



Variegated VC Rime Restrictions in Sinitic languages

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SETTING THE STAGE

Markedness accounts for VC rime gaps in Sinitic languages:

VC rime gaps in Chinese languages have been customarily analyzed as cooccurrence markedness constraints, e.g.,

- (1) RIME HARMONY for Standard Chinese (Duanmu 2007, Lin 1989, *a.o.*).
- (2) *IK (*[-cons, +hi][+cons, +hi]) for Cantonese (Kenstowicz 2012).

★Using cooccurrence constraints are in danger of over-prediction:

(Some) gaps in Taiwanese (Southern Min), Hakka, & Cantonese:

Taiwanese	-p̄	-t̄	-k̄	-ʔ	Hakka	-p̄	-t̄	-k̄	Cantonese	-p̄	-t̄	-k̄
a	✓	✓	✓	✓	a	✓	✓	✓	{a, ə}	✓	✓	✓
i	✓	✓	✓	✓	i	✓	✓	x	i	✓	✓	✓
e	x	✓	x	✓	e	✓	✓	x	e	✓	x	✓
u	x	✓	x	✓	u	x	✓	✓	u	x	✓	✓
{o, ə}	✓	x	✓	✓	o	x	✓	✓	o	x	✓	✓

- “Systematic” gaps across various (sub-)dialects of Southern Min.
 - ◆ Also, “production problems” with {*ot/*on, *uk/*uŋ, *up/*um}
- Q1: More relaxed restrictions on VC rimes in Hakka & Cantonese.
- Q2: Restrictions of this sort are *barely* found in English, e.g., *[u].

CHECKED SYLLABLES

- Stop codas are never released in checked syllables
- Checked syllables are heavily “glottalized”
- Diminished duration → vowel reduction (Not stress-related!)
- Prediction: There should be significant differences between Taiwanese and Hakka/Cantonese w.r.t. the acoustic properties of VC rimes.

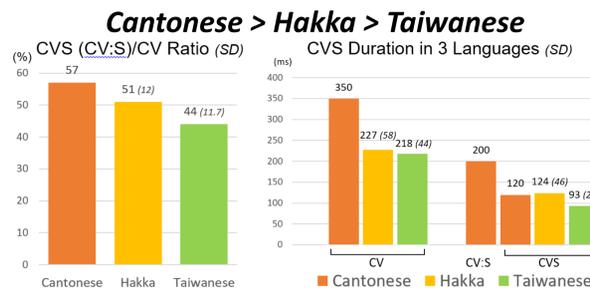
ACOUSTIC STUDIES

Participants: 10 native speakers of Taiwanese and 5 native speakers of Hoiliuk (Hailu) Hakka (All male; aged: 20~70 at the time of recording).

Material: Meaningful monosyllabic words with all possible CV:, CVN and CVS(top) combinations were embedded in a carrier phrase and repeated 10 times in a randomized order. **Data Analysis:** The recordings were analyzed with the help of Praat. Formant frequencies were normalized using the Lobanov method and were subsequently converted back to Hz. The Cantonese data were taken from Zee (2003).

RESULTS

(1) Vowel duration



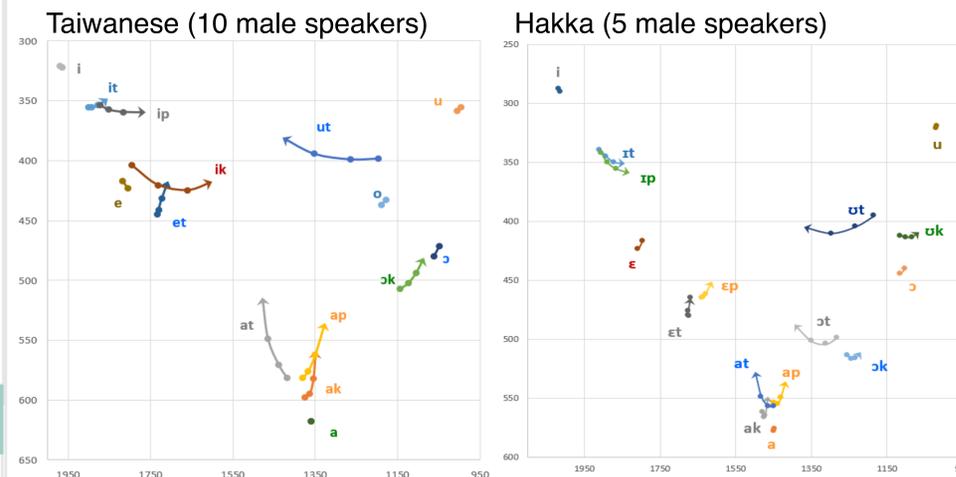
Differences in mean vowel duration and CVS/CV ratio between Taiwanese and Hakka are statistically significant ($p < .001$).

