

The Role of Sub-phonemic Detail in Explaining Phonological Change

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I. Introduction

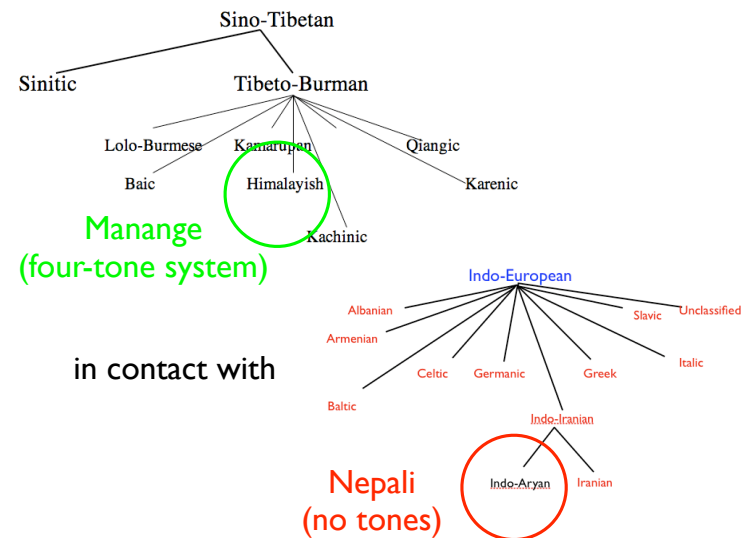
- An examination of observed sound-change-in-progress
 - Specifically: a tone-merger that is both phonetically gradual & diffused incompletely across the lexicon & across speakers
- The social & structural environments of this change create some interesting challenges for (traditional) sociolinguistic & purely structural explanations/approaches
- My position: A combined & modified approach, with an eye to the rise of sub-phonemic factors in the emergent system

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II. The change & other background information

- The change is occurring to the tone system in Manange, a (Bodish) Tibeto-Burman language spoken in two communities of Nepal
- The two Manange communities have different language-contact & language usage scenarios:

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II. The change & other background information

- “Prototypical” Tone in Manange (and other Bodish languages)
- 4 tones that are a combination of:
 - PRIMARILY: vowel fundamental frequency (F₀), and
 - SECONDARILY: onset obstruent phonation properties

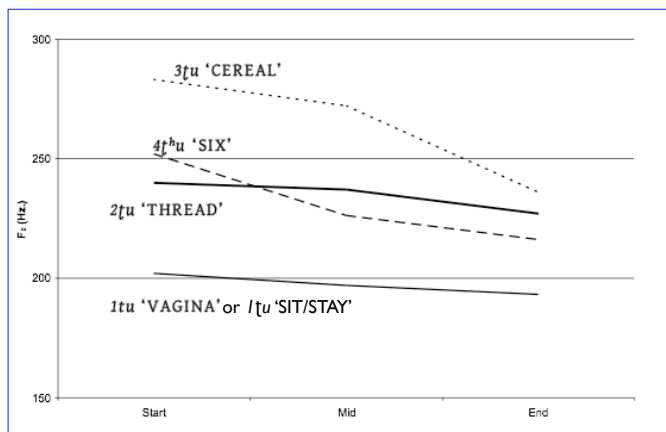
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II. The change & other background information

Tone	F ₀ (and onset phonation) Properties	Example
1	low, level	[tu 'sit/vagina', ŋi 'old objects']
2	high, level	[tu 'thread', ŋi 'seven']
3	very high & falling; initial obstruents are [-asp]	[tu 'cereal', ŋi 'frightening']
4	mid & falling; initial obstruents are [+asp]	[tu 'six', ŋi 'two']

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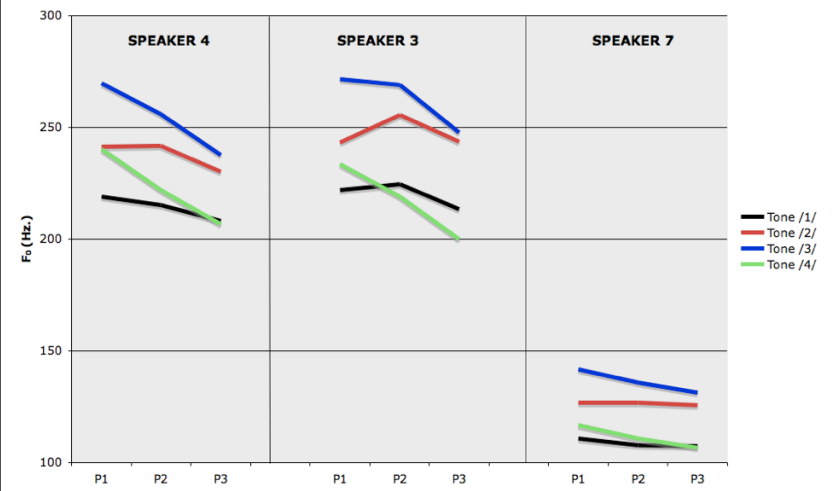
II. The change & other background information



Rural speaker, Ngawal Manang

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Average F₀ values at 3 measurement points: Rural Mananges



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The two Manange communities

“Rural”

