PALATALIZATION & VELARIZATION IN MALAYALAM NASALS

A PRELIMINARY ACOUSTIC STUDY OF DENTAL & ALVEOLAR NASALS

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FASAL-9, 17 MARCH 2019

BACKGROUND

	Labial	Dental	Alveolar	Retro.	Pal.-alv.	Pre-vel.	Velar
Plosive	*p* /p/	*t̪* /t̪/	*t* /t/	*ṭ* /ʈ/	*c* /tɕ/	*k'* /k̟/	*k* /k/
Nasal	*m* /m/	*n̪* /n̪/	*n* /n/	*ṇ* /ɳ/	*ñ* /ɲ/	*ṅ'* /ŋ̟/	*ṅ* /ŋ/
Approx.	*ʋ* /ʋ/	*r̪* /ɾ̪ ~ l̪/	*r* /ɾ ~ ɻ/	*ẓ* /ɻ/	*y* /j/		
Lat. app.		*l̪* /l̪/		*ḷ* /ɭ/			

- Malayalam (M) is rich in place contrasts (M&M84)
- How can one distinguish so many places?
- All Cs have **place cues** in formant transitions
- Some Cs have additional cues: (J04)
  - Plosives have strong cues in their burst
  - Fricatives have strong cues in their noise
  - Liquids/glides have some formant cues internally
  - But **nasals have virtually nothing else** (M56)
- So **how do speakers manage 7 nasals?**
  - Speakers do produce 7 diff. nasal places (D&N99)
- Phonological distribution helps:
  - Far fewer contrasts initially and finally
  - Full inventory only seen in intervocalic geminates
  - Having Vs on both sides provides transitions
  - Length arguably compensates for weak place cues

Place	Initial	Singleton V_V	Geminate V_V	Final
labial *m* /m/	*māṉ* 'deer'	*āma* 'turtle'	*kammi* 'shortage'	*āẓam* 'depth'
dental *n* /n̪/	*nālŭ* 'four'	*	*panni* 'pig'	*
alveolar *ṉ* /n/	*	*āṉa* 'elephant'	*kaṉṉi* '(a month)'	*ñāṉ* 'I'
retroflex *ṇ* /ɳ/	*	*āṇŭ* 'be'	*kaṇṇi* 'link'	*
palatoalv. *ñ* /ɲ/	*ñāṉ* 'I'	*	*kañña* 'rice stew'	*
pre-velar *ṅ'* /ŋ̟/	*	*	*tēṅṅ'a* 'coconut'	*
velar *ṅ* /ŋ/	*	*	*tēṅṅal* 'wailing'	*

- But are there other ways speakers might be accentuating these weak place contrasts?
- Impressionistic descriptions suggest yes:
  - "Medial *n̪/n̪n̪* have a distinctly **palatal** tamber" (A&K97)
  - "Mlm's dental *n* is strongly **velarized**" (McA98)
- Plus, **liquids** *r r̪ ẓ l l̪* in Mlm are described as **clear** or **dark** (L&S99, P11, P&K11, S&a13, S&R88)

QUESTION & OBJECTIVES

- Do speakers use **sec. articulations to enhance place contrasts in coronal nasals?**
  - **Velarization** and other "**dark**" articulations
  - **Palatalization** and other "**clear**" articulations
- Review existing literature on liquids *r r̪ ẓ l l̪*
- Collect and analyze new data on nasals *n n̪*

PREVIOUS STUDIES OF LIQUIDS

Acoustic findings (L&S99)

- **r l higher/fronter than r̪ l̪**
  - Lower F1 (=higher quality) in *r l* and preceding V
  - Higher F2 (=fronter quality) in *r l* and preceding V
- **Length affects quality**
  - Higher F1 (=lower quality) in V preceding long C
  - Higher F2 (=fronter) in C when long

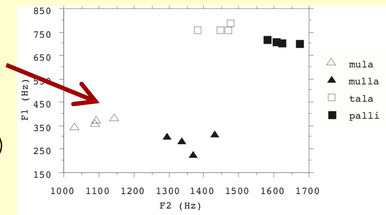


Figure 1. F1-F2 plot of first syllable vowels /u/-/a/ in *mula-mulla, tala, palli*

Study	Methods	Clear/ palatalized	Dark/velarized/ pharyngealized
L&S99	acoustic	*l*	*l̪*
P11	acoustic	*l r ẓ*	*l̪ r̪*
P&K11	acoustic	*l r ẓ*	*l̪ r̪*
S&a13	ultrasound	*l r ẓ*	*l̪ r̪ (ẓ)*
S&R88	x-ray & pal.	*r*	*r̪*

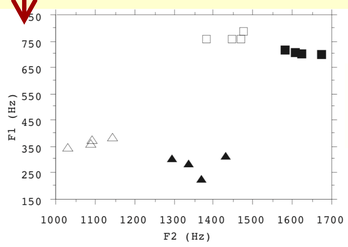
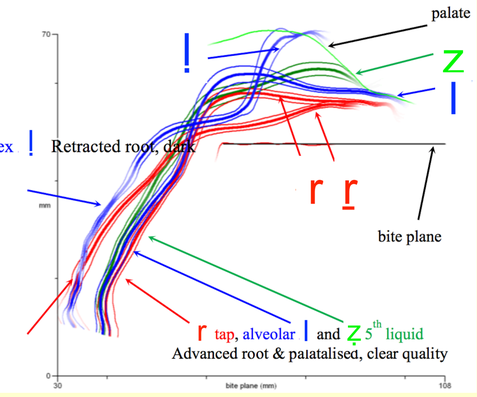


