# Laryngeal realism and voiced aspirates: The case of Nepali

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Theories of laryngeal realism (Honeybone 2005, Iverson and Salmons 2011, Beckman et al. 2011, 2013) argue for a tight correspondence between a segment's phonetic cues and the phonological features that represent that segment. Consequently, the contrast between [p] and [b] in French, which is expressed phonetically by vocal fold vibration during the stop closure is represented by a [voice] feature whereas the [p]/[b] contrast in English, which is expressed phonetically by long and short aspiration, is represented by a [spread glottis] feature. A language like Thai with a three-way contrast employs both these features. However, none of the arguments for or against laryngeal realism deal with languages with a class of stops that is specified for two laryngeal features on a single segment. Nepali 's four-way contrast that requires two features on the same segment raises questions about whether the cue-to-feature correspondences can be upheld in a language with segments specified for both [voice] and [spread].

**Nepali:** Nepali has a four-way contrast between voiceless, voiced, voiceless aspirated, and voiced aspirated stop classes. Iverson and Salmons (1995) propose that this type of contrast is represented by the feature representations in table (1) below, but do not expand upon it as a potential challenge for laryngeal realism. I argue that Nepali does - with some caveats - support a realist view. I also test the extent to which two diagnostics proposed by Beckman et al. (2011, 2013) for determining feature specification support voiced aspirates as being specified for both [voice] and [spread].

| (1) | voiceless (T): | voiceless aspirated (Th): | voiced (D): | voiced aspirated (Dh): |
|---|---|---|---|---|
| | [ ] | [spread] | [voice] | [spread], [voice] |

**Methods:** Data was collected from native Nepali speakers in Sikkim, India and consists of a set of target words with the relevant stops in initial, medial, and final position produced in a carrier phrase. Acoustic annotation and analysis was conducted in Praat (Boersma & Weenik 2016) for several phonetic cues, following the conventions for Indo-Aryan languages (Mikuteit and Reetz 2007, a.o.) including prevoicing duration (vocal fold vibration during the stop closure), and two measures for post-release duration: ACT ("After Closure Time" - period between the release burst and the onset of voicing of the following vowel) and SA ("Superimposed Aspiration" - period following the release burst characterized by glottalic pulsing *and* frication noise).

**Results:** This study considers two diagnostics for feature representation based on phonetic cues. The first is presence of a cue and its capacity to distinguish one class from another in word-initial position. I find that prevoicing duration significantly distinguishes the voiced classes from the voiceless classes, supporting the representation of D and Dh classes with a [voice] feature as in (1). Post-release duration proved to be significantly longer on the aspirated classes than the unaspirated classes, though the primary cue is ACT for Th and SA for Dh. This is problematic for a strict reading of laryngeal realism since the [spread] feature corresponds to different cues on different classes, though this can be potentially reconciled with Ridouane et al.'s (2011) expanded definition of [spread] that combines sounds like Th and Dh due to their acoustic, if not articulatory, similarity.

The second set of diagnostics comes from Beckman et al.'s (2011, 2013) proposal that cues corresponding to specified features (i.e. aspiration on Th and Dh classes) are controlled by speakers, but that cues corresponding to unspecified features (i.e. aspiration on T and D classes) are automatic. They provide two contexts in which to diagnose this: the effect of speech rate on voice onset time durations word-initially, and passive voicing during stop closure word-medially. For speech rate, Beckman et al. (2011) finds that cue durations corresponding to specified features increase as speech rate slows but that cues corresponding to unspecified features do not. I find that in Nepali, speech rate effects are as predicted by Beckman et al. for pre-voicing duration as well as ACT and SA durations, including that the Dh stops show speech rate effects for both prevoicing and SA durations. For passive voicing, Beckman et al. (2013) finds that stops specified for [voice] are voiced throughout the closure in intervocalic position, but stops specified for [spread] block passive voicing from the surrounding vowels. Nepali's stops that are specified for both [spread] and [voice] thus pose conflicting predictions. I find that voiced aspirated segments behave like a segment specified for [voice], not [spread], suggesting that [voice] feature may be stronger than the [spread] feature. Nepali thus poses a potential challenge for laryngeal realism, shows that the theory is able to accommodate it, and raises questions for further study, particularly about the status of [spread] on voiced aspirates.

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