- Intermittent contact with Nepali
- Manange is dominant and a lingua franca
- most contact is within family & sub-grouping, where tone profiles are similar



Tengki Manang, 2004

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The two Manange communities

“Urban”

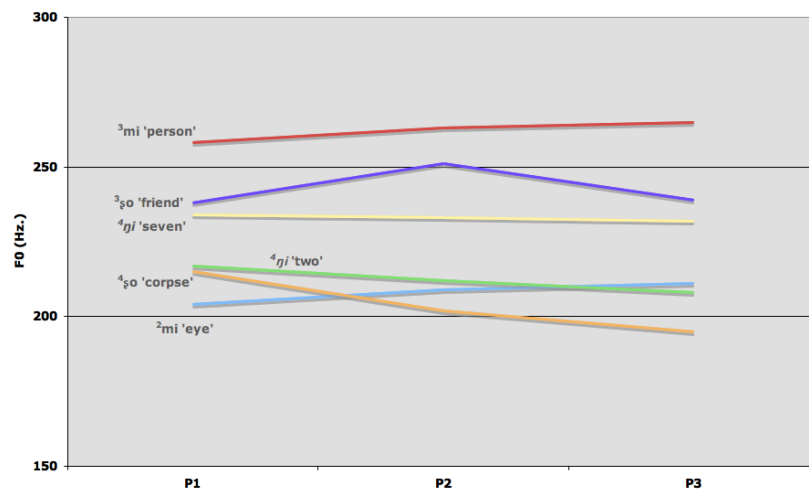
- A recently founded community in Kathmandu
- Life-long cross-family bilingualism is the norm
- Nepali is the dominant, (official) lingua franca outside of family interaction



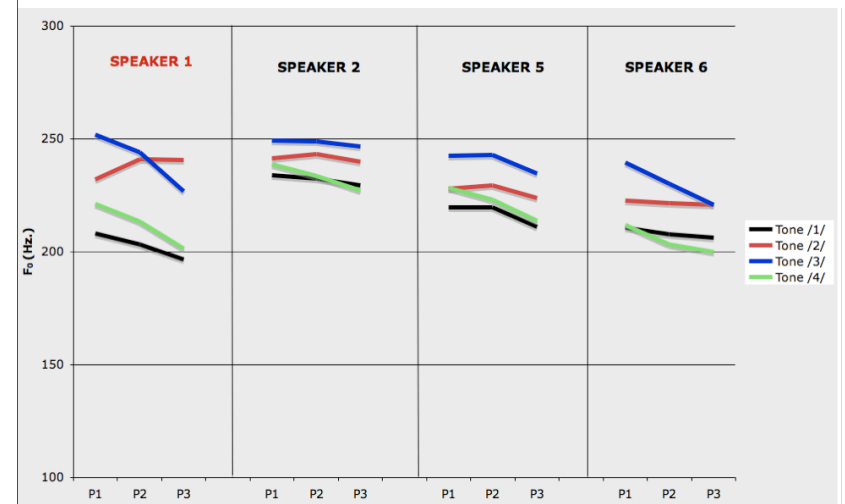
Swayambhu, Kathmandu, 2006

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Some Minimal Pairs, Urban Speaker



Average F0 values at 3 measurement points: Urban Mananges



III. How to account for this?

- One option: tone merger due to language contact
 - This is still just another description
 - Yes, but: not all urban speakers evidence the same degree of merger
 - Yes, but: minimal pairs still exist for both communities (both production & perception)

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III. How to account for this?

- The change is affecting the production before the perception
- The change is more pervasive for some Urban speakers than for others
- It is affecting some portions of the lexicon before others

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III. How to account for this?

- Words as vehicle for sound change; words may behave independently
 - Frequency as an important factor (Schuchardt 1885; Wang 1969; Bybee 1985, 2001; Phillips 1984, 2006)
- Change affects all words subject to that change (neogrammarian)
 - Or, all phonological change begins with lexical diffusion and then ends up neogrammarian, given enough time (Anderson 1973; Lass 1997)

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III. How to account for this?

- Regular sound change (change from below)
 - “phonetically gradual” change of individual feature in a continuous phonetic space;
↓ social awareness; “post-lexical”
- Lexical diffusion (change from above)
 - “abrupt substitution” of one phoneme for another in words with that phoneme;
↑ social awareness; “lexical”

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III. How to account for this?

<i>Phonetically gradual</i>	<i>Phonetically abrupt</i>
vowel shifts & diphthongization	shortening/lengthening
POA adjustments	metathesis
consonant manner changes	tone & stress changes

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III. How to account for this?

