

A Pathway to Tonogenesis

Shifting Language Dynamics in Kuy and the Perception-Production Link

Raksit T. Lau-Preechathammarach

University of California Berkeley
raksit@berkeley.edu

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Acknowledgments

I am honored to be learning on the traditional, ancestral, and unceded lands of the Ohlone people and to be attending a conference hosted by universities on the traditional, ancestral, and unceded territories of the Musqueam, Squamish, Tsleil-Waututh, Okanagan, Kwikwetlem, Semiahmoo, Katzie, Kwantlen, Qayqayt and Tsawwassen Nations.

Acknowledgements



Sidawun Chaiyapha

ສີດາວຽຮ ທ່າຍກາ

Thongwilai Intanai

ທອງວິໄລຍໍ ອິນຕະນັຍ

Objectives

Bilingualism/Contact as a *catalyst* for change

- Previous tonogenesis studies have primarily focused on generational differences
- Limited studies on role of contact languages in tonogenesis (Brunelle, 2009)
- In this study, I want to provide contemporary experimental evidence to support circumstantial evidence for contact-induced tonal spread

Goals of current study

- ① To explore role of language usage & life experience in shifting of cue weights in perception of voice quality distinction in Kuy, a minority language of Northeast Thailand
- ② To connect perception to production results looking at same question

Cue weighting and Tone

Relationship between phonation and f0

Voicing: vowels after voiced C **lower f0 on average** than after voiceless C

Voice Quality: breathy vowels **lower f0 on average** than modal vowels

- * **Tonogenesis:** development of **phonemic tone**
 - f0 becomes **primary cue** (Maran, 1973)
- * **Cue Weighting:** relative usage of cue in perceiving/producing a contrast
 - Heavier cue weighting of f0 over VOT shown in younger speakers
 - Korean (Kang, 2014)
 - Afrikaans (Coetzee et al., 2018)

Why do cues shift?

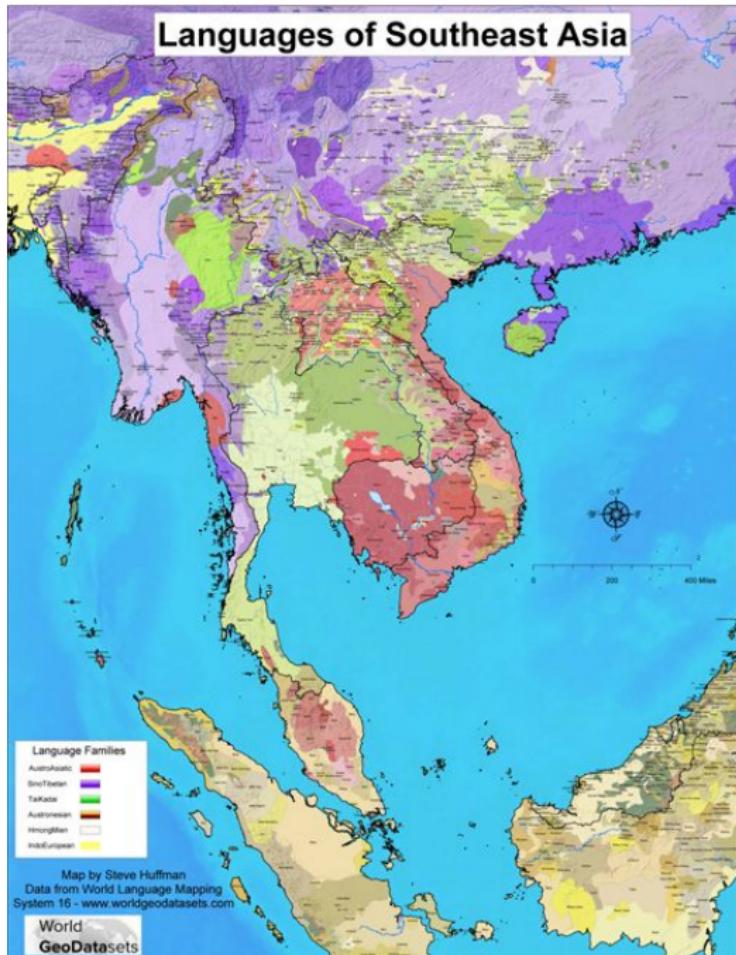
* **Actuation Problem:** Why does a change happen when it does?

(Weinreich et al., 1968)

Bilingualism affects both perception and production

- Convergence at all levels (phonology: Hinton 1991, syntax: Ross 2007)
- If one of a speaker's languages exploits a cue primarily, it can potentially cause that cue to be more prominent in another of their languages
- Bilingualism may interact with social factors to actuate change

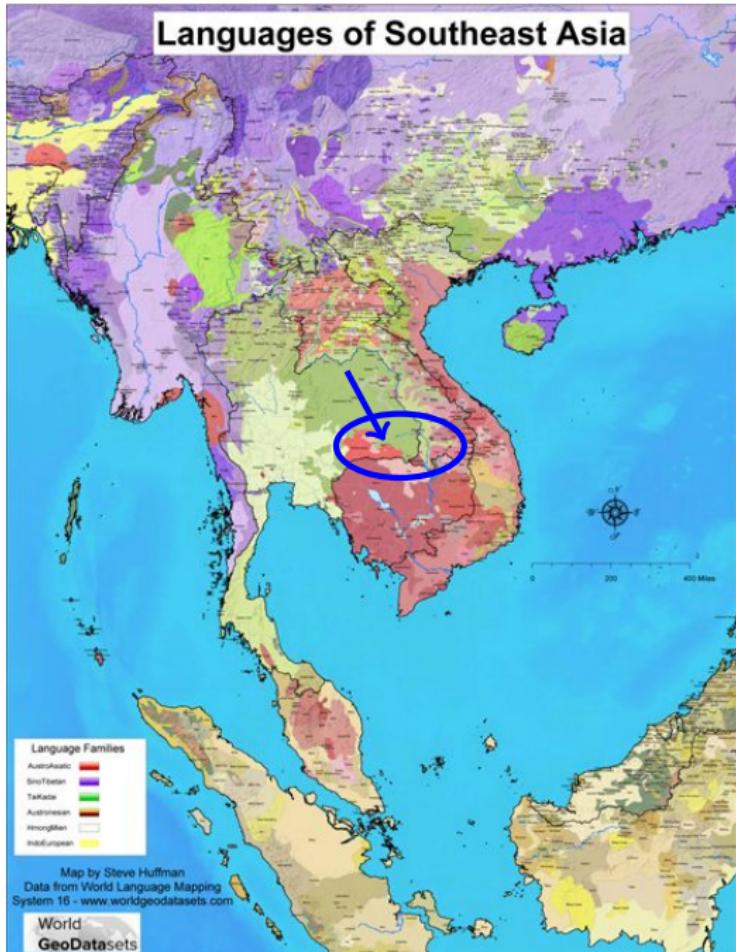
Multilingualism in Mainland Southeast Asia (MSEA)



