An Ultrasound Study of High and Mid-Vowel Articulation in Media Lengua

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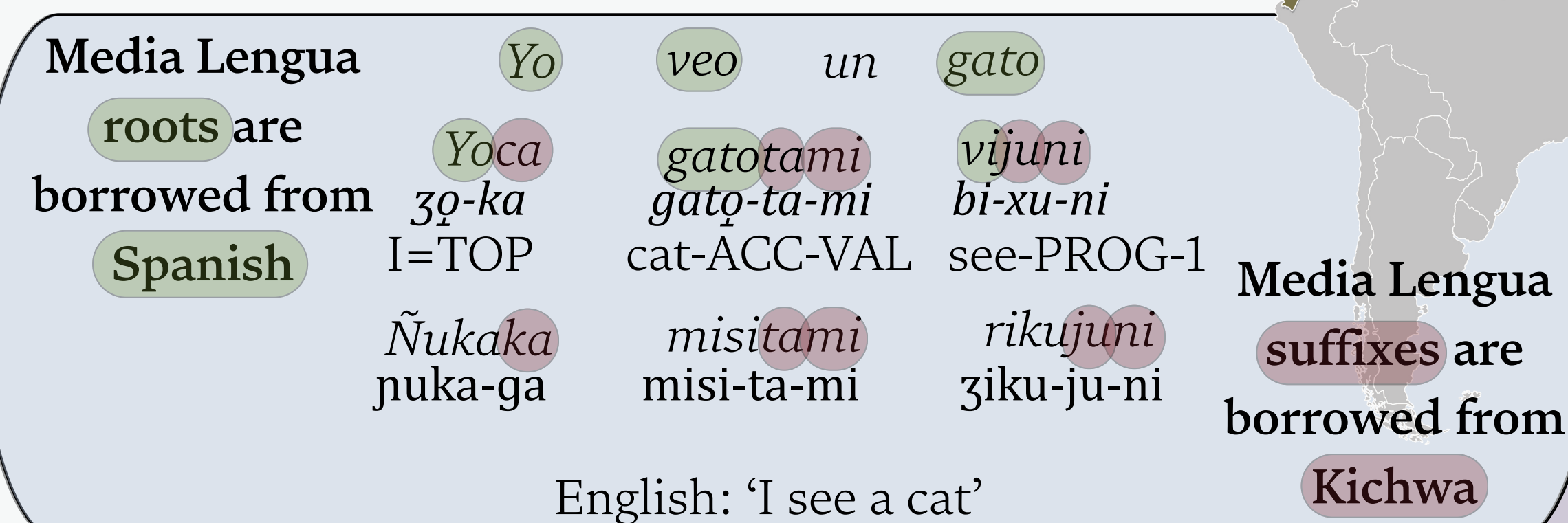
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Introduction

Media Lengua: a case of unique contact

- Spoken in the Ecuadorian Highlands, Media Lengua is a type of contact language; it is a mixed language with a Spanish-origin lexicon and Kichwa-origin morphosyntax.[1]
- Media Lengua was formed for expressive purposes rather than necessity.
- Media Lengua speakers are trilingual:
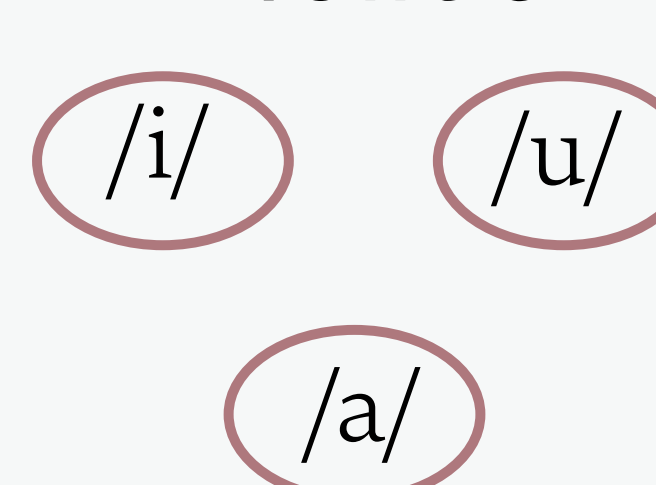L1 = Kichwa & Media Lengua (simultaneous);
L2 = Spanish.

A small number of communities in Imbabura and Cotopaxi[2] speak the language. This research focuses on speakers from Pijal, Imbabura.
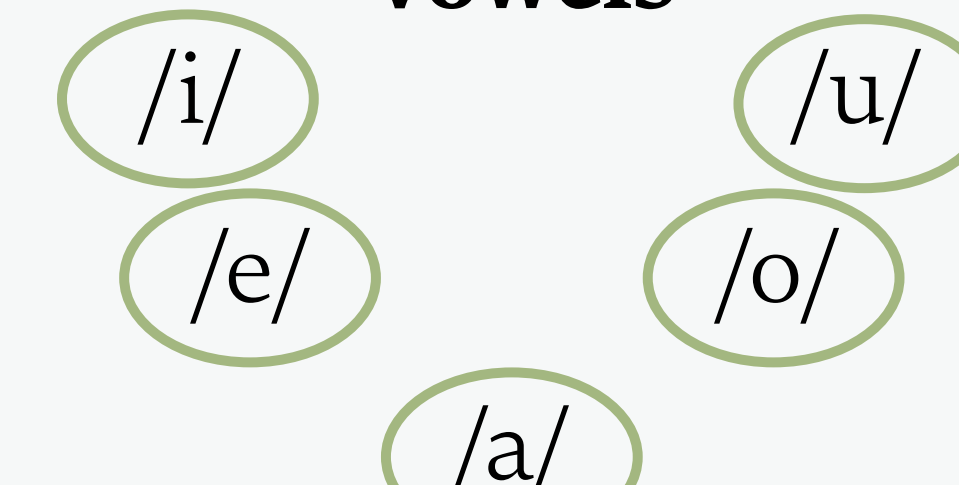
Media Lengua	*Yo*	*veo*	*un*	*gato*
roots are borrowed from **Spanish**	*Yoca* ʒo-ka I=TOP	*gatotami* gato-ta-mi cat-ACC-VAL	*vijuni* bi-xu-ni see-PROG-1	
	Ñukaka ɲuka-ga	*misitami* misi-ta-mi	*rikujuni* ʒiku-ju-ni	**Media Lengua suffixes** are borrowed from **Kichwa**

