Measures of Phonemic Voice Quality in the Burmese Tonal Contrast

This paper describes an acoustic and glottographic experiment that examines the phonetic nature of the phonological tone contrast used in the Burmese language. Descriptions of the four Burmese tones in the literature are often conflicting (see Watkins 2005), but most researchers agree that they differ phonetically in voice quality and pitch, as well as in duration, intensity, vowel quality, and syllable structure (Bradley 1982, Thein Tun 1982, Javkin & Maddieson 1983, Watkins 2001). However, some of these properties, in particular voice quality, have proven difficult to detect via indirect acoustic analysis according to the studies described in Thein Tun (1982), Ladefoged, Maddieson, & Jackson (1988), Watkins (1997), and Gruber & Feizollahi (2006). Instead, pitch contour and duration were found to be far more robust indicators of the tonal categories. It is significant though that the above studies have examined only tone-bearing syllables elicited in isolation or within a frame of two surrounding modal low tones. The present study provides glottographic data in addition to new acoustic data recorded in a number of sentential contexts. These data are used to test the strength of the association between voice quality and the four phonological tones. Results indicate an inconsistent correspondence with voice quality, save for those cases where creaky or tense voice quality is reported, for which the laryngealization is found to be context-dependent.

Ten native Burmese speakers were recorded while wearing EGG electrodes measuring variation in vocal fold contact rates during speech. The stimuli consisted of twenty-two tokens – representing three vowels in each tone, three nasal vowels in three of the tones, and an additional unstressed, minor syllable token. The subjects read the tokens aloud in isolation and embedded in seven frame sentences, which examined the following contexts: (i) between low-toned syllables, (ii) between low and high tones, (iii) between high and low tones, (iv, v) between each a low and high tone and an unstressed, toneless syllable, (vi, vii) phrase-finally following each a low and high tone syllable.

The results of the study reveal a number of distinctions not always interpretable from the acoustic pressure signal, most significantly tighter glottal constriction in creaky-toned syllables. This constriction however was frequently neutralized in connected speech, while other phonetic manifestations of lexical tone (e.g. pitch, intensity) were critically not. This finding suggests that the heightened pitch of creaky tones occurs independent of any laryngeal constriction, in contrast to phonological models (Green 2005, Lee 2007) which treat the high F0 as a phonetic consequence of phonological voice quality distinctions. For the other lexical tones, voice quality was not reliably indicated by rates of vocal fold contact. Thus, the elevated pitch values of the high tone are likewise independent of voice quality as there is no reliable association of the tone with breathiness. In addition to providing a clearer picture of the laryngeal settings used in the production of the tones, the study contributes insight into the shortcomings attested for acoustic analysis of voice quality in Burmese, where the task is complicated by distinct intensity levels, pitch targets, and vowel qualities found on each tone.
References


