Decay of Breathy Phonation in Austroasiatic Languages of Northeastern Thailand

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I would like to respectfully acknowledge that I study on the traditional, ancestral, and unceded lands of the Chochenyo Ohlone people.
Acknowledgements

Sidawun Chaiyapha (Kuy)
Thongwilai Intanai (Kuy)
Kraisorn Hardkadee (Thro)
Sompong Tonprathum (So Thavung)
Social Background
Language Background
Hypotheses
Methodology
Preliminary Results
References

Isan (Northeastern Thailand) is a region well defined geographically and politically.
On the Khorat Plateau, a drier and less arable region of Thailand.
In close contact culturally and linguistically with Laos; southern part with Cambodia.
We will be looking at 3 Austroasiatic languages spoken here: Kuy (Katuic), Thro (Katuic), So Thavung (Vietic).

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Kuy (Katuic)

- Many speakers multilingual (some older speakers can speak Kuy, Lao, Thai, and Northern Khmer)
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Most people above 20 have some command
Kuy (Katuic)

- Many speakers multilingual (some older speakers can speak Kuy, Lao, Thai, and Northern Khmer)
- Most people above 20 have some command
- Children primarily use Thai in the home; many in the older generation self-report using Thai with their grandchildren
Kuy Language Vitality and Attrition

- Parents say teachers would say their children were โง่เหมือนควาย [ŋôː mîən kʰwaːj] ‘dumb as a water buffalo’ if they responded to teachers in Kuy.

Many young people leave the village for college or work.

Few young speakers report knowing Khmer, some even report not being able to speak Lao; Kuy still regularly heard.
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Thro (Katuic)

Kusumal District, Sakon Nakhon

- Live alongside various Tai languages (Lao, Phuthai, Nyo)
- Spoken in city of Kusumal and surrounding villages
Tho (Katuic)

- Live alongside various Tai languages (Lao, Phuthai, Nyo)
Thro (Katuic)

- Live alongside various Tai languages (Lao, Phuthai, Nyo)
- Spoken in city of Kusumal and surrounding villages
Thro Language Vitality and Attrition

- Most robustly spoken in the village of Kudsakoy, including by children at elementary school with one another
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- Kraisorn Hardkadee teaches students how to write and teachers who speak Thro mix it with Thai with the children
Thro Language Vitality and Attrition

- Most robustly spoken in the village of Kudsakoy, including by children at elementary school with one another
- Kraisorn Hardkadee teaches students how to write and teachers who speak Thro mix it with Thai with the children
- Gradually being lost elsewhere, especially in city of Kusumal
So Thavung (Vietic)

- During communist scare of 1965–1980, both communists and the Thai military were mistrustful of the So Thavung

Songdao District, Sakon Nakhon
So Thavung (Vietic)

- During communist scare of 1965–1980, both communists and the Thai military were mistrustful of the So Thavung
- Speaking their language often led to being severely punished or executed due to mistrust
So Thavung Language Vitality and Attrition

- Only 3 historically isolated villages speak So Thavung
So Thavung Language Vitality and Attrition

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- Much exogamy, such that commonly heard languages in the villages are Tai languages such as Lao, Nyo, and Kaloe
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So Thavung Language Vitality and Attrition

- Only 3 historically isolated villages speak So Thavung
- Much exogamy, such that commonly heard languages in the villages are Tai languages such as Lao, Nyo, and Kaloe
- Nyo words mixed in for younger speakers (Premsrirat, 1996)
- Youngest speakers in their 40s—self-report speaking “impurely”, but have more pride in speaking than older speakers
Summary of Language Situations

• Kuy (Katuic; Tambon Tum, Sisaket)
  • Spoken primarily by those 20 and up
  • No longer being passed on
  • Still heard regularly in villages
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  • Less used in cities, but generally passed on
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  - Still spoken by schoolchildren in some pockets
  - Less used in cities, but generally passed on
  - Heard regularly in villages

- **So Thavung (Vietic; Tambon Pathumwapi, Sakon Nakhon)**
  - Spoken by those 40 and up
  - No longer being passed on, stigma in usage
  - Rarely heard in villages, people primarily use Tai languages
Voice Quality difference