English: 'I see a cat'

Background Information

Kichwa vowels   **Spanish vowels**   =   **Media Lengua high & mid-vowels**

/i/ /u/ + /i/ /u/
/a/ /e/ /o/
/a/

/i/ /u/
/e/ /o/   0.36 Bark[7]

The vowel systems between Media Lengua's source languages result in conflicting areas of phonological convergence due to Spanish-origin mid-vowels.[3,4,5]

High vowels: Spanish- and Kichwa-derived /i/ & /u/
Mid-vowels: Spanish-derived /e/ & /o/

The separation between high and mid-vowels is *just above* the Kewley-Port threshold (0.3 Bark)[6] in Media Lengua. These categorical overlaps have enough separation in order to be <u>perceptually</u> contrastive to Media Lengua speakers, but this is only marginally true for Kichwa speakers.[7]

Methodology

Participants

- Preliminary: 18 participants (6 from each language)

Why ultrasound?
To investigate how *physical differences* in tongue body height are related to *acoustic properties* (and to some extent, perceptual differences), specifically in Media Lengua.

Data collection

- Participants held the probe to their chin midsagitally while the feedback was monitored while reading words from carrier sentences presented as images on PowerPoint slides; the same cognates were used in Spanish and Media Lengua.
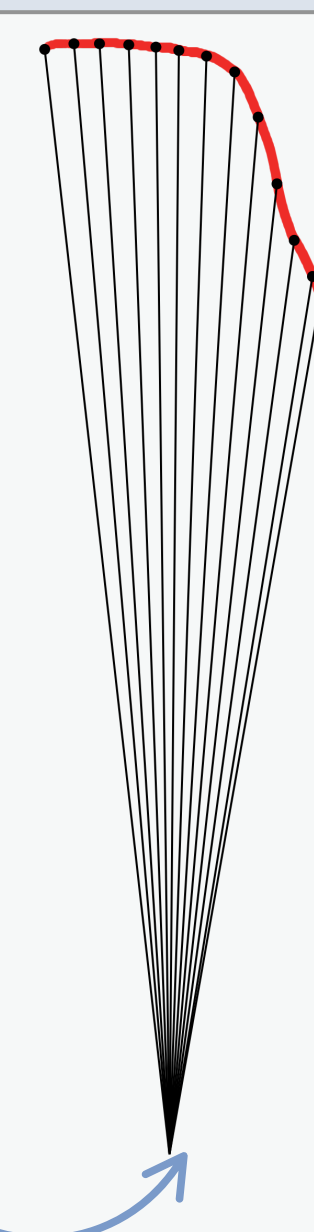- There are ~50 tokens per vowel per participant.

Tongue contours were manually traced - without head stabilization, this is important for accuracy.[8]

Mandible (jaw) shadow was used as the reference point.

Polar coordinates (r, θ) are used from the origin point of the probe to investigate tongue curvature.[9]

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Results

Articulatory differences across languages

- Following predictions, high and mid-vowels are closer together articulatorily in height in Media Lengua than in Spanish due to the Kichwa substrate.

tongue tip - tongue root

Normalized, averaged contours
/i/ ● /u/ ●
/e/ ● /o/ ●

Spanish   Kichwa   Media Lengua

Spanish - GAMMs Participant 25

i
e
u
o

Est. difference in Y

Media Lengua - GAMMs Participant 12

i
e
u
o

*underlined red area = significance

- As expected, high and mid-vowels significantly differ in tongue body height along the curvature of the tongue in Spanish within both front and back vowels.
- Media Lengua does not reflect this: between back vowels, there is no significant difference, and between front vowels, the significant difference is not in height, instead, it appears that /e/ is similar in height to /i/ and retracted, similar to Spanish /e/.

Discussion

Minor non-significant differences in tongue position can = significant acoustic differences

- Media Lengua speakers articulate high and mid-vowels with minimal difference - but enough that they can still perceive it. The difference between high and mid-vowel articulation is minimal enough that it is largely not statistically significant.
- These articulatory results reflect the acoustic work by Stewart[2] - Media Lengua has high and mid-vowel categories that substantially overlap in acoustic space.
- These results align with phonologies of other contact languages, in which they adapt the phonological material of the ancestral language (in this case, Kichwa).[10] However, Media Lengua speakers added a new category, mid-vowels, and distanced them apart - just enough from their high vowel counterparts acoustically allowing for perceptual contrasts
- <u>*This is the first study to investigate articulatory properties of a mixed language using ultrasound.*</u>

References

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5. Onosson, S., & Stewart, J. (2021b). <u>*The Effects of Language Contact on Non-Native Vowel Sequences in Lexical Borrowings: The Case of Media Lengua.*</u>
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9. Coretta, S. (2020). <u>*Assessing Mid-Saggital Tongue Contours in Polar Coordinates Using Generalized Additive Mixed Models (GAMMs).*</u>
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