The Curious Absence of Aspiration in Indian English: The Role of Phonetics in Adaptation

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Introduction

- Phonological behavior is known to take precedence over phonetic cues in cases of loanword adaptation
- For example - illusory vowels
- [ebzo] → [ebɯzo]
- The opposite case rarely observed since phonetic cues typically align with phonological behavior

Adaptation in Indo-Aryan Loans and Indian English

- In Indo-Aryan (IA) loanwords and Indian English (IE), English aspirated stops adapted as unaspirated, even though aspirated stops in IA languages are contrastive
- For example, $[p^hiz] \rightarrow [piz]$

English	$/p^h/$	$/t^h/$	$/k^h/$
IA	$/p/$ $/p^h/$	$/t/$ $/t^h/$	$/k/$ $/k^h/$
IE	$[p]$	$[t]$, $[t]$	$[k]$

Aspiration in English and IA

- English has an aspiration, rather than voicing contrast, and the aspirated series is unmarked
- IA languages have a more complex contrast with both features, [spread glottis] and [voice] active

	Voiceless	Voiced
Unaspirated	[kəɖi] ("bolt")	[gəɖi] ("worker")
Aspirated	[kʰəɖi] ("gravel")	[gʰəɖi] ("fold")

Aspiration in English and IA

- Even if we do not assume that aspirated stops in English are unmarked, the aspirated phoneme occurs in the most prominent contexts in English
- IA languages and IE consistently adapt these stops as unaspirated

Cues to two-way laryngeal contrast in English

- VOT (lead-lag) < VOT (short-lag) < VOT (long-lag)
- Onset f0 secondary cue
- Aspiration raises onset f0

Cues to four-way laryngeal contrast in IA

- Overlap in VOT values
- Onset f0 primary cue
- Aspiration lowers onset f0
- Onset f0 order: breathy > lead-lag > long-lag > short-lag

Hypothesis

- Perceptual adaptation is based on phonetic, rather than phonological cues only
- English and IA languages like Hindi and Marathi show phonetic differences
    - IA VOT (long-lag stops) > English
    - Aspiration lowers onset f0 in IA but raises it in English
- These phonetic differences could explain the IA and IE adaptation pattern

Participants

- Speech samples from The Speech Accent Archive of 102 native speakers of one of 10 IA languages and IE
- Control group: 6 speakers of British English (BE)

Language	Number of speakers
Bengali	14
Gujarati	11
Hindi	28
Konkani	3
Marathi	8
Nepali	14
Oriya	2
Pahari	2
Sinhala	7
Urdu	13
Total	102

Materials

Speech samples of speakers reading a passage in English from The
Speech Accent Archive (Weinberger and Kunath, 2011) reading the
same passage in English:

*"Please call Stella. Ask her to bring these things with her from the
store: Six **spoons** of fresh snow **peas**, five thick slabs of blue
cheese, and maybe a snack for her brother Bob. We also need a
small plastic snake and a big toy frog for the **kids**. She can **scoop**
these things into three red bags, and we will go meet her
Wednesday at the train station."*

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Measurements

VOT and onset f0 of target words

- [pʰiz]
- [spunz]
- [kʰɪdz]
- [skup]

	peas	spoons	kids	scoop
BE speakers	6	6	6	6
IE speakers	99	101	99	96

VOT Measurement

- Interval between the beginning of the release burst and the onset of quasi-periodicity
- Normalized with respect to vowel length to account speech rate
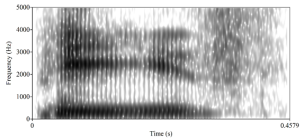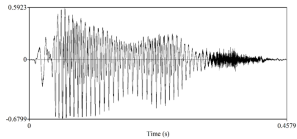
Onset F0 Measurement

- Measured at the first point immediately at the onset of voicing at which periodicity could be detected
- Clear outliers that typically result from pitch-halving and pitch-doubling errors of Praat's autocorrelation algorithm corrected manually by measuring the duration of a single glottal pulse as the duration of one cycle of the periodic waveform and taking its inverse
- Normalized via conversion to semitones using the semitone conversion equation provided in the Praat internal users' manual

Results - BE VOT

- BE short-lag and long-lag stops have significantly different VOT
- Laryngeal categories are differentiated in terms of VOT based on context