- All 3 languages have *breathy* voice contrasting with *modal* voice
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  - Longer *open quotient* (proportion of glottal cycle for which glottis is open)
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  - Percept of more air coming out
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- So Thavung also has (neither will be explored here)
  - *Creaky* voice contrast
  - 3 tonal patterns for modal voice
Preservation and Restructuring of Voice Quality

- Breathiness contrast in Thro is quite clear
  - palih ‘to twist’ 🎤 vs. palih ‘to flip’ 🎤
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• Breathiness contrast in Kuy can still be heard, but less clear. Possibly a pitch distinction
  • lu: ‘to howl’ vs. lʉ: ‘thigh’
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- Breathiness contrast in Kuy can still be heard, but less clear. Possibly a pitch distinction
  - lu: ‘to howl’ vs. lu: ‘thigh’
- Breathiness contrast in So Thavung sounds like a vowel quality difference, at least for mid-vowels
  - dɔ: ‘monkey’ vs. dɔː: ‘many’
  - tɛh ‘to give birth’ vs. tɛːh ‘leech’
Breathiness and change

- Voice quality distinctions include a bundle of factors, including altered f0 and F1 (Kirby and Brunelle, 2017)
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Breathiness and change

- Voice quality distinctions include a bundle of factors, including altered f0 and F1 (Kirby and Brunelle, 2017)
- Lowered f0 can lead to a low tone
- Lowered F1 can lead to vowel raising or diphthongization (Wayland and Jongman, 2002)
- These changes may be pressured further by other mergers
Cluster of mergers

- Phonological systems approaching Thai/Lao
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- Kuy
  - Loss of prenasalization: ncʰu:n ～ cʰu:n ‘to hide’
  - Merger between final /l/ and /r/: pi:r ～ pi:l ‘flower’
Cluster of mergers

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- Kuy
  - Loss of prenasalization: ncʰuːn /chart/ ~ cʰuːn /chart/ ‘to hide’
  - Merger between final /l/ and /r/: piːr /chart/ ~ piːl /chart/ ‘flower’
- Thro
  - Merger between final /l/ and /n/: ckal /chart/ ~ ckan /chart/ ‘to crow’
  - Merger between final /n/ and /ɲ/: pɛɲ /chart/ ~ pɛn /chart/ ‘to shoot’
Cluster of mergers

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- So Thavung (completed changes from Premsrirat (1996))
  - Merger between final /l/ and /n/: kahâ:n ‘tiger’ (cf. kaha:l in Lao Thavung)
Cluster of mergers

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- So Thavung (completed changes from Premsrirat (1996))
  - Merger between final /l/ and /n/: kahâːn ‘tiger’ (cf. kahaːl in Lao Thavung)
  - Merger between final alveolars /t n/ and palatals /c ɲ/: kûːn ‘male’, kʰɔːːt ‘to roll up’ (cf. kuːn, kʰɔːː in Lao Thavung)
Social motivations for change

- Thailand has rapidly modernized and centralized in the past few decades
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  - Greatly improved transportation system throughout country
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  - Increased media access
  - More mobility for education and jobs
  - More schoolteachers coming in from other provinces
- Younger speakers are increasingly dominant in Thai (or Lao), such that there may be imposition (Winford, 2005) of the Thai (or Lao) phonological system on the local language within a speaker
Hypothesis

As voice quality is not a phonemic distinction in any Tai language (the dominant languages, both nationwide and also at the local level), the robustness of the breathiness distinction will be linked to the vitality of the language.
Audio recording

• Recordings for Thro and So Thavung taken with C544-L headset microphone, mostly in homes or outdoor settings.
Audio recording

- Recordings for Thro and So Thavung taken with C544-L headset microphone, mostly in homes or outdoor settings
- Elicitation of minimal pairs in wordlists (less controlled)
Production study

- Kuy speakers asked to embed target words in carrier sentences, recorded on C544-L headset microphone
Production study

- Kuy speakers asked to embed target words in carrier sentences, recorded on C544-L headset microphone
- Carried out task on tablet screen in temple computer room or guest room
Production study

- Kuy speakers asked to embed target words in carrier sentences, recorded on C544-L headset microphone.
- Carried out task on tablet screen in temple computer room or guest room.
- More controlled than Thro and So Thavung elicitation.
Measures

• Files aligned with Montreal Forced Aligner (McAuliffe et al., 2017), measurements taken with VoiceSauce (Shue et al., 2011)