- What about “complex tone” systems?
- And what about the mis-match between perception of tone and production?
- What about structurally external factors?
 - contact, (asymmetrical) bilingualism

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III. Assumptions & Goals

- Tone is conceptually relevant for both rural & urban Manages, despite observed changes to the system
- The change to Manange tone is a case of phonetically gradual sound change (despite assumptions to the contrary about tone change)
 - i.e. it is possible to observe the rise of non-contrastive factors in influencing the direction/rate of the change

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III. Resulting Assumptions & Goals

- Frequency of usage is an additional structural - interactional factor, interacting with the sub-phonemic properties of the complex system to hasten the changes
- In addition to this are structurally-external factors of (asymmetrical) bilingual language use & language contact between prosodically different types

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IV. Methods & Findings

- Data-set: 400 (same) words (nouns, verbs, adjectives, function words) from nine speakers (7 included here)
 - 3 rural (2 f, 1 m); 4 urban (4 f)
 - all 20-35 yrs. of age at time of study
- RURAL = born & raised in Manang
- URBAN = born or living in Kathmandu for at least ten years

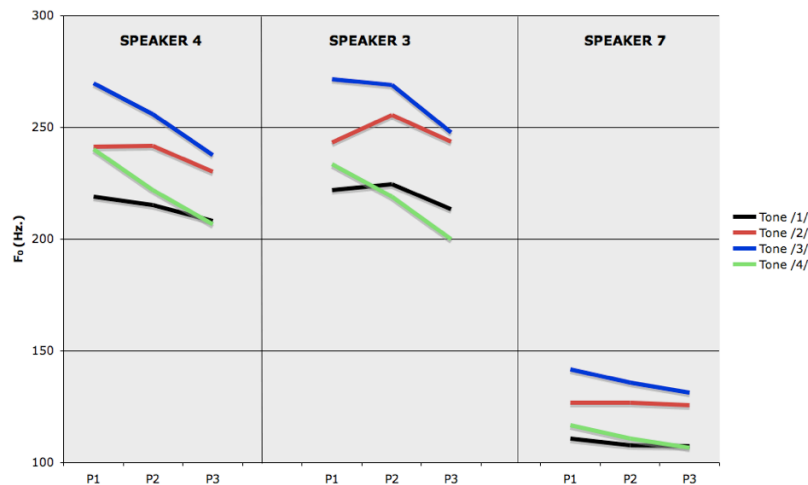
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IV. Methods & Findings

- Words recorded in both isolated (list) & frame-medial (clause-medial) contexts
- Recorded in multiple repetitions (middle, frame-medial repetition represented here)
- PC-Quirer acoustic analysis
- Numeric data a combination of individual measurements & averages
- Averages subjected to analysis of significance of variation (ANOVA or t-test)

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Average F₀ values at 3 measurement points: Rural Mananges



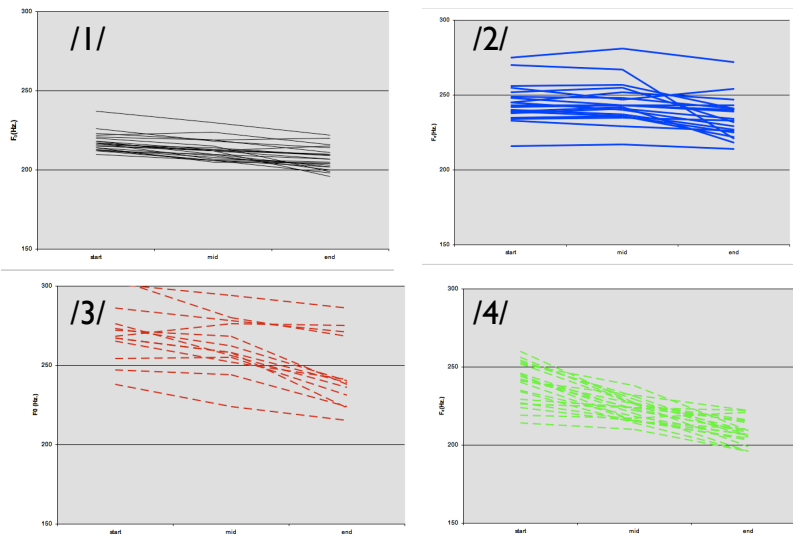
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Significant Tone Category Separation (Rural)?

categories	P1	P2	P3
1 & 2	ALL	ALL	ALL
1 & 3	ALL	ALL	ALL
1 & 4	4		
2 & 3	ALL	ALL	
2 & 4	7	ALL	ALL
3 & 4	ALL	ALL	ALL

rural

Absolute F₀ Variation, Speaker 4 (Rural)



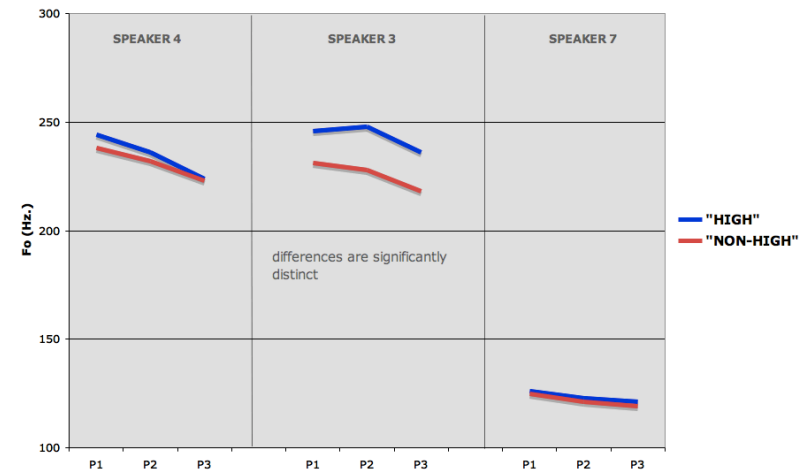
IV. Methods & Findings: Summary So Far

- The acoustic component reconfirms 4 tones
- But visual representation & statistic procedures also reveal overlap
- Despite contrastivity & overall category significance, what (if anything) can we say about the variation?