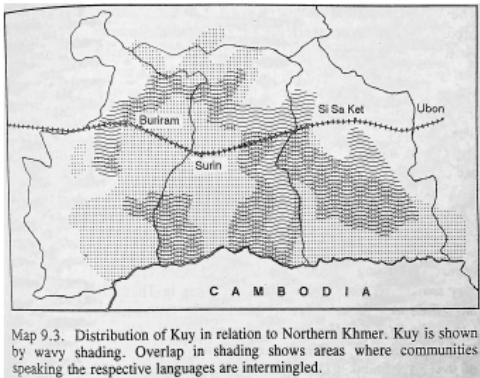
Multilingualism in Mainland Southeast Asia

- * Longtime multilingualism in MSEA *potential catalyst* for tonogenesis
(Kirby and Brunelle, 2017)
- * Tonogenetic languages in largely non-tonal families—happen to be in heavy contact with tonal languages
 - Vietic (Austroasiatic)—Vietnam under colonial rule by China for over a millennium (Haudricourt, 1954)
 - Chamic (Austronesian)—Vietnam, Hainan (China) (Thurgood, 1996)
- * More recently, tonogenesis described in languages in Thailand
 - Austronesian: Pattani Malay (Abramson, 2004) & Moklen (Larish, 1997)
 - Austroasiatic: Khmu (Premsrirat, 2001) & Kuy (Sukgasame, 2003; Abramson et al., 2004)

Kuy (Katuic, Austroasiatic)



Kuy (Katuic, Austroasiatic)



Map 9.3. Distribution of Kuy in relation to Northern Khmer. Kuy is shown by wavy shading. Overlap in shading shows areas where communities speaking the respective languages are intermingled.

Smalley (1994, 149)

Modal vs. breathy voice

- ti: 'old'
- t_{ii}: 'tall'

Breathiness can lead to bundle of side effects

- Lowered f₀ > low tone
- Lowered F₁ > vowel raising or diphthongization
(Wayland and Jongman, 2002)

Kuy linguistic situation

- * For at least 20 years, preference for using Thai has grown (Sukgasame, 2003)
- * Present-day in Ban Khi Nak
 - Parents in 20s and 30s generally speak Thai to their children
 - Children respond in Thai even if parents use Kuy
- * Majority of participants express worry that Kuy might stop being used

Pride in ability to speak 4 languages (Kuy, Thai, Lao, Northern Khmer), but multilingual ability decreasing

- 2/32 older speakers (age ≥ 50) can't speak Khmer
- 9/32 younger (age < 40) can't speak Khmer (2 among them cannot speak Lao)
- Children becoming monolingual in just Thai

Kuy social situation

- * Most older speakers attended school at Ban Khi Nak up to **4th grade**
 - 5th and 6th grades began to be offered in 1972
 - 7th to 9th grades began to be offered in 1998
- * Most younger speakers attended Ban Khi Nak through 9th grade, finished high school nearby, and then left for college or work
 - 13/32 older speakers have never left home
 - Only 3/32 younger speakers have never left home

Increased Thai usage in younger generation

- Longer schooling
- More movement to other regions

Motivations for change

- * Social: integration into rapidly modernizing & centralizing Thai society
 - Better transportation—younger people more likely to move
 - Increased media access and schoolteachers from other provinces
- * Linguistic: other parts of phonology nearing Thai/Lao
 - Loss of prenasalization: nc^hu:n ~ c^hu:n ‘to send’
 - Merger between final /l/ and /r/: pi:r ~ pi:l ‘flower’
 - These mergers lead to fewer onset/coda distinctions
- * Pressure to increase f0 diff if breathiness weakened by contact
- * Tonogenesis in other Ku(a)y dialects (Sukgasame, 2003; Abramson et al., 2004)

Hypothesis

- ① Kuy speakers who are more integrated into Thai society and/or use more Thai/Lao will be less sensitive to breathiness cues and more to f0 cues
- ② Agnostic about *alignment* of perception & production (Kim, 2004; Kleber et al., 2012; Coetzee et al., 2018)

Stimuli Design

- * Adapted Praat script using KlaatGrid synthesizer (Brunelle and Kirby, 2020)

/ti:/ 'old'



~

/tj:/ 'tall'



/ta?/ 'to grab'



~

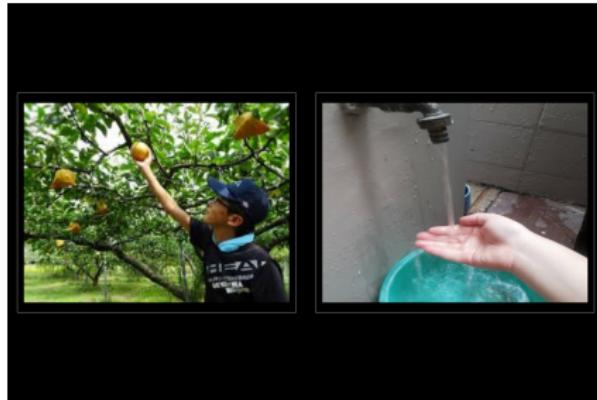
/taʔ/?/ 'to place under'



- * Acoustic parameters enhanced from average trajectories of speakers with clear distinction, taken from production study
 - **Tonal cue:** f0
 - **Breathiness cue:** H1*-H2* (Iseli et al., 2007)
- * Intermediate F1 value between modal and breathy voice for all stimuli
- * Continuum of 5 starting f0 values crossed with 5 starting OQ (open quotient: breathiness correlate) values
- * Stimuli were piloted and revised for naturalness

Experiment Presentation

- * Presented on OpenSesame on Microsoft Surface Go tablet in temple room
- * 2AFC task: participants listened to stimuli with AKG K240 Headphones and chose with a stylus which of the minimal pair they heard
- * Ex. /taʔ/ 'to grab' vs. /tɑʔ/ 'to place under'