• $f_0$ measured in semitones as proxy for pitch

• $F_1$ measured for vowel quality differences

• Spectral measures of breathiness (corrected for resonances (Hanson, 1995; Iseli et al., 2007))

• $H_1^*-A_2^*$ (proxy for open quotient)

• $H_1^*-A_3^*$ (spectral tilt)

• CPP (measure of aperiodic noise in spectrum)
Measures

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- Each measure averaged at each of 20 chunks across the vowel, with SDs calculated by speaker
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- f0 measured in semitones as proxy for pitch
- F1 measured for vowel quality differences
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Measures

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  - \( H_1^-A_2^- \) (proxy for open quotient)
  - \( H_1^-A_3^- \) (spectral tilt)
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- Each measure averaged at each of 20 chunks across the vowel, with SDs calculated by speaker
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  - $H_1^*-A_2^*$ (proxy for open quotient)
  - $H_1^*-A_3^*$ (spectral tilt)
  - CPP (measure of aperiodic noise in spectrum)
Modal (top) vs. Breathy (bottom) Spectra
Modal (top) vs. Breathy (bottom) Spectra
Modal (top) vs. Breathy (bottom) Spectra

H1-A3

H1-A3
Participants

- Recorded all together:
  - 75 speakers for Kuy
  - 17 speakers for Thro
  - 9 speakers for So Thavung
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• Analyzed for this work in progress:
Participants

- Recorded all together:
  - 75 speakers for Kuy
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  - 9 speakers for So Thavung
- Analyzed for this work in progress:
  - 2 young speakers for each language
    - 20s for Kuy (1 M, 1 F) and Thro (2 F)
    - 40s for So Thavung (2 M)
Participants

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  - 2 young speakers for each language
    - 20s for Kuy (1 M, 1 F) and Thro (2 F)
    - 40s for So Thavung (2 M)
  - 2 old speakers for each language
    - Kuy: 60s (1 M, 1 F)
    - Thro: 1 M in 50s, 1 F in 60s
    - So Thavung: 1 M in 60s, 1 F in 80s
Participants

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  • 75 speakers for Kuy
  • 17 speakers for Thro
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  • 2 old speakers for each language
    • Kuy: 60s (1 M, 1 F)
    • Thro: 1 M in 50s, 1 F in 60s
    • So Thavung: 1 M in 60s, 1 F in 80s
• Modal-breathy vowels in minimal pairs measured
  • Kuy: 39 words; 151 modal, 153 breathy
  • Thro: 42 words; 160 modal, 171 breathy
  • So Thavung: 14 words; 167 modal, 194 breathy
Summary of Hypotheses

- Loss of breathy contrast will be proportional to language vitality (Thro < Kuy < So Thavung)
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• The measures of breathiness
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  - Higher H1*-H2* (open quotient) = more breathy
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• Loss of breathy contrast will be proportional to language vitality (Thro < Kuy < So Thavung)
• The measures of breathiness
  • Higher H1*-H2* (open quotient) = more breathy
  • Higher H1*-A3* (spectral tilt) = more breathy
  • Lower CPP (aperiodic noise in signal) = more breathy
H1*-H2*: Thro

Voice Quality

breathy

modal

Mean H1*-H2*

20, f

25, f

51, m

70, f

Timepoint
H1*-A3*: Thro

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CPP: Thro

![Graphs showing voice quality over time for different individuals](image)

- **Voice Quality**
  - Breathy
  - Modal

- **Individuals**
  - 20, f
  - 25, f
  - 51, m
  - 70, f

- **Timepoints**
  - 0, 5, 10, 15, 20
f0: Thro

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Thro Summary

- Breathiness is cued by at least one acoustic correlate of breathiness for all speakers
Thro Summary

• Breathiness is cued by at least one acoustic correlate of breathiness for all speakers
• $H1^{*}-H2^{*}$ (open quotient) seems robust for the 25 F and 51 M speakers and potentially for the first part for the 20 F speaker
• CPP is consistently lower for all speakers except 51 M, who doesn’t seem to reliably express this cue
• $f0$ is potentially a cue for the 70 F speaker
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• f0 is potentially a cue for the 70 F speaker
**H1*—H2*: Kuy**