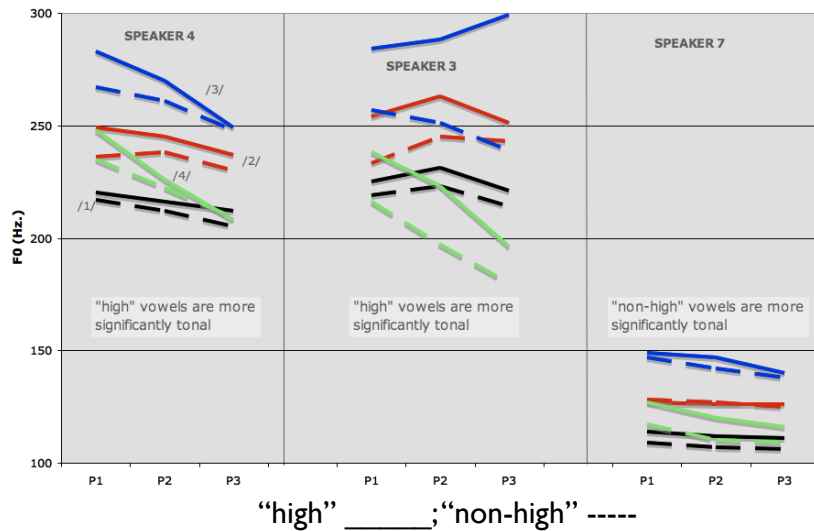
IV. Methods & Findings: “Intrinsic Pitch”

- Does vowel quality (height/F1) interact with F₀?
- (Lehiste & Peterson 1961; Lehiste 1976; Hombert 1978; Ohala 1978; Laver 1994; Maddieson 1996)
- Explanations range from perceptual ~ production conditioning factors to more articulatory-only factors
- Comparison of F₀ values of “high” (i, u) vs. “non-high” vowels (a, ʌ)

“Intrinsic Pitch” (Rural Speakers)



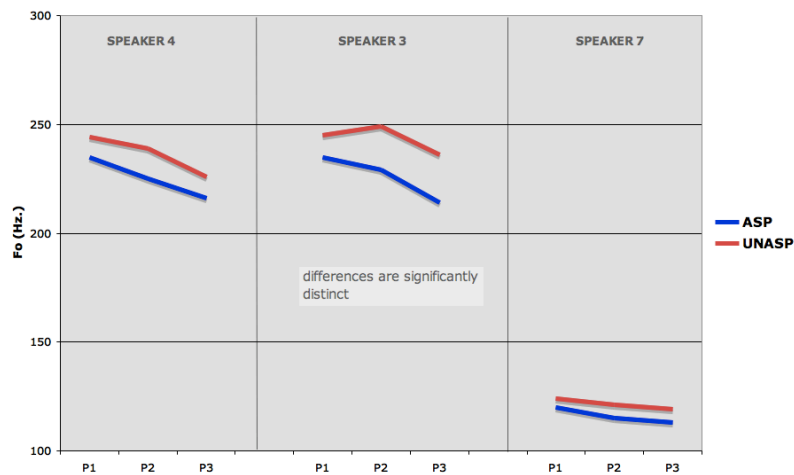
“Intrinsic Pitch,” X Tones, Rural Manages



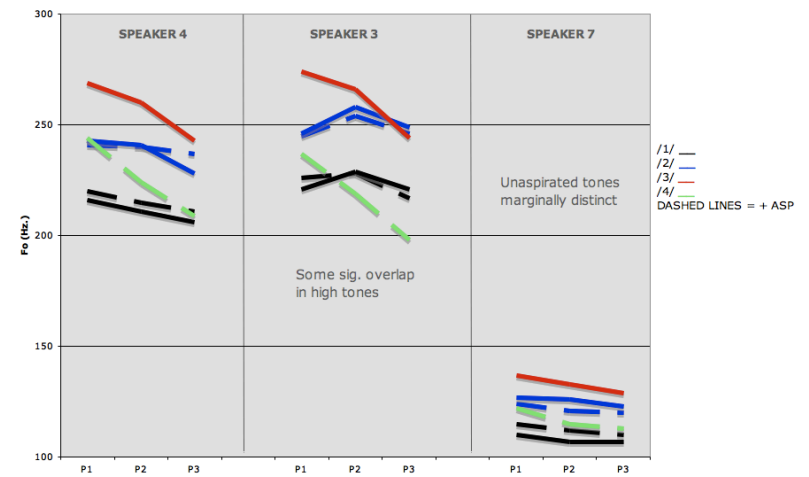
IV. Methods & Findings: Aspiration ~ F₀ Interactions

- Can manifest an overlapping relationship between an initial voiceless segment and a following voiced one (vowel) at the leading edge of a syllable
 - delayed voicing (highly positive V.O.T.), with lowered F₀ on the initial phase of vowel (quasi-breathy phonation) (Laver 1994)

The Interaction of Aspiration with Vowel F₀ (Rural)