Experiment Layout

- * Practice round for familiarization with task & images
- * 8 alternating blocks of each syllable, optional breaks
- * $5 f_0 \times 5 OQ \text{ values} = 25 \text{ tokens / block}$, 400 total
- * Half of participants saw *ta?* pair first, half *ti:* first



ta? first



ti: first

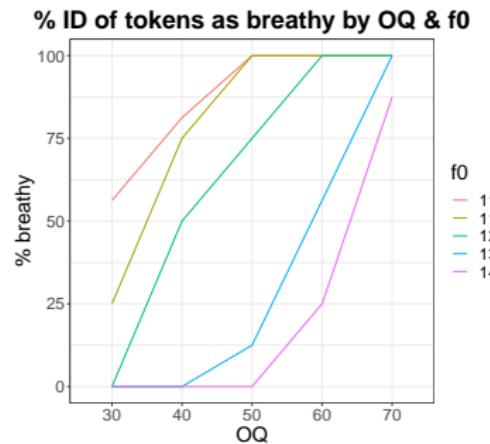
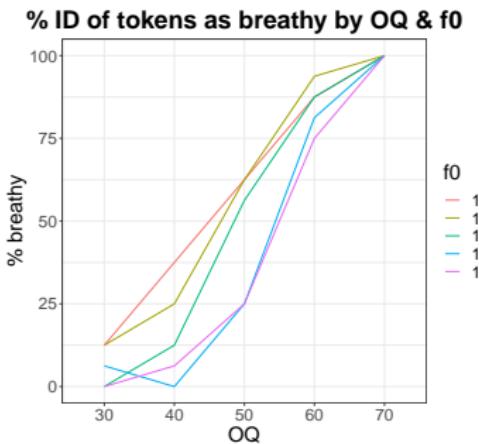


Demographics & Conditions

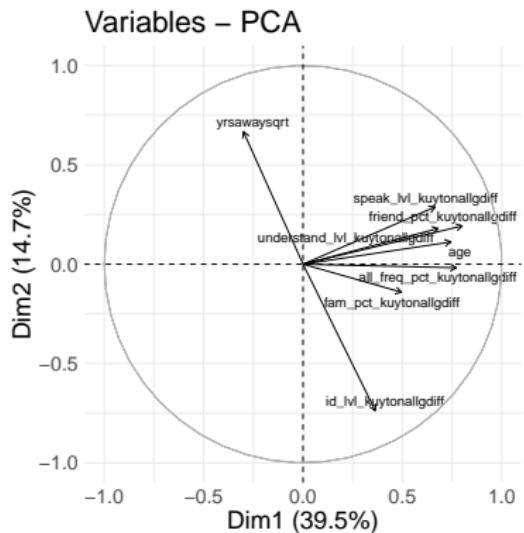
- * Analyzed 64/74 participants (10 thrown out for issues)
- * Balanced for gender (F, M) and age by decade (20, 30, 50, 60)
- * For each gender-decade combination, 4 saw *ta?* first, other 4 saw *ti:* first
- * For each of these conditions, 4 possible configurations of modal-breathy minimal pairs (i.e. which picture was on the left and which on the right)
- * Follow-up interview on demographics, life experience, language attitudes, identity, etc.

Example Raw Results

- * Expect variation in weighting of OQ and f0 cues
- * Example from 2 extreme speakers: 60 F vs. 29 M
 - Left speaker has s-curve function **barely influenced by f0**
 - Right speaker's responses **strongly depend on f0**



Variable Selection



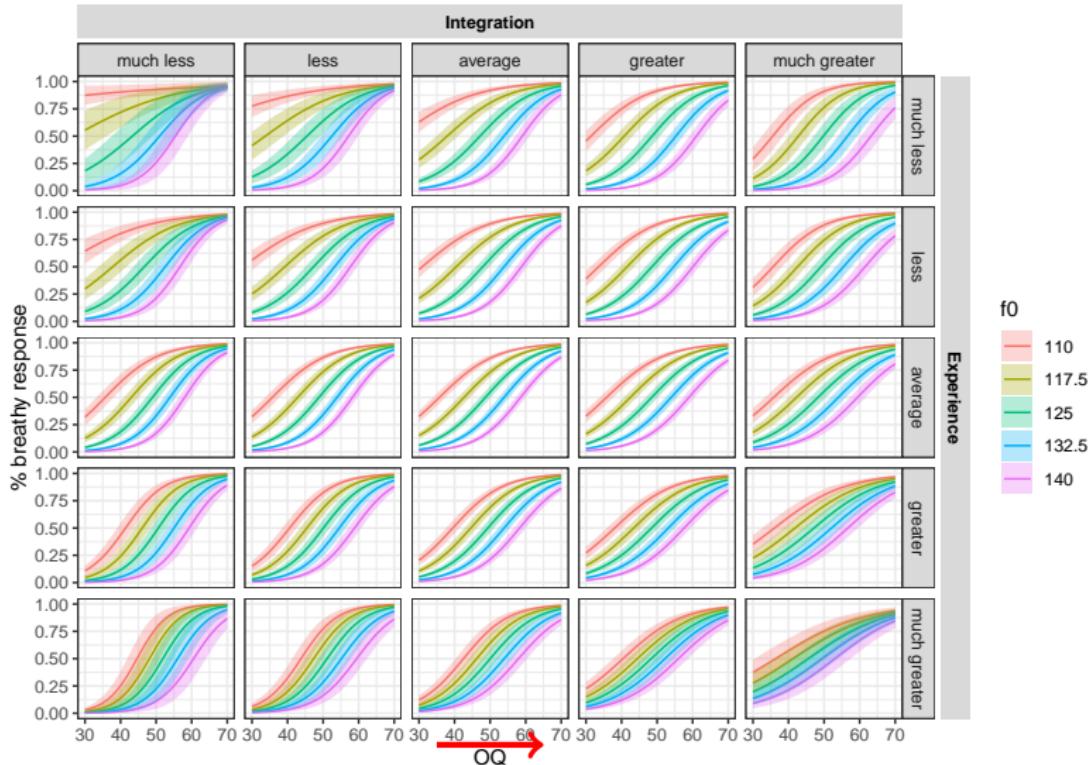
PCA: combine social variables

- * Dimension 1 (“Experience”)
 - Age
 - Kuy Relative Ability
 - Kuy Relative Frequency of Usage
- * Dimension 2 (“Integration”)
 - Time away from home
 - Kuy Relative Identity (inverse)