<table>
<thead>
<tr>
<th>Timepoint</th>
<th>Mean H1*—H2*</th>
<th>Voice Quality</th>
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<tbody>
<tr>
<td>22, f</td>
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<tr>
<td>27, m</td>
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<tr>
<td>62, f</td>
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<tr>
<td>66, m</td>
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**Voice Quality**
- breathy
- modal
H1*-A3*: Kuy

Mean H1*-A3* over time for different voice qualities (breathy and modal) for individuals 22, f, 27, m, 62, f, and 66, m.
CPP: Kuy

<table>
<thead>
<tr>
<th>Timepoint</th>
<th>Mean CPP</th>
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<tbody>
<tr>
<td>0</td>
<td>15</td>
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<tr>
<td>5</td>
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Voice Quality
- breathy
- modal

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f0: Kuy

![Graph showing voice quality and mean f0 over time for different subjects.](image-url)
Kuy Summary

- H1*-H2* is a robust cue for the young male speaker and potentially the older male speaker (although he has much variation)
Kuy Summary

- H1*-H2* is a robust cue for the young male speaker and potentially the older male speaker (although he has much variation)
- H1*-A3* seems to be a fairly strong cue for voice quality in Kuy, particularly in female participants
Kuy Summary

- H1*-H2* is a robust cue for the young male speaker and potentially the older male speaker (although he has much variation)
- H1*-A3* seems to be a fairly strong cue for voice quality in Kuy, particularly in female participants
- CPP does not seem to be a cue for anyone
Kuy Summary

• H1*-H2* is a robust cue for the young male speaker and potentially the older male speaker (although he has much variation)
• H1*-A3* seems to be a fairly strong cue for voice quality in Kuy, particularly in female participants
• CPP does not seem to be a cue for anyone
• f0 seems to be consistently lower for breathy vowels for the younger speakers and also shows much less variation
H1*-H2*: So Thavung

Voice Quality: breathy, modal
H1*-A3*: So Thavung

Voice Quality
- breathy
- modal
CPP: So Thavung

Mean CPP vs. Timepoint for different individuals:
- 45, m
- 49, m
- 66, m
- 86, f

Voice Quality:
- breathy
- modal
f0: So Thavung

- **45, m**
- **66, m**
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<table>
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<th>Timepoint</th>
<th>Mean f0 (Semitone)</th>
<th>Voice Quality</th>
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- **Breathy**
- **Modal**
So Thavung Summary

- Neither acoustic correlates of breathiness nor f0 are very reliable cues for breathiness
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- However, spectral tilt (H1*-A3*) may be a cue for the older female speaker
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- However, spectral tilt (H1*-A3*) may be a cue for the older female speaker
- The other differences that exist are in the opposite expected direction
Vowel Spaces: Thro (left) vs. Kuy (right)

- No clear height differences in mid-front vowels for either language, but difference for Kuy mid-back vowels
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Vowel Spaces: Thro (left) vs. Kuy (right)

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  - Thro /ɛ, ɑ/ : n = 77, t(66.83) = 0.09, p = 0.93
  - Kuy /ɛ:, e:, o:/ : n = 80, t(77.37) = 2.62, p = 0.011 (but not significant if separate out front from back vowels)
• Only So Thavung seems to have a relatively clear height difference for all mid vowels: $n = 51$, $t(47.92) = 2.5$, $p = 0.016$
Discussion

- So Thavung speakers do not seem to recruit *any* canonical correlates of breathiness to express the distinction, but instead are potentially transitioning it into a distinction of vowel height in mid vowels.
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  - Neither f0 (except perhaps for the older female speaker) nor vowel height seems to be a robust cue
  - Each of the acoustic correlates of breathiness seem to be recruited here, but to varying extents by speaker
Directions

• The two languages that are less endangered still have fairly strong cues of breathiness, although the cues differ by language and speaker (CPP is not a reliable correlate at all for Kuy)
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- However, the less vital of the two seems to show younger speakers potentially beginning to use f0 redundantly as a cue (incipient tonogenesis? cf. Abramson et al. (2004)).

- So Thavung seems to be restructuring the voice quality contrast into a vowel quality contrast.

- Thus, we see restructuring of the voice quality system interacting with the differing situations of language shift.

- Plans: Analyze rest of speakers; get more controlled data for Thro and So Thavung.
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เร้าขอ กู้นะกู้ไก
[rəʔaː kuːnaʔkuːdaj]
Thanks everyone!
raksit@berkeley.edu

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References I


References