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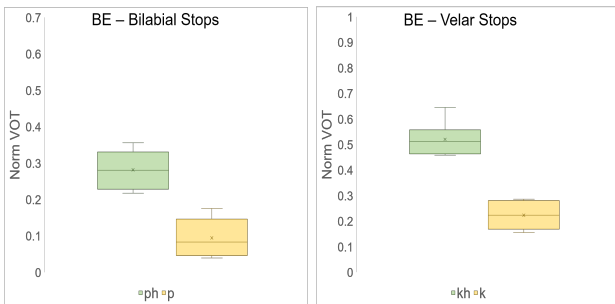
Results - IE VOT

- IE short-lag and (underlyingly, in English) log-lag stops do not have significantly different VOT
- Laryngeal categories are **not** differentiated in terms of VOT based on context
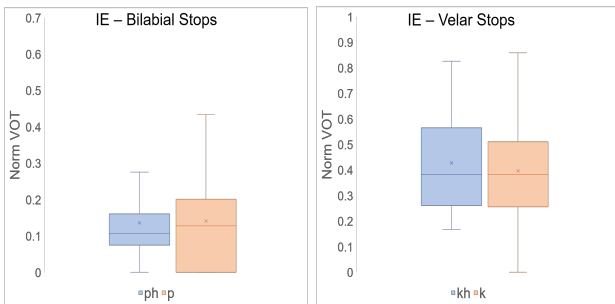
Hindi VOT

VOT (in ms) of Hindi stops reported by previous studies-

	[p^h]	[p]	[k^h]	[k]
Lisker and Abramson, 1964 (N = 1)	63	12	84	16
Benguerel and Bhatia, 1980 (N = 2)	119	15	142	52
Shimizu, 1989 (N = 3)	75	12	119	34
Weighted Average	**88**	**13**	**121**	**37**

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Results - VOT Comparison

VOT (IE "long-lag" stops) ≈ VOT (Hindi short-lag stops) < VOT (BE long-lag stops) < VOT (Hindi long-lag stops)
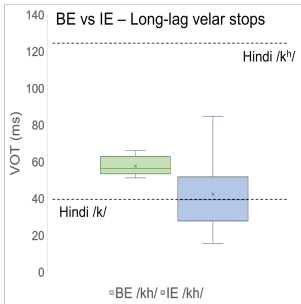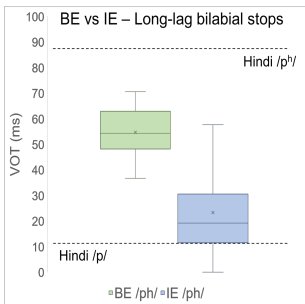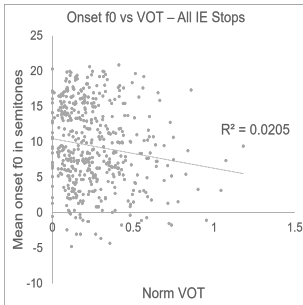
Results - Onset F0

- Significant negative correlation between aspiration and onset f0
- Longer aspirated release correlates with lower onset f0
- IE aspiration-f0 $\sim$ IA aspiration-f0
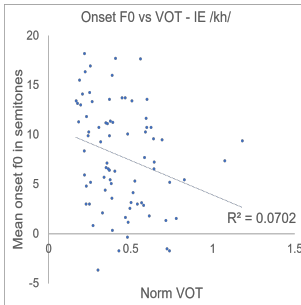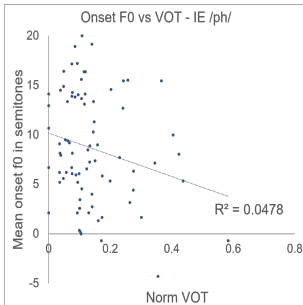
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- IE aspiration-f0 $\sim$ IA aspiration-f0

Conclusion

- IA short-lag stops = short VOT + slight lowering of onset f0
- IA long-lag stops = long VOT + considerable lowering of onset f0
- English long-lag stops = long-ish VOT + raising of onset f0
- IA short-lag stops acoustically less dissimilar to English long-lag stops
- Due to these acoustic differences, English long-lag stops perceived as being categorically unaspirated by IA native speakers

Conclusion

- Adaptation patterns may be rooted in perception
- IA speakers must ignore the fact that the stops are phonologically aspirated, only engaging in low-level perceptual adaptation
- Grammatical processing does not necessarily do the same, but it is likely that some parts of loan adaptation do not involve grammar at all
- Phonetics can play a role in loanword adaptation and cases where phonetics and phonology match may also have an entirely phonetic explanation

Thank you!

(Please email me for references at jahnavi.narkar@wayne.edu)