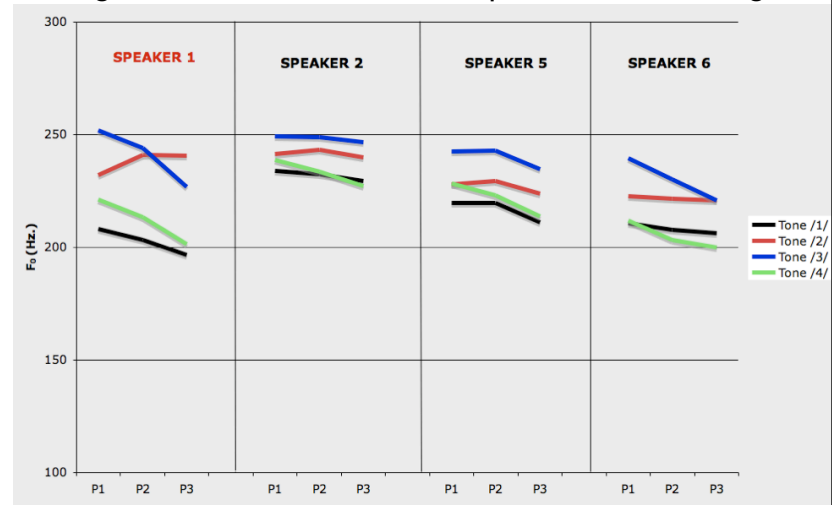
Aspiration - F₀ Averages X Tones (Rural)



IV. Methods & Findings: Summary So Far

- Some variation may be accounted for by appeal to sub-phonemic properties:
 - Intrinsic Pitch
 - Aspiration ~ F0 Interactions
- What about Urban Speakers?

Average F₀ values at 3 measurement points: Urban Manages

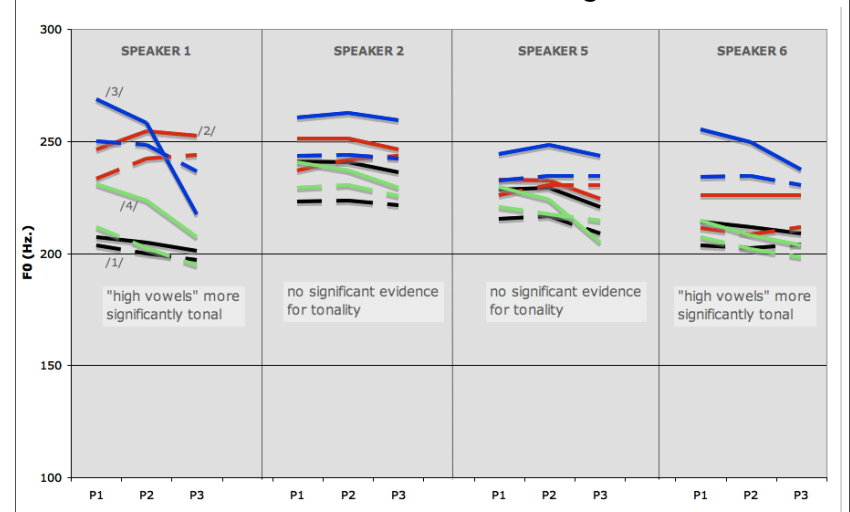


Significant Tone Category Separation (Urban)?

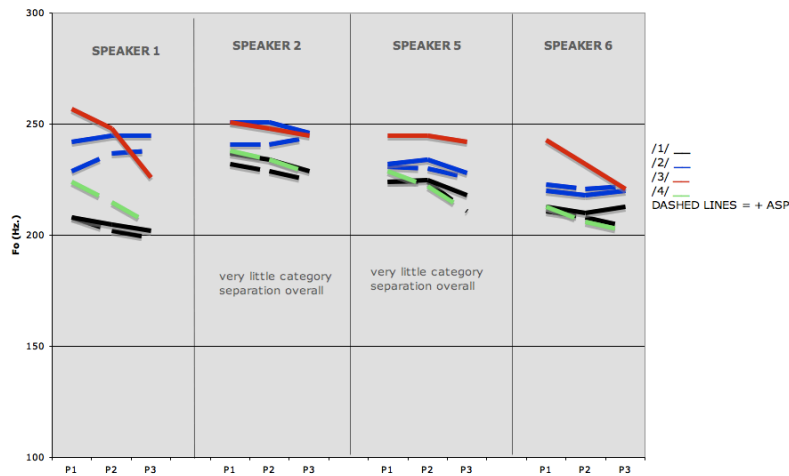
categories	P1	P2	P3
1 & 2	1, 5, 6	ALL	ALL
1 & 3	ALL	ALL	ALL
1 & 4	1, 5		
2 & 3	5, 6	5, 6	1, 5
2 & 4	1, 6	1, 2, 6	2, 5, 6
3 & 4	ALL	ALL	ALL

urban

“Intrinsic Pitch,” Urban Manages



Aspiration - F₀ Averages X Tones (Urban)



IV. Methods & Findings: Summary So Far

- The acoustic patterns for urban speakers reveal more significant overlap
- The sub-phonemic intervening variables are more more significantly evident
- But it is not obvious that these variables are themselves responsible for the overall merger phenomenon
- An additional (usage) factor: Lexical frequency