Modeling results

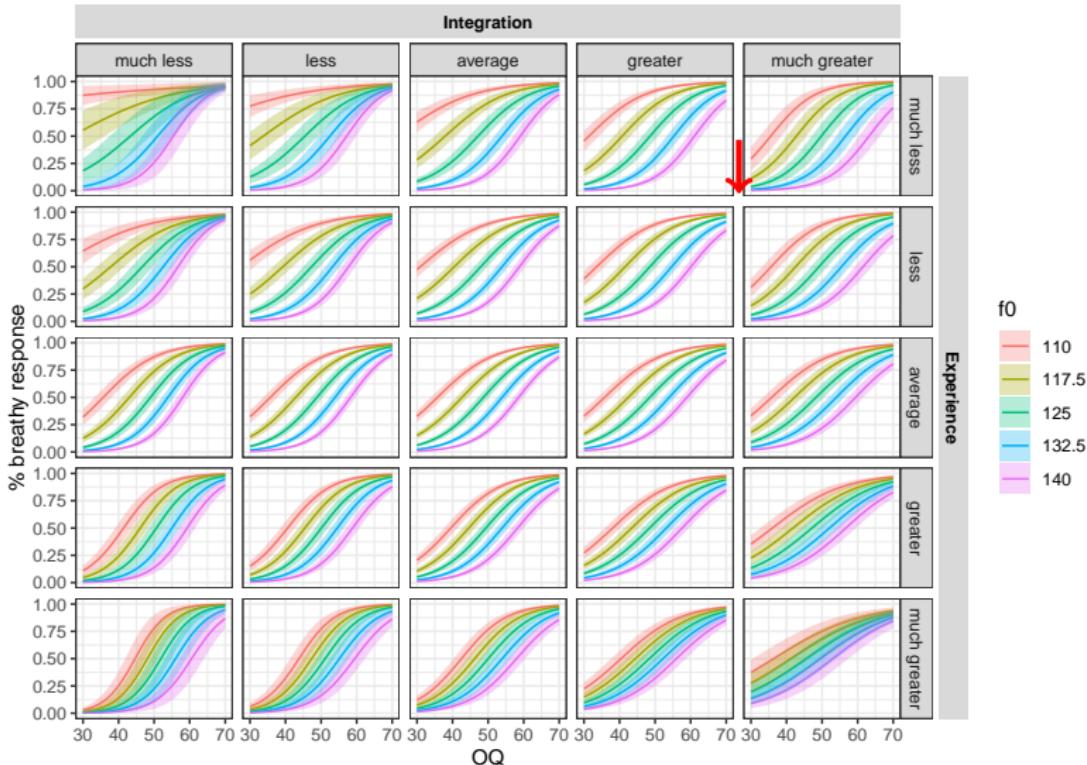
- * Mixed effects logistic regression analysis with `lme4` (Bates et al., 2015) in R
- * Interaction of all fixed effects: *OQ, f0, Gender, Experience, Integration*
- * Random intercepts for *Speaker* and *Syllable*
- * 5-way interaction significant ($p < .05^*$)
- * Effects estimated with `effects` package (Fox and Hong, 2009)

Estimated OQ by f0 curves for male speakers



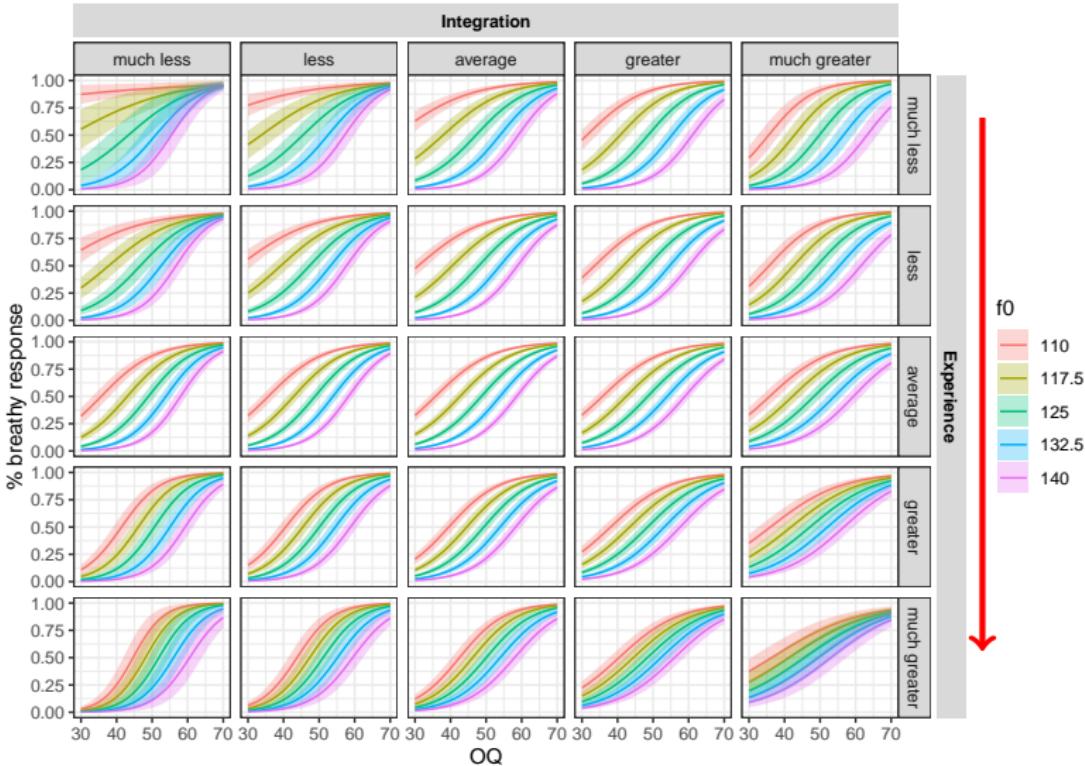
Higher OQ → more breathy responses

Estimated OQ by f0 curves for male speakers



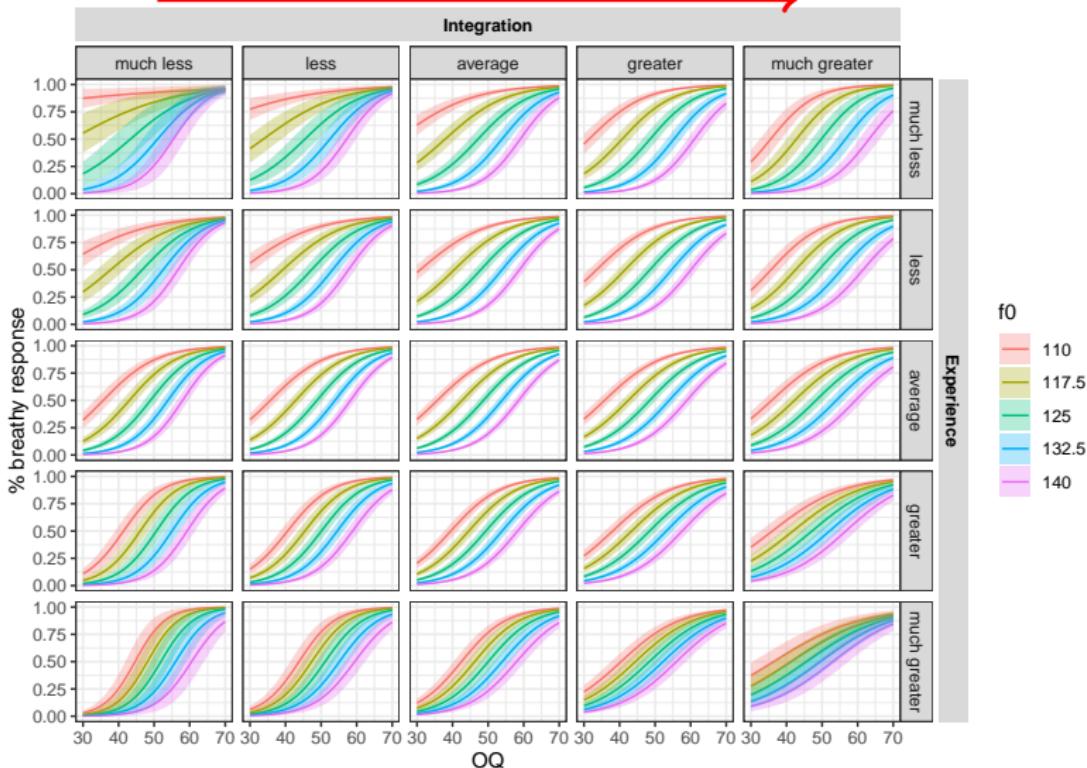
Higher f0 → curve lowers (fewer breathy responses)

