Adaptation of English Stops in Indo-Aryan: The Problem of De-aspiration

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Background

- Phonological behavior is known to take precedence over phonetic cues in cases of loanword adaptation (for example, illusory vowels (Dupoux et al, 1999)).
- The opposite case, where phonology is unable to explain adaptation patterns, but sheer phonetic cues are, is rarely observed since phonetic cues typically align with phonological behavior.

Indo-Aryan Adaptations

- Indo-Aryan (IA) languages are reported to have a loanword adaptation pattern whereby English aspirated stops are adapted as unaspirated (Paradis & LaCharite´, 1997), even though aspirated stops in IA languages are contrastive (Lisker & Abramson, 1964).
- This also applies to Indian English (IE) (Sailaja, 2009).
- For example, [pʰiz] → [piz]

IA	/p/ /pʰ/	/ʈ/ /ʈʰ/	/k/ /kʰ/
English	/p/	/t/	/k/

A Purely Phonetic Explanation?

- This can be explained if we assume that borrowing involves perceptual adaptation based on phonetic, rather than phonological cues only (Peperkamp & Dupoux, 2003).
- English and IA languages like Hindi and Marathi show phonetic differences
  - IA VOT for aspirated stops is higher than English (Lisker & Abramson, 1964)
  - Aspiration lowers F0 in IA but raises F0 in English (Dmitrieva & Dutta, 2018).
- These phonetic differences could explain the loanword adaptation pattern seen in IA languages and in Indian English.

Methods

- Participants: Speech samples from The Speech Accent Archive (http://accent.gmu.edu) of 114 native speakers of one of 11 IA languages that have a four-way voicing
- Control group: 6 speakers of British English (BrE)
- Materials: Each speaker read the same passage in English

Quantifying adaptation patterns

- Expected occurrences of stops and their corresponding environments identified.
- A native speaker of Marathi made auditory judgments
- These compared to segments expected to be produced by native speakers of British English.
- 'Ratio of de-aspiration' = number of unaspirated voiceless stops in the IE output / number of aspirated stops in BrE
- Another widely reported adaptation pattern found in IA languages – adaptation of alveolar stops as retroflex (Arsenault, 2006) quantified
- 'Ratio of retroflexion' = number of retroflex stops in the IE output / number of alveolar stops in BrE

Investigating the role of phonetics

- VOT of voiceless stops from the speech samples in the word *peas, toy* and *kids* measured in Praat (Boersma, 2001)This was compared to the average VOT measured for the same words from the speech samples of the BrE speakers
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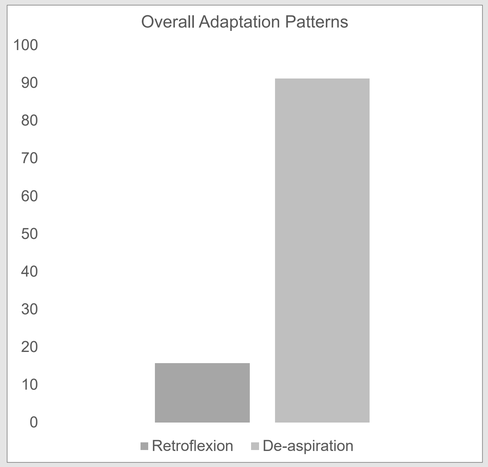
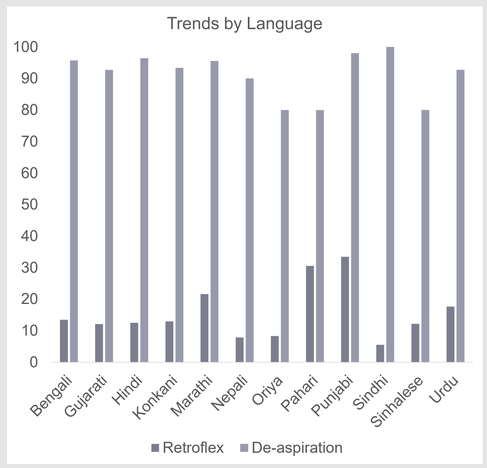
- The VOT of the same sounds from the British samples was compared to the average VOT reported for Hindi in previous studies - Lisker and Abramson (1964), Benguerel and Bhatia (1980) and Shimizu (1989)