IV. Methods & Findings: The Role of Frequency

- Linguistic categories influenced by mental representation, which is in turn influenced by experience & usage
- Tone:
 - defined partly by the (contrastive) phonetic correlates
 - the toneme itself also a (cumulative) product of lexical members in their different instantiations & their respective properties

IV. Methods & Findings: The Role of Frequency

- The shape, size and potential path for the (tone) category is linked to properties of exemplars in language use through time
- Linguistic change is as much a factor of interaction as the system itself

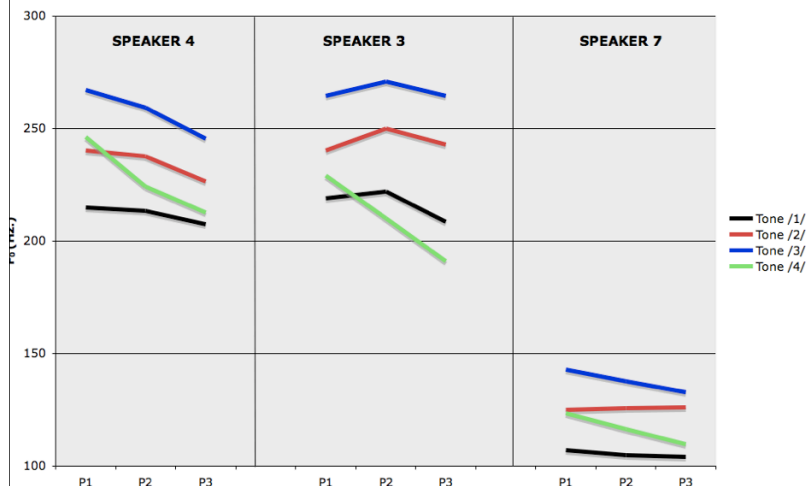
IV. Highly frequent members undergo certain types of changes first

- Highly frequent words: Speakers & listeners have stronger mental representations, allowing for phonetic reductions without heavy costs to storage & retrieval
- Assumes “normal usage/transmission” scenarios
- With an added factor (contact), the possibility for confounding interactions increases
 - Mental representation remains intact (for now), while innovative pronunciations emerge

IV. Methods & Findings: The Role of Frequency

- What counts as \pm frequent?
- Data from 30 texts (mixed genres)
 - caveat: not all texts are Manange
- Cut-off point: 9+ instances/6500 words = “frequent”
 - caveat: not up to the “million-word” standard
- Caveat: results in a smaller database of “frequent” words than “non-frequent”

Average F₀ Values X Tones, Frequent Words (Rural)

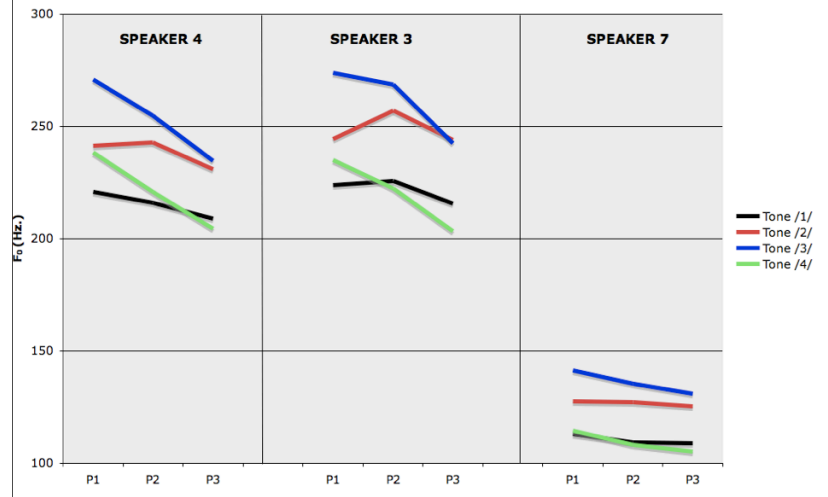


Significant Tone Category Separation (Rural Frequent)?

categories	P1	P2	P3
1 & 2	4, 7	4, 7	4, 7
1 & 3	ALL	ALL	ALL
1 & 4	4, 7		
2 & 3	4, 7	4	4
2 & 4		3	3
3 & 4	ALL	ALL	ALL

rural

Average F₀ Values X Tones, Non-Frequent Words (Rural)

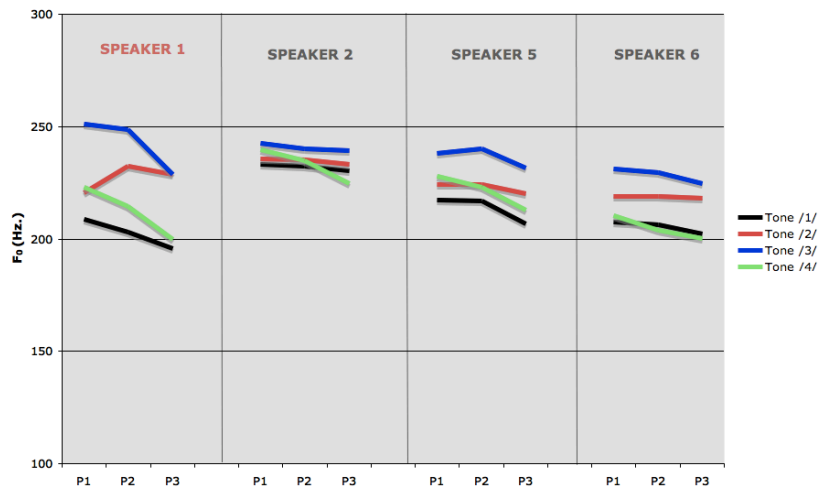


Significant Tone Category Separation (Rural Non-Frequent)?