Estimated OQ by f0 curves for male speakers



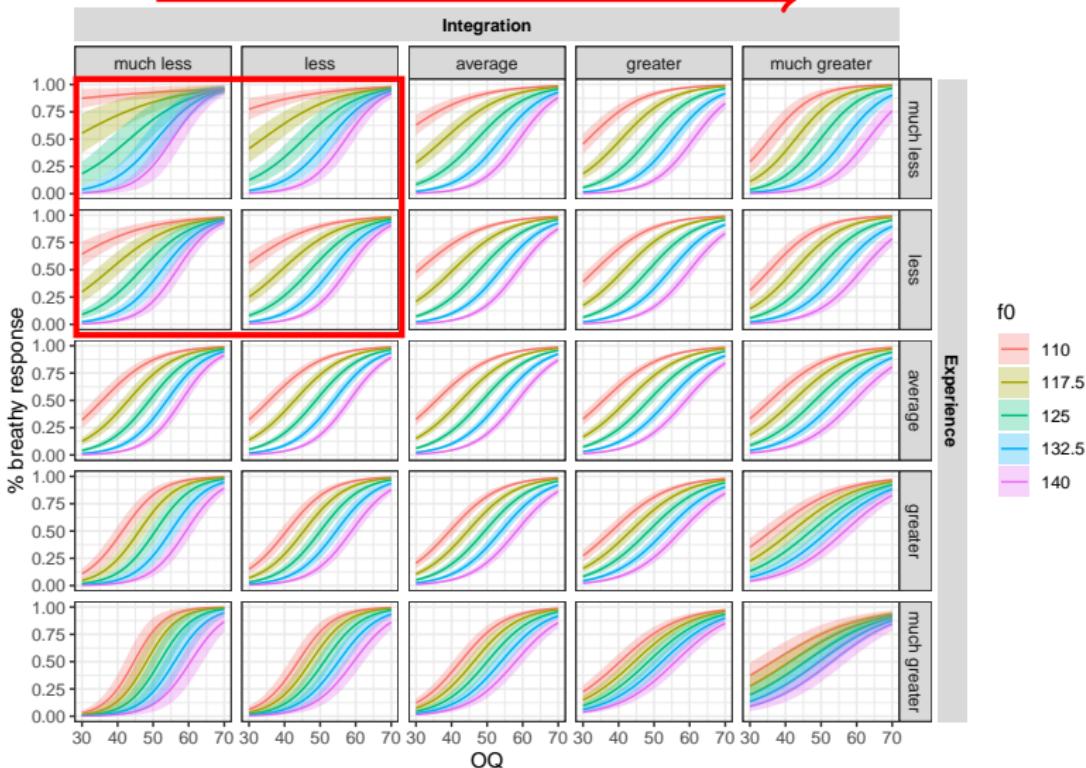
Greater experience → curves become closer together (f_0 affects less)

Estimated OQ by f0 curves for male speakers



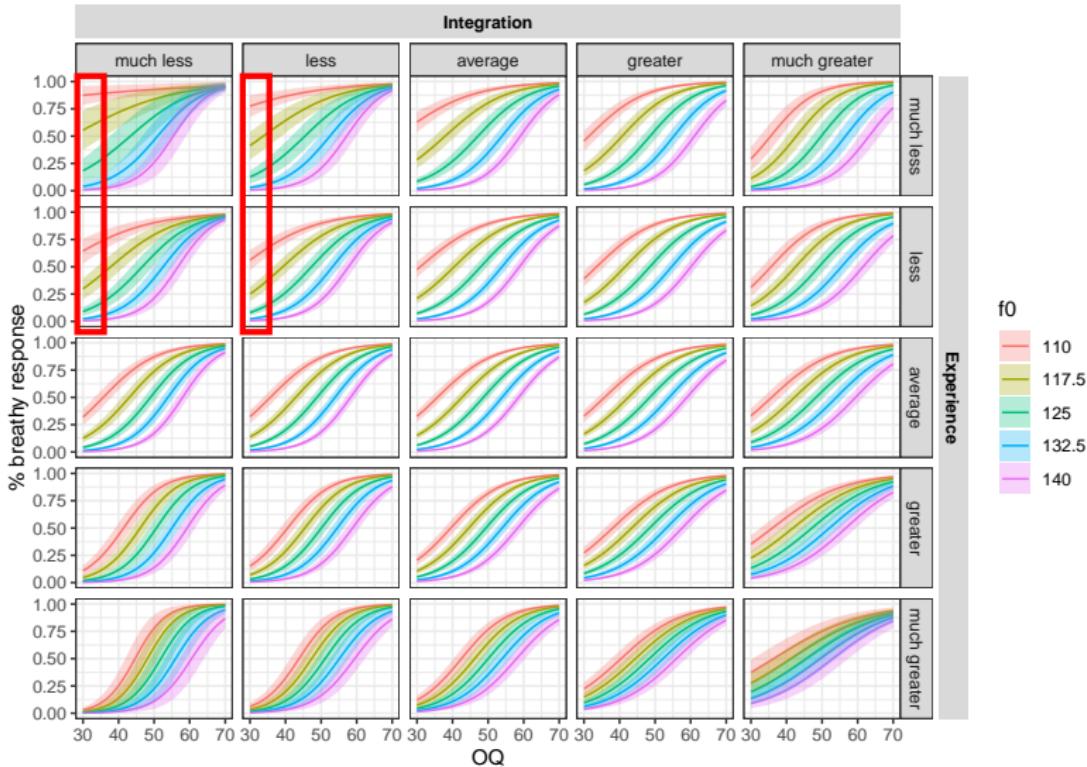
Greater integration → curves flatten, less s-like (OQ affects less)

