Interesting Acoustic and Laryngeal Correlates in Thai Poetic Reading[1]

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A videolaryngoscope was used to record the laryngeal activities of a well-known female poetry reader while reading portions of sample poetry. The recording was made on three different reading styles; regular, tuneful and affective tuneful reading. Salient acoustic features were investigated and compared on metrically prominent syllables of all the three reading styles on a separate cassette recording.

Interesting acoustic features observed in conjunction with varying laryngeal features are presented and discussed.

1. Introduction

Generally, Thai verse is recited either with or without a tune. As for regular reading, no tune is given, the rhythm is essential. Tuneful reading (or verse chanting) can be done with or without emotive emphasis, the former being affective tuneful reading (or affective verse chanting) and the latter the regular tuneful reading (or verse chanting in general). For each type of poetry; *khlong* (โคลง), *chan* (ฉันท์), *kap* (กาพย์), *klon* (กลอน), and *rai* (ร่าย), a unique tune is designated, and there are slight variations on the sub-types of each type.

In affective chanting, 'feeling is infused' in the verse (Nandha Khunpakdee, 1994). For example, where the text conveys anger, the reader is to make this mood vivid by chanting the verse faster, louder and with a little harsh voice. Such is not emphasized in verse chanting in general.

Verse chanting is distinguished from Thai singing in that the content, the verse is crucial in chanting, whereas in singing, the tune is more important. Singing is possible without words, but verse chanting cannot be done without the verse itself.

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A common feature employed in both verse chanting and Thai singing is traditionally described as 'using the throat' (ใช้ลูกคอ) (Khonphon Chanhom, 1996; Nandha Khunpakdee, 1994), which primarily involves laryngeal control.

In order to understand clearly the chanting of Thai verse from a phonetic and phonological perspective, the physiology involved and the acoustics of verse chanting are to be studied. This paper reports an initial investigation of the articulatory and acoustic phonetics of the reading of Thai poetry.

2. Procedure

A video laryngoscope was used at a local hospital to record the laryngeal activites of a well-known female poetry reader while reading excerpts of different types of poetry in three different styles : regular, tuneful and affective tuneful reading. In addition, a separate tape-recording was made on a TEAC-V510 tape recorder in a soundproof room with the same subject reading sample poetry; one for each of the five types mentioned above, and each, in three different styles. The recording was duplicated onto a cassette tape and was digitized and analyzed acoustically using a Kay Elemetrics CSL 4300 program.

3. Results

3.1 Acoustic Features

The acoustic features observed for the three different reading styles are summarized as follows:

3.1.1 Pitch. The fundamental frequency (F0) of the reader varied according to the 'mood' called for, especially demonstrated in the affective tuneful reading. Basically, the average F0 of the reader was around 200 Hertz, which was found as the mean F0 in regular reading. In comparison of the three reading styles, for example, of a stanza of the *klon 'samkrung'* (สามกรุง), the average F0 of the three reading styles was 200, 207 and 210 Hertz for regular, tuneful and affective tuneful reading, respectively. Another example from a stanza of the *klong 'sayam manusti'* (สยามมานุสติ) which was to be read with a courageous mood, the mean F0 in the regular reading was 194 Hertz whereas the average F0 for the two chanting styles was 164 Hertz.

3.1.2 Intensity. Generally, the intensity of both chanting styles was found to be higher than that of the regular reading style, more so in affective chanting than in regular chanting. For example, in a stanza in the *kap 'chom khriung khaw wan'* (กาพย์ชมเครื่องคาวหวาน), the mean intensity was 51 dB in regular reading whereas in chanting styles the average intensity was 60 dB. Interestingly, the intensity contours of the stressed syllables the metrically strong syllables in the poetic lines (Apiluck Tumtavitikul, 1997), were observed to have a different shape in chanting. In regular reading, as in regular speech, the intensity contours were all in normal shape, with peak energy corresponding to syllable nucleus starting from the vowel onset and gradually decreasing energy at syllable offset (Figure 1). However, the contours of stressed syllables in tuneful reading styles were in a crescendo from vowel onset to offset with energy peak near the end of the vowel followed by a sudden cutoff or a sharp fall at the beginning of syllable coda (Figures 2 & 3).

3.1.3 Formant. Only the first formant (F1) was observed for the vowel [a] on stressed syllables in a stanza from the *khlong 'sayam manusti'* (สยามมานุสติ) . It was found that the F1s in both chanting styles were lower than that of the regular reading . For example, the average F1 of the vowel [a] in regular reading was 1046 Hertz, whereas in tuneful and affective tuneful reading the average F1 was around 954 and 965 Hertz, respectively.

3.2 Laryngeal Features

The following laryngeal features were observed in the three different reading styles:

3.2.1 Glottis. The glottal state seemed to be normal in the regular reading style and similar to its state in the rest position in normal breathing, i.e., the thickness/thinness and tenseness/laxness of the vocal folds did not show any noticeable differences from one another (Figure 4).

3.2.2. Larynx. During the production of stressed syllables in chanting, the arytenoid cartilages and aryepiglottic folds tightly sphinctered (Figure 5).

3.2.3 Epiglottis. During both tuneful reading styles, the epiglottis was lowered, especially during the production of the stressed syllables, such that most of the larynx was covered and could not be observed. Hence, the true state of the glottis and the vocal cords could not be seen on stressed syllables in chanting (Figure 6).

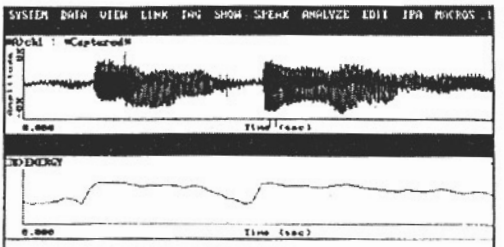

Figure 1: Waveform and intensity contour of 'suang sawan' (สวรรค์)
in regular reading

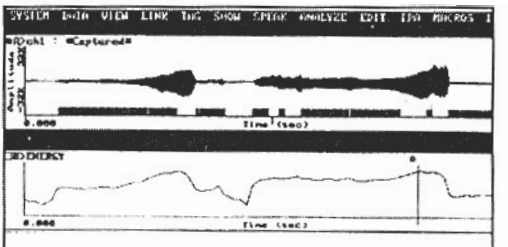

Figure 2: Waveform and intensity contour of 'suang sawan' (สวรรค์)
in tuneful reading (or chanting)

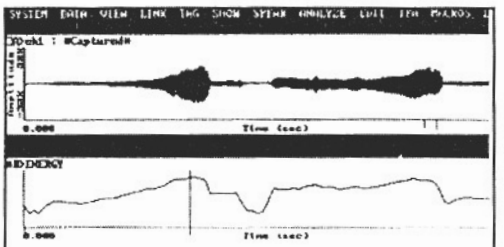

Figure 3: Waveform and intensity contour of 'suang sawan' (สวรรค์)
in affective tuneful reading (or affective chanting)

Figure 4: Glottal state in regular reading

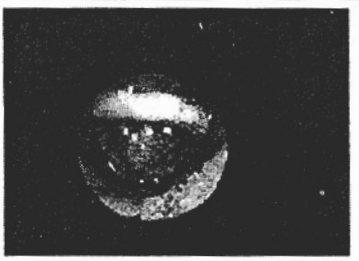

Figure 5: Arytenoid cartilages and aryepiglottic folds tightly sphincterred