categories	P1	P2	P3
1 & 2	ALL	ALL	ALL
1 & 3	ALL	ALL	ALL
1 & 4	4		
2 & 3	ALL	4	
2 & 4	7	ALL	ALL
3 & 4	ALL	ALL	ALL

rural

Average F₀ Values X Tones, Frequent Words (Urban)

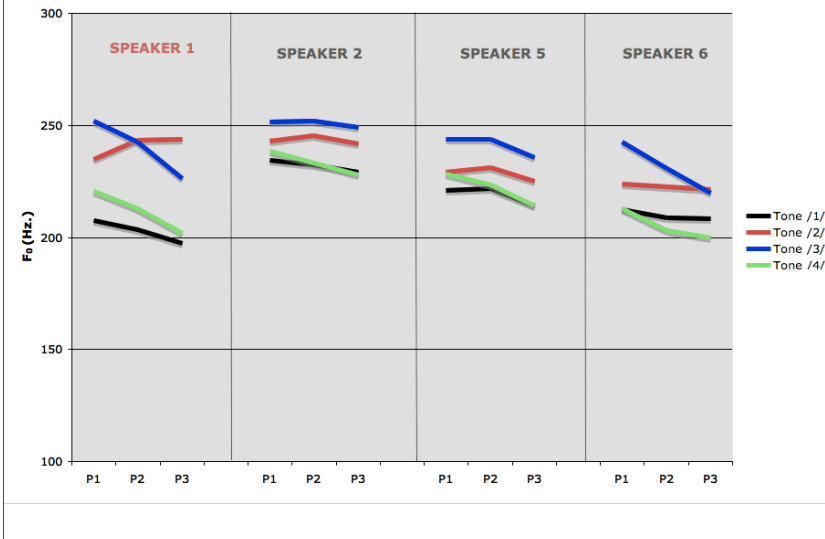


Significant Tone Category Separation (Urban Frequent)?

categories	P1	P2	P3
1 & 2		1	1
1 & 3	1, 5, 6	1, 5, 6	1, 5, 6
1 & 4			
2 & 3	1	5	
2 & 4			1
3 & 4	1, 6	1, 5, 6	6

urban note: no significant category separation for inf. 2

Average F₀ Values X Tones, Non-Frequent Words (Urban)



Significant Tone Category Separation (Urban Non-Frequent)?

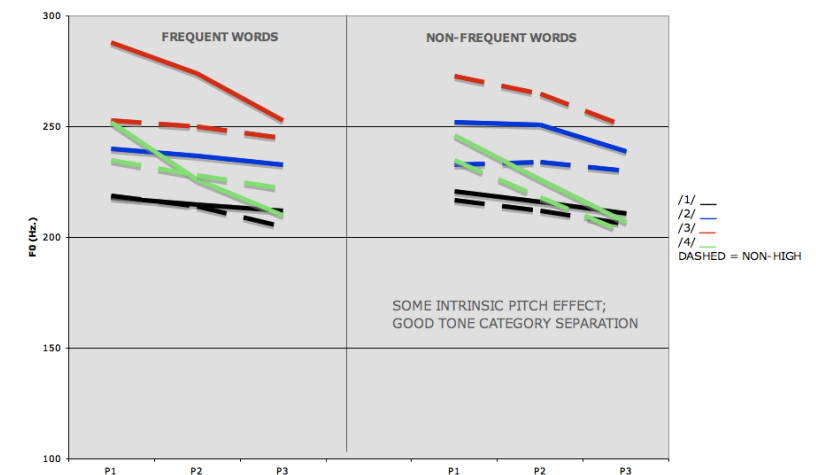
categories	P1	P2	P3
1 & 2	1, 6	ALL	ALL
1 & 3	ALL	ALL	ALL
1 & 4	1		6
2 & 3	1, 5, 6	5, 6	1, 5
2 & 4	1, 6	1, 2, 6	1, 2, 6
3 & 4	ALL	ALL	ALL

urban

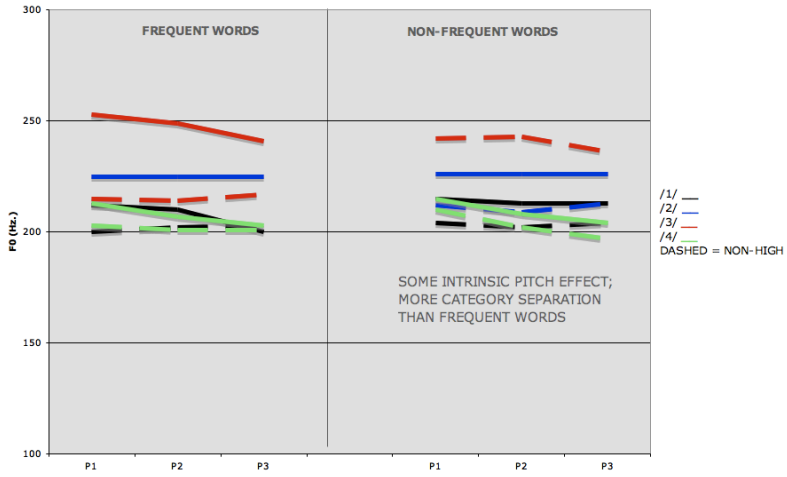
IV. Methods & Findings: Summary of Frequency Effects Overall

