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Paper Title: Acoustic Features of Obstruent Voicing Contrasts in Burmese

Sub-field: Phonology

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This phonological study is the first (to my knowledge) to offer an in-depth analysis of acoustic characteristics that differentiate Burmese obstruent voicing categories. The results of the study contribute two new findings to the field:

- Voice onset time (or VOT; the length of time between the release of the stop and the beginning of voicing) is a relatively minor aspect of the Burmese voiceless vs. voiced distinction.
- In fricated segments, frication intensity is an important aspect.

Cross-linguistically, three-way obstruent voicing distinctions are often signaled not only by variations in VOT but also by variations in the length of the following vowel. For Burmese, however, the acoustic features of the three-way contrasts (typically transcribed as voiceless aspirated, voiceless unaspirated, and voiced) do not appear to be simply a matter of these two signals. At least two additional factors are also implicated – breathiness (a well-known feature for Burmese) and frication intensity. Furthermore, in some cases VOT is at best only marginally implicated.

The Burmese obstruents showing three-way voicing contrasts include the following phonological segments:

Bilabial stops:	p <sup>h</sup> , p, b
Alveolar stops:	t <sup>h</sup> , t, d
Palatal stops (affricates):	c <sup>h</sup> , c, ʃ
Velar stops:	k <sup>h</sup> , k, g
Alveolar fricatives:	s <sup>h</sup> , s, z

Based on my spectrographic and waveform analysis of pilot data collected from one native speaker, it appears that there are at least four acoustic phenomena involved in Burmese voicing contrasts:

(1) Voice onset time: For the non-affricated stops, average VOT is longest for the aspirated and shortest for the voiced segments. However, the fricated obstruents each follow different average VOT patterns. Furthermore, VOT for some voiced vs. voiceless pairs may not be consistently distinguishable.

(2) Duration of the following vowel: For obstruents at most places of articulation, average length of the following vowel is shortest for the unaspirated and longest for the voiced segments.

(3) Breathiness (i.e., reduced levels of acoustic intensity across all frequencies throughout the syllable's vowel): For obstruents at all places of articulation, the voiced segments are signaled by breathiness throughout the syllable.

(4) Acoustic intensity of high-frequency energy in fricated segments: For the affricates and fricatives, the level of acoustic intensity in the frication itself appears to be important in voicing contrasts.

Research is currently underway to incorporate more extensive data from additional native speakers into the final analysis.