(2) Durational differences among VC rimes

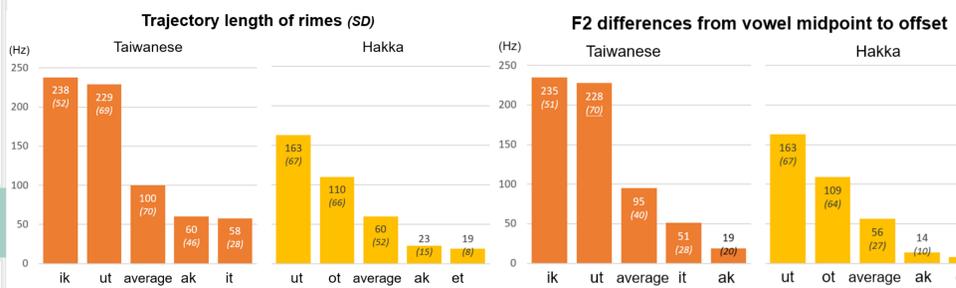
Taiwanese										Hakka											
rime	ik	ut	et	at	ak	it	ap	ok	ip	rime	ot	ok	et	it	ap	ip	ut	at	ep	uk	ak
duration (ms)	108	102	99	99	93	92	91	90	79	duration (ms)	138	133	130	127	125	125	122	121	119	118	112
SD	24	22	16	17	23	18	21	19	19	SD	59	52	53	49	46	51	61	50	48	47	40
statistical significance	[Shaded areas indicate insignificant differences in duration among rimes ($p > 0.05$)]									[Shaded areas indicate insignificant differences in duration among rimes ($p > 0.05$)]											

Longer duration = higher degree of “coarticulatory independence” (i.e., vowel gliding)
A mini-typology: Longest VC rimes in Taiwanese: {-ik & -ut} vs. Hakka: {-ot & -ok}

(3) Formant trajectories of CVS syllables: A comparison



• Taiwanese has longer VC transitions than Hoiliuk (Hailu) Hakka



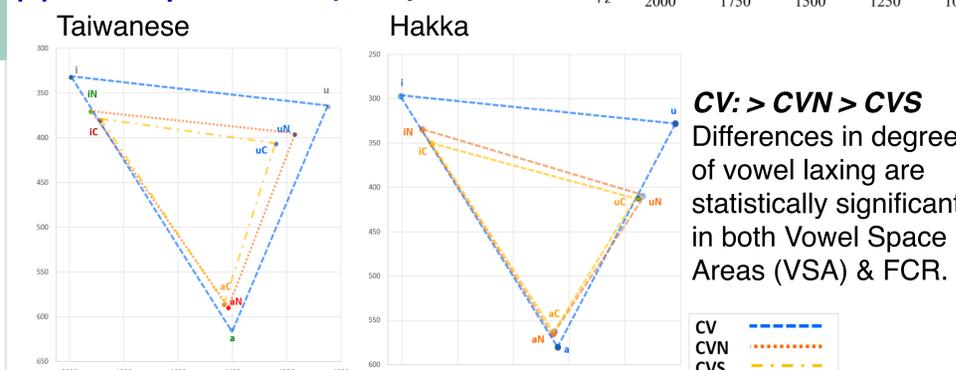
(4) -k induces laxing most robustly

Degree of vowel laxing correlates with:

- Presence of -k (but not -p, -t, -ʔ)
- “Conflicting” VC rimes (e.g., [ik], [ut])

F1 differences between V_k & V_p/V_t are statistically significant. $p < .001$ for -ik, $p < .05$ for -uk & -ok

(5) Vowel spaces of CV:/CVN/CVS



DISCUSSION & CONCLUSION

(1) Principal findings of the acoustic studies

- Closed syllable vowel laxing is robust in Sinitic languages, too (note again that it has nothing to do with stress).
- Checked syllables are significantly shorter in Taiwanese (Southern Min).
- VC transitions in Taiwanese are more pronounced than in Hakka.
- F2 transitions (midpoint-to-offset) are more significant in high vowels and less so in nonlow vowels (robust F1 raising in low vowel).
- Stop coda -k induces the greatest degree of vowel laxing than -p and -t.

(2) Previous phonetically based account

- Higher degree of VC coarticulation (more gestural overlap) is invoked to enhance perceptibility of unreleased stop codas, e.g., /ot/ → [ut].
- Vowel reduction leads to mergers in VC rimes, e.g. *{uk-ok} >> *{ok-ak}.
 - Some potential problems for Hsieh’s (2010) analysis of Taiwanese:
 - VC transitions are significant in {ik & ut}: how can vowel gliding (but not vowel centralization) be allowed in a phonetically short syllable?
 - How do we know that *{uk-ok} >> *{ok-ak} if [uk] does not surface?

(3) Consequences for phonological patterning: Present results

- High vowels are more resistant to coarticulatory influence, hence vowel gliding (significant F2 transitions) in [iʌk & uʌt]. By contrast, F2 transition is not a possible option for mid back vowels: *{ot/on} in Taiwanese.
- Phonological distinctiveness can be maintained by longer duration: more relaxed restriction on VC phonotactics in Hakka (and Cantonese).

(4) Towards a new analysis of VC rime gaps in Taiwanese Southern Min

- Vowel gliding in [iʌk & uʌt] may be invoked to enhance distinctiveness, too.
- *[-uk & *-ot] may be “real gaps” in Taiwanese: /-ok/ is chosen as surface forms b/c it is sufficiently dispersed with -ut and -ak (à la Flemming 2002). Recall that native speaker have “production problems” with these gaps, too.
- For gaps with a front vowel, for example, [-et & -ek] are not real gaps because these rimes may be found in other varieties of Southern Min.
- Loose ends: it remains to be seen whether [up] is an accidental gap (NB: [-op/-om] are rare, which are an instance of the so-called labial dissimilation)

(5) Conclusion

- A phonetically based account fares better than a markedness account as far as the presence and absence of VC rime gaps are concerned.
- This study confirms that duration plays a key role in VC rime phonotactics.

SELECTED REFERENCES

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