Introduction

'Creaky voice' has distinct subtypes [8]:

- Creaky voice
- Creak voice

Glottalized vowels are only
unconstricted
prototypical
vocal fry
constricted
irregular pitch
low pitch

Tense (or 'pressed') voice is constricted, but usually regular and high in f0.

Keating et al. (2015) left open the possibility for non-high tense voice. This would be a type of creaky voice characterized only by glottal constriction.

We claim that, in Zongozotla Totonac, 'glottalized' vowels are characterized only by increased constriction.

Zongozotla Totonac

Totonac (- Tepehua-Totonac or 'Totonacan') is spoken in the Sierra Madre Oriental, Mexico.

Zongozotla (Puebla, pop. ~10,000) Totonac (glottocode high1243) belongs to the Sierra subgroup, near the better described Totonac of Zapotitlán de Méndez [2].

Vowels /i/, /u/, /a/ contrast in terms of phonation (except word-finally in open syllables). They can be modal or glottalized (laryngealized).

Glottalized vowels are only weakly creaky, esp. when short.

Across Totonac: phonation contrasts have few minimal pairs (e.g. [11]).

Glottalized vowels are reconstructed at least for Proto-Totonac [3, 10]. But some Totonac varieties have only modal vowels [12].

The phonetic characteristics of glottalized vowels are understudied (cf. for more distant varieties, [1, 5]).

The data

Stimuli

- Words with modal vs. glottalized vowels
- Controlled for vowel length, stress, word type

Participants

- 8 speakers (incl. co-author O. López-Francisco)
- Gender balanced

Task and recording

- Words were recorded 3x in isolation
- Then once in carrier 'X iyma n'achier' in 'X is a word.'
- Recordings were done in Zongozotla by later two co-authors.

The phonetic characteristics of glottalized vowels are understudied:

Glottalized

Modal

x ana'tal 'flower, flora'

x k'alon 'coast, tejon'

paq'al 'it blossomed, florecido'

khi'n 'mouth, boca'

paq'al 'hit, golpe (onomatope.)'

ka:k.ta: 'cut ill, corralo!

ch'a:ni 'ant, hormiga'

ama.cha: 'it's going there, va por alla'

Voicing intensity (SoE [7])

Glottalized vowels have weaker voicing.

Carrier

Short V

Citation

Short V

Citation

Carrier

Short V

Citation

Short V

Citation

Carrier

Short V

Citation

Short V

Citation

Carrier

Short V

Citation

Short V

Citation

Fundamental frequency (f0)

Glottalized vowels have a weaker fundamental.

Carrier

Short V

Citation

Short V

Citation

Carrier

Short V

Citation

Short V

Citation

Carrier

Short V

Citation

Short V

Citation

Acoustic measures from VoiceSauce [15] → Flagged
within-speaker f0 outliers and within-vowel F1/F2 outliers → Tokens with outliers were excluded from spectral tilt analyses → Logistic mixed-effects regression

Main finding: Measures that emerge as significant are correlates of glottal constriction: weaker voicing, and weaker fundamental.

Other common correlates related to the fundamental frequency and its periodicity during creaky voice (f0, harmonics-to-noise ratio measures) did not emerge as significant.

Discussion

The glottalized vowels of Zongozotla Totonac are best characterized phonetically as produced with a kind of tense voice.

→ Glottalized vowels are constricted, but their voicing is regular.

Given that they're produced with tense voice, it is surprising that the glottalized vowels show no differences in f0.

→ Tense voice is often, but not necessarily, higher-pitched than modal voice; supports Keating et al. (2015)'s taxonomy [8].

In Zongozotla Totonac, glottalization is phonetically strongest for long vowels, particularly in citation form.

As in other Totonac varieties, contrast might be weakening: glottalization's increased constriction remains, but it's not strong enough to perturb the f0 or the periodicity.

Weakening of contrast might be tied to presence of few minimal pairs, with a restricted distribution within the word.

Diachronic loss of glottalization is frequently associated with tone development, e.g. [7] > [19] (13).

→ The data here are more consistent with the other common path of change: loss of glottalization through gestural weakening.

Acknowledgements and references

Copy of poster available here:

[9] Gettysburg College
[13] Totonac (Puebla, pop. ~10,000) Totonac (glottocode high1243) belongs to the Sierra subgroup, near the better described Totonac of Zapotitlán de Méndez [2].