Estimated OQ by f0 curves for male speakers



Exception in UL: upper left less s-like than upper right

Estimated OQ by f0 curves for male speakers

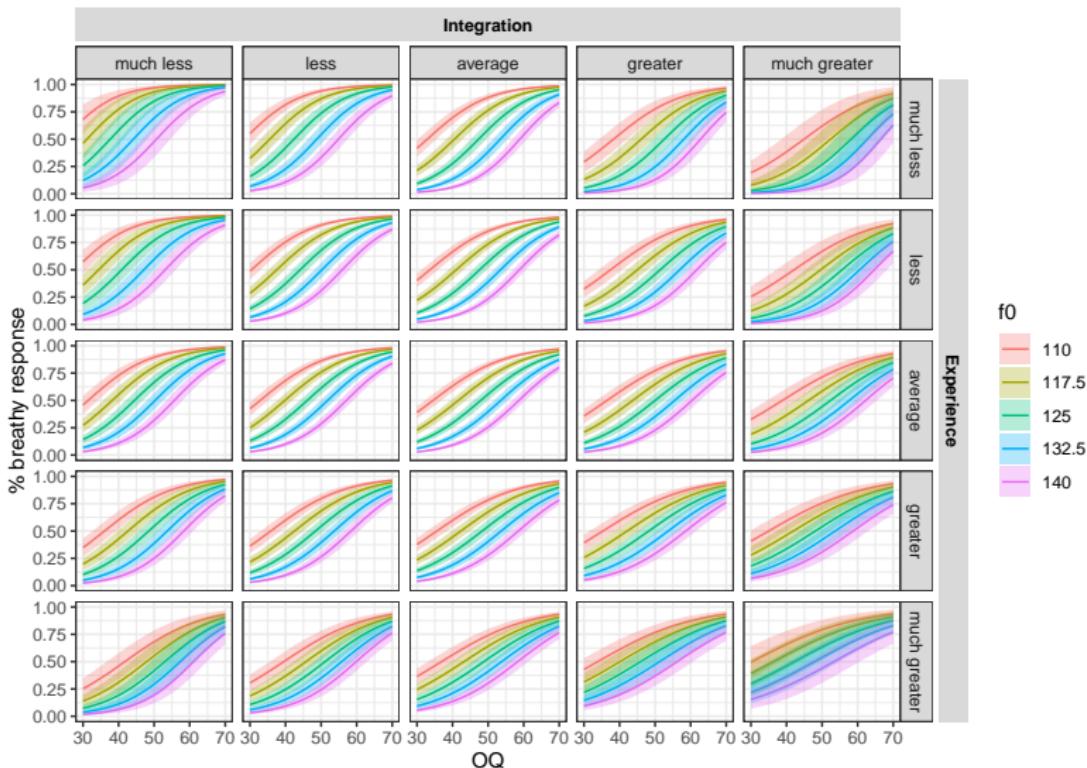


Exception in UL: identification of low-OQ tokens heavily depends on f0

Patterns

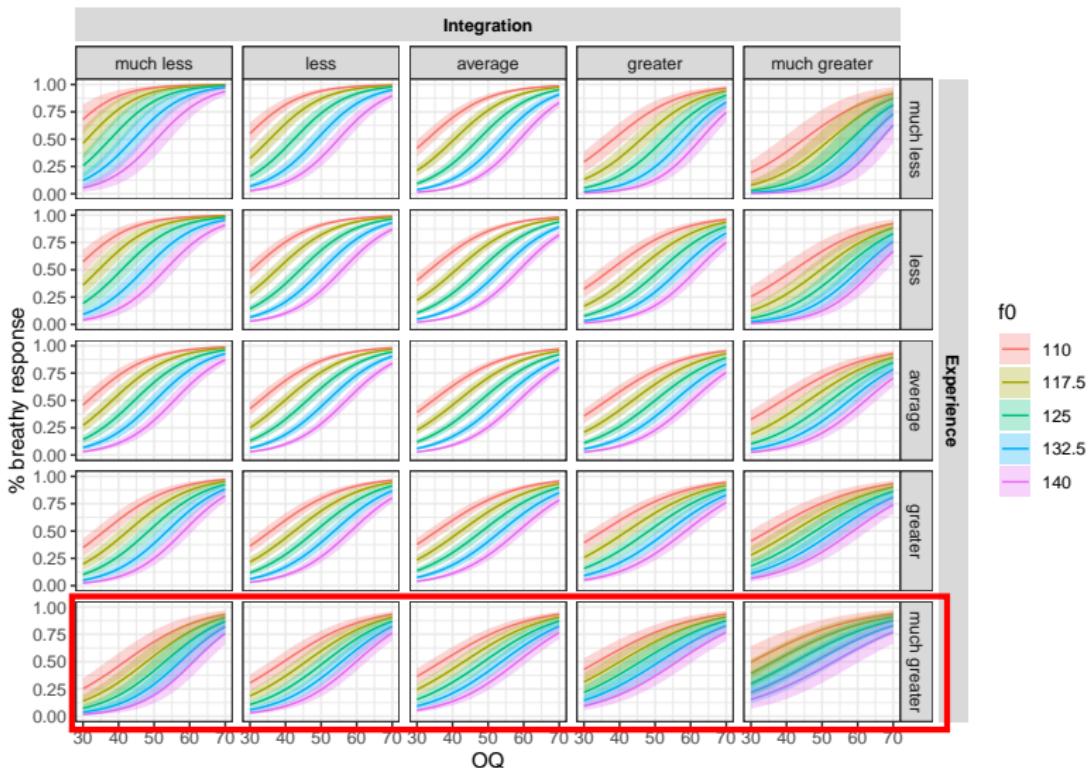
- * Higher OQ leads to more breathy responses
- * Higher f0 shifts the curve down (fewer breathy responses)
- * Greater experience leads the OQ × f0 curves to be closer together
- * Greater integration flattens the curves, making them less s-like
 - However, this is not fully true **if experience is low**
 - Identification of low-OQ tokens is heavily dependent on f0