- For rural speakers: frequent words show increased acoustic overlap
- For urban speakers: the frequent-overlap is more pronounced
- The reductive/variation effect is strongest for frequent words
 - For urban speakers: non-frequent words more closely mirror the rural patterns
- Does frequency interact with intrinsic pitch or aspiration ~ F₀?

Intrinsic Pitch X Tone X Frequency (Rural Speaker 4)



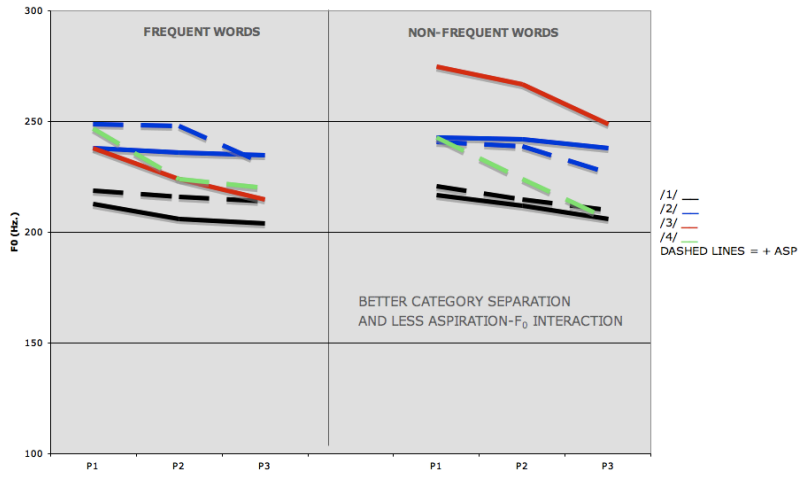
Intrinsic Pitch X Tone X Frequency (Urban Speaker 6)



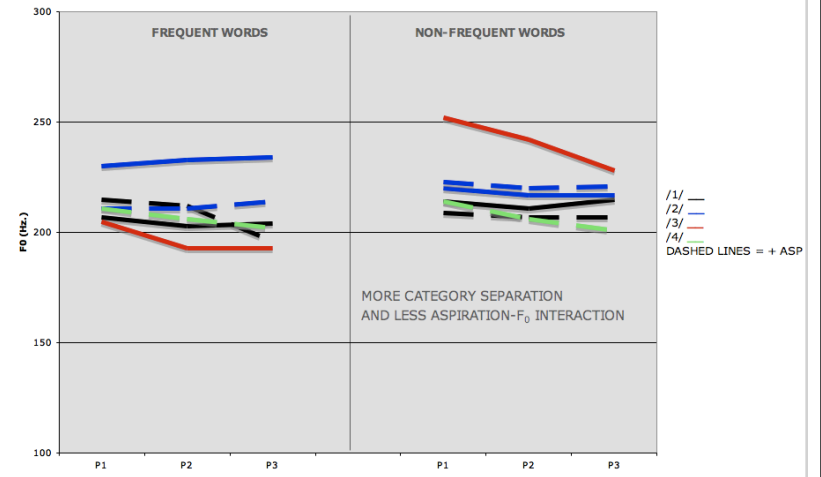
Intrinsic Pitch X Tone X Frequency: Other Speakers

Spkr 1 U	Spkr 2 U	Spkr 3 R	Spkr 5 U	Spkr 7 R
non-frequent words: minimal effect	non-frequent words: lessened effect	non-frequent words: minimal effect	non-frequent words: lessened effect	non-frequent words: minimal effect

Aspiration/F₀ Interaction X Frequency (Rural Speaker 4)



Aspiration/F₀ Interaction X Frequency (Urban Speaker 6)



Aspiration/F₀ Interaction X Tone X Frequency: Other Speakers

Spkr 1 U	Spkr 2 U	Spkr 3 R	Spkr 5 U	Spkr 7 R
non-frequent words minimal interaction			Frequent words: strong interaction Non-frequent words: medium interaction	

IV. Summary of Findings

Spkr	Frequency Effect?	Frequency & sub-phonemic effect?
3	NF: 4 tones	medium effect
4		weak effect
7		medium effect
1		weak effect
2	NF: 3 tones	strong effect
5		
6	NF: 3-4 tones	

V. Concluding Comments & Future Considerations

- The complex tone system of Manange may be deconstructed into contrastive and sub-contrastive properties, which assist in explaining tone change (production) for urban speakers
- But structural factors alone are not enough: usage-based factors (system-internal & external) reveal the exact nature of the change & also reveal the remnants of the conservative system

Thank You