Figure 1. F1-F2 plot of first syllable vowels /u/-/a/ in *mula-mulla, tala, palli*

Articulatory findings (S&a13)

- **r l ẓ are "clear"**
  - High, flat tongue body
  - Advanced tongue root
- **r̪ l̪ are "dark"**
  - Low tongue body
  - Retracted tongue root



r̪ trill and retroflex

CURRENT STUDY OF NASALS

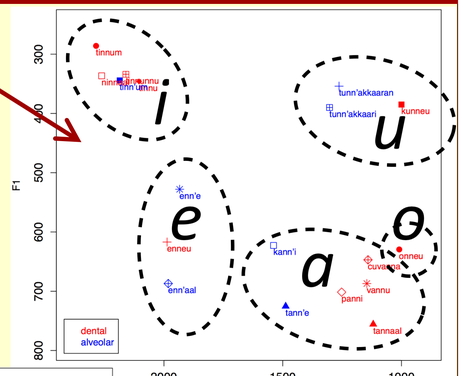
Methods

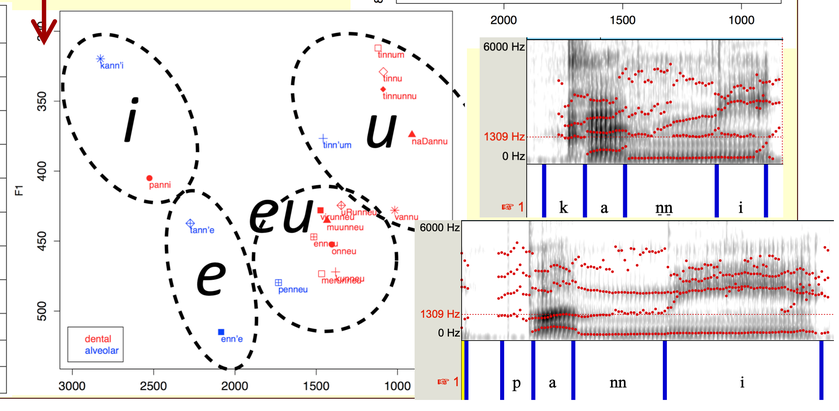
- **One speaker** (cf. S&a13)
  - Reed undergraduate
  - Male, from Thrissur, Kerala
- **Wordlist**
  - Dental *nn* vs alveolar *n̪n̪*
  - All intervocalic geminates
- **Acoustic analysis**
  - F1xF2 of surrounding Vs, at midpoint (cf. L&S99)
  - Unlike liquids, there are no oral formants during nasals

Dental *nn* /n̪n̪/	Alveolar *n̪n̪* /nː/
panni 'pig'	*kaṉṉi* '(a month)'
tannu 'give-PST'	*taṉṉe* 'indeed/self-ACC'
tannāl 'if X gives'	*enṉāl* 'by me'
tinnŭ 'eat-PST'	*tiṉṉum* 'eat-FUT' ~ *tinnum*
ennŭ 'COMP'	*enṉe* 'I-ACC'
ninnŭ 'from'	*niṉṉe* 'you-ACC'
kunnŭ 'mountain'	*tuṉṉakkāri* 'seamstress'
vannu 'come-PST'	*piṉṉe* 'later'
onnŭ 'one'	
mūnnŭ 'three'	
cuvanna 'red'	

Results

- **Back Vs front before *n̪n̪***
  - F2 higher in *u o a* before *n̪n̪*
  - No consistent effect on *i e*
  - Suggests palatalization of *n̪n̪* or velarization of *nn*
- **Back Vs front after *n̪n̪***
  - F2 higher in *u ŭ* after *n̪n̪*
  - Possible raising on *i* after *n̪n̪*
  - Suggests palatalization of *n̪n̪* or velarization of *nn*





SUMMARY

- So… ***do* speakers use sec. articulations to enhance place contrasts in coronal nasals?**
- At least for this one speaker, **yes**:
  - Vs near dental *nn* are lower and/or backer
  - Vs near alveolar *n̪n̪* are higher and/or fronter
- Suggests ***nn* is velarized**, ***n̪n̪* is palatalized**
  - Confirms previous impressionistic claims (A&K97, McA98)
  - Much like findings on liquids (L&S99, P11, P&K11, S&a13, S&R88)
- Helps explain how **speakers maintain place contrasts** in sounds with poor place cues

FURTHER QUESTIONS

- What are speakers **doing physiologically** to achieve these sec. articulations?
  - Need ultrasound, palatography, etc.
- Are sec. articulations **seen across speakers?**
  - This is still based on only one speaker
- Are they **seen across positions?**
  - Exaggerated due to shorter duration?
  - Or attenuated due to contrast neutralization?
- Are they **seen in other nasals?**
  - Impressionistically, *ñ ṅ'* are clear; *m ṉ ṅ* are dark
  - Articulatory work by others on *ṅ'* is underway (B&a18)

ACKNOWLEDGMENTS

Many thanks to Abhi Rajshekar for serving as our field methods consultant, and to the whole LING336 class of 2018 for your input!

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