Estimated OQ by f0 curves for female speakers



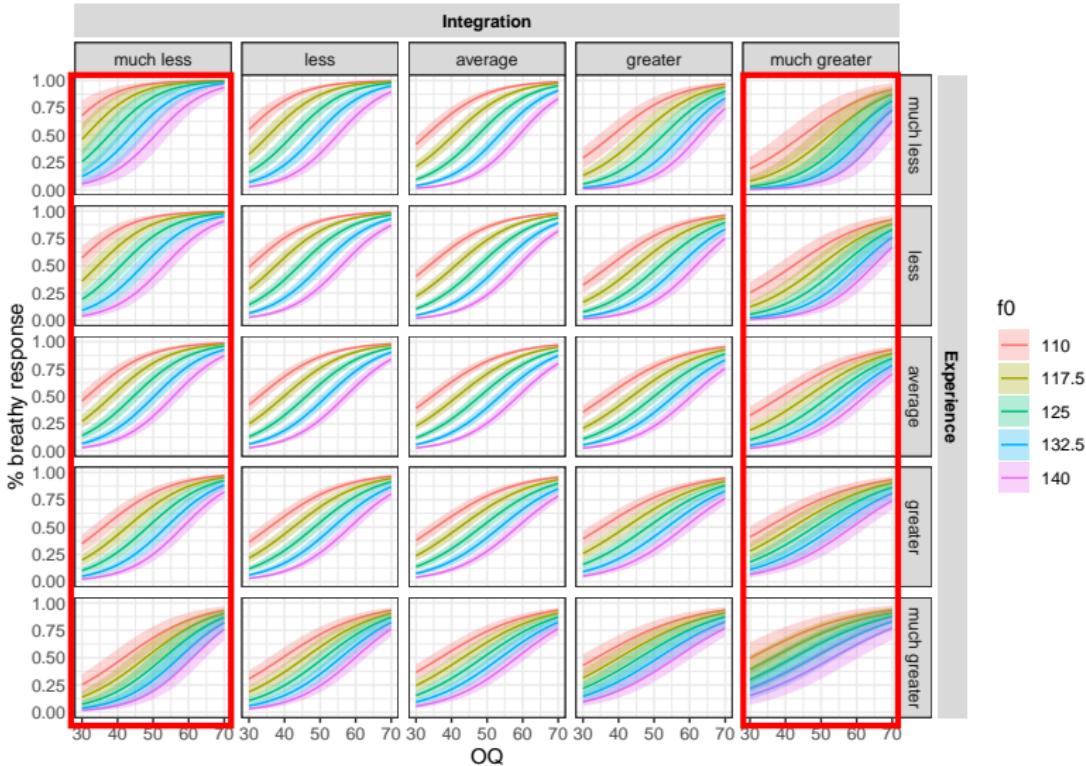
Same general patterns, but flatter and curves are less s-like

Estimated OQ by f0 curves for female speakers



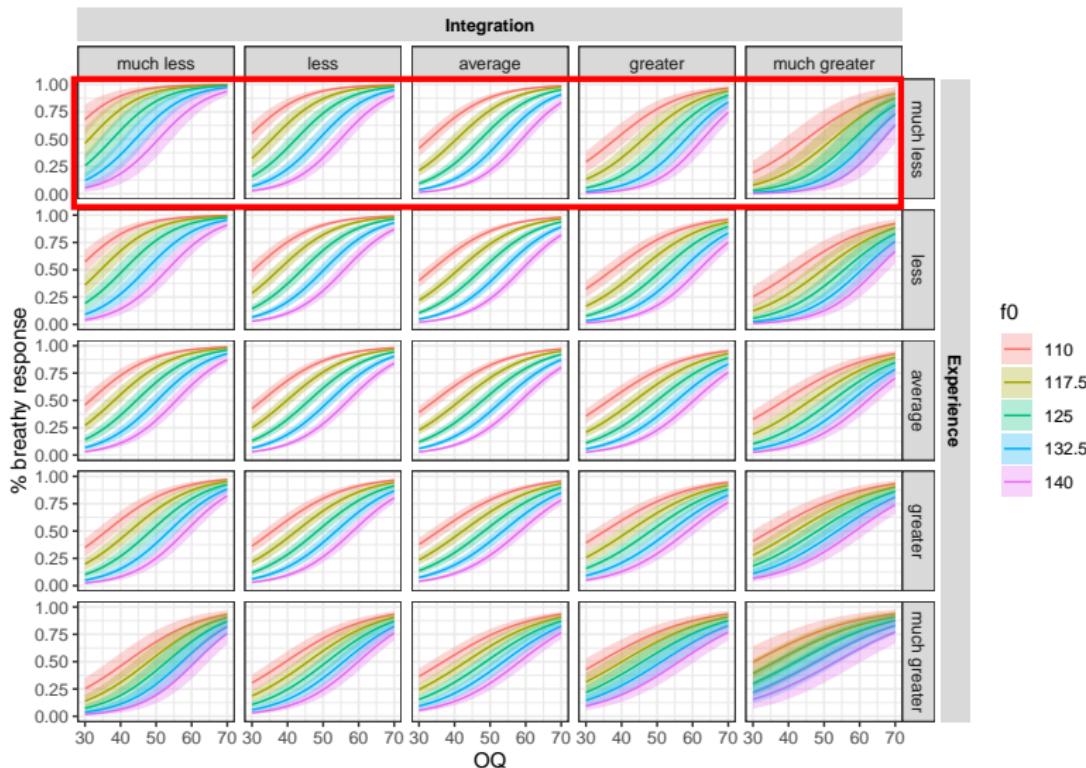
Social effects weaker for women: integration

Estimated OQ by f0 curves for female speakers



Social effects weaker for women: experience

Estimated OQ by f0 curves for female speakers



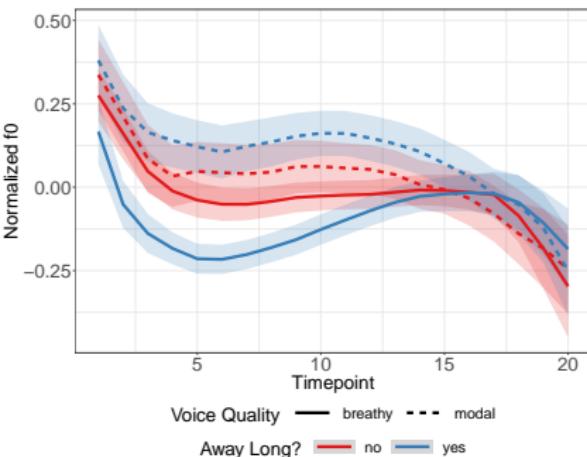
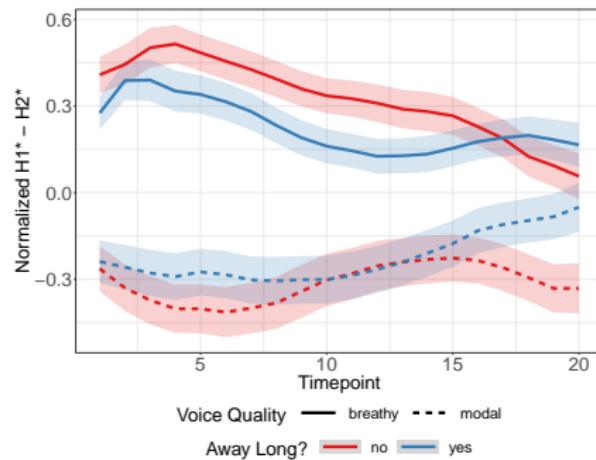
Low-experience women: breathy bias if less integrated, modal if more

Gender Patterns

- * Same general patterns but women's curves flatter and less s-like
- * Social effects weaker for women
 - Women's curves are less flattened by higher integration
 - Women's reliance on f0 is less affected by experience
- * Women who rank low on experience
 - Biased towards **breathy** responses if less integrated
 - Biased towards **modal** responses if more integrated

Previous Production Results: Away Long

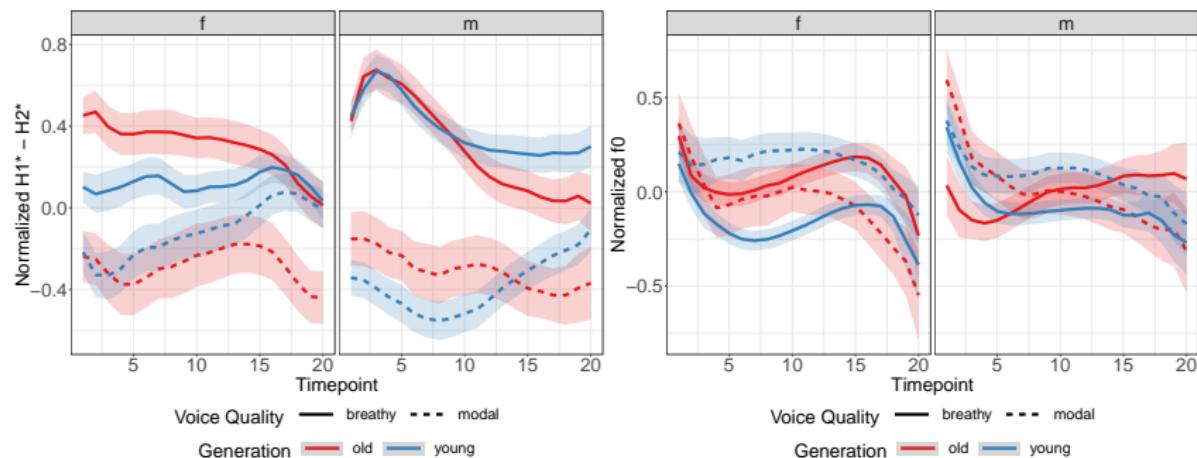
- * 32 speakers, balanced for generation (20s, 60s), gender (F, M), & away long



Those away longer (≥ 4 years) have smaller $H1^*-H2^*$ difference and a larger f0 difference between voice qualities in expected directions

Previous Production Results: Gender & Generation

- * Not enough speakers yet for cross section with *away long*



- * Younger women have weakest H1*-H2* difference, men don't differ much
- * Younger people, especially women, have clearer f0 difference

Comparison of Perception & Production

Perception	Production
Older/Higher Exp men most conservative	
Younger/Lower Exp women spearheading loss of breathiness	
Lower Exp men rely most on f0	Younger women rely most on f0
Men more affected by social factors	
Lower Exp + Lower Int = ↓OQ ↑f0 Higher Int = ↓OQ	Younger (Lower Exp) = ↓OQ ↑f0 Away (Higher Int) = ↓OQ ↑f0

Conclusions

- ① Both lower age (experience) and being away (integration into Thai society) lead to tradeoff between breathiness and f0 cues in production
- ② In perception, greater integration only weakens breathiness cues
- ③ Perceptual cue tradeoff in **low experience, low integration** group
 - Lower experience means receiving more Thai input, proportionally
 - When away, people hear little to no Kuy—breathiness cue is dulled
 - Thai tonal contrast may be recruited to enhance contrast in production
 - Younger Kuy people socialize with peers of similar age, many of who *have* gone away and may be enhancing the f0 difference
- ④ Back to actuation, situation is ripe for tonogenesis in Kuy because of increasing encroachment of Thai, a tonal language, *in the village*
- ⑤ These micro-effects show how contact, particularly in a society with changing social dynamics, can play a role in catalyzing tonogenesis



ខុសគុណ ក្រចុបនេ
[kʰàpkʰun krəpnə?]
Thank you everyone!
raksit@berkeley.edu

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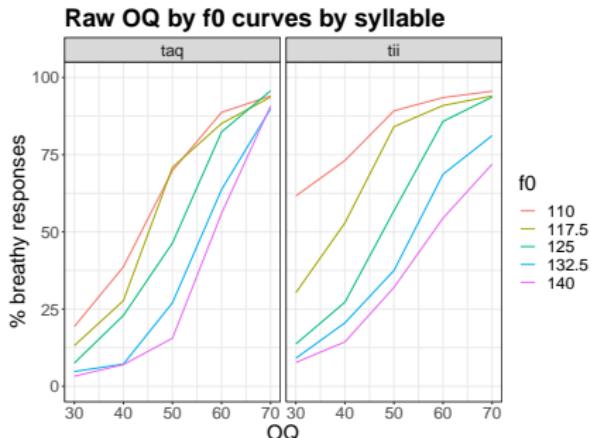
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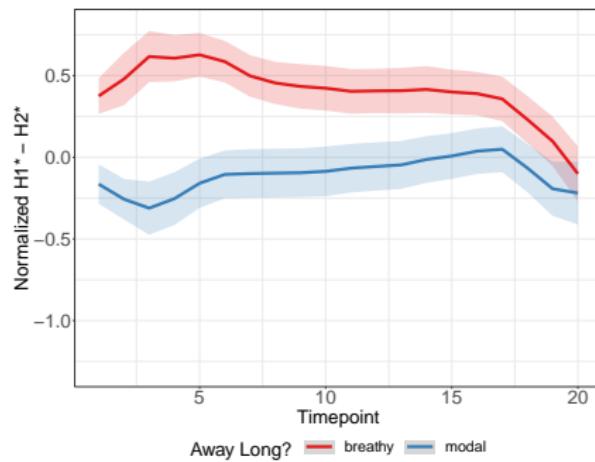
(Extra) Differences by syllable stimulus



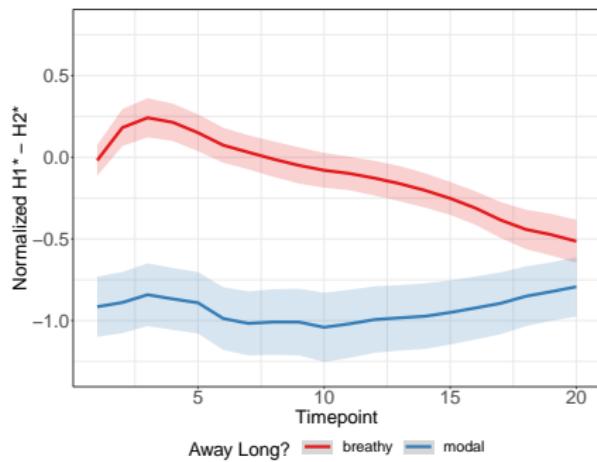
- * Judgments for *ti*: notably more affected by f0, especially when low-OQ
- * Some speakers said *ti*: did not sound as “natural” (however, *ti*: reaction times faster on average by ~100 ms)
- * May be because *ta?* minimal pair has larger breathiness difference

(Extra) Average H1*-H2* trajectories

- * $ti:$ has smaller H1*-H2* difference—perhaps speakers more attuned to f0



/ti:/ vs. /t̪i:/



/taʔ/ vs. /t̪aʔ/