Results: Adapatation Patterns

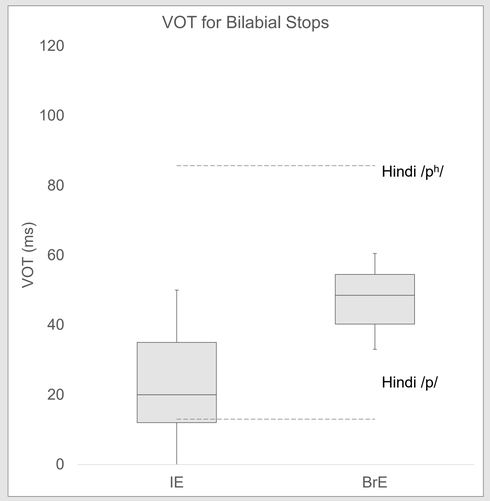
- The quantitative analysis showed that de-aspiration occurs in over 90% of the tokens from the IA speakers.
- This is especially stark compared to the ratio of retroflexion which is only about 15%
- De-aspiration is robust across IA languages with no significant differences between languages that have more than 10 speakers.

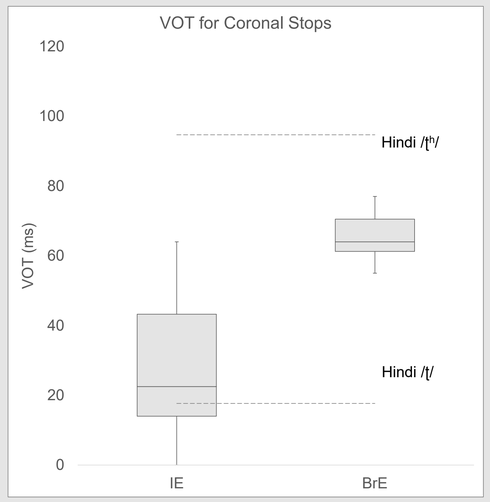


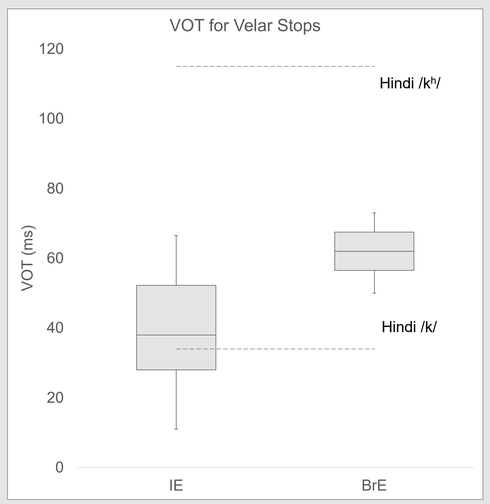


- The average VOT of aspirated stops produced by IA speakers was found to be significantly lower than that for the British speakers.
- The VOT measured for the British speakers was significantly lower than the VOT of aspirated stops reported for Hindi.

Results: VOT







Conclusion

- Since VOT of English word-initial voiceless stops is lower than the VOT of [spread glottis] stops in IA languages, English aspirated stops are categorically perceived as being unaspirated by IA native speakers and are therefore adapted as such.
- This study shows that adaptation patterns may be rooted in perception and accented speech provides a way of looking into "live" loan adaptations with non-trivial results.
- When adapting English loans, IA speakers must ignore the fact that the stops are phonologically aspirated, only engaging in low-level perceptual adaptation.
- This does not necessarily mean that grammatical processing needs to do the same, but it is likely that some parts of loan adaptation do not involve grammar at all.
- This study shows that phonetics can play a role in loanword adaptation and suggests that many cases where phonetics and phonology match in this process may also have an entirely phonetic explanation.

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The Speech Accent Archive (http://accent.gmu.edu)