, and other acoustic measures play in establishing and describing these voice quality distinctions. This phonetic knowledge is critical in explaining how these voice qualities are produced.

It is commonly accepted that the sounds used by language are organized and stored in an abstract language system we call the phonological component of mental grammar. Different linguistic theories argue that there is little to no phonetic input (Reiss 2017), whereas others say that phonetics and phonology are entirely unified with total overlap (Flemming 2001). One of the questions that my dissertation will address is to what extent the data from SLZ voice quality can shed light on this interaction, particularly how it relates to the representation of these sounds in the phonological component of mental grammar. These phonological representations form the building blocks from which our understanding of how sounds pattern and are organized into cohesive systems. There is debate about how information is stored in these phonological representations. Some linguists argue that only a single form is stored (e.g., Albright 2002). Others argue that instead, we have a set of multiple forms stored (e.g., Mascaró 2007) or all the actual

forms spoken or heard (e.g., exemplar theory, Ernestus & Baayen 2007). Essentially, these views ask how abstract these phonological representations could be for the grammar to operate. My dissertation will contribute to the ongoing debate about the nature of these phonological representations.

2 Timeline for dissertation

Milestone	Date
Finish theoretical research	May 2024
Start first draft of dissertation	May 2024
Conference presentation at LabPhon	June 2024
Research travel to Oaxaca	July 2024
Process collected data	August–October 2024
First draft completed	December 2024
Revisions to dissertation	December 2024–January 2025
Present at LSA and SSILA	January 2025
Completed defense draft	February 2025
Defend Dissertation	March 2025
Revisions completed	May 2025
Submit Dissertation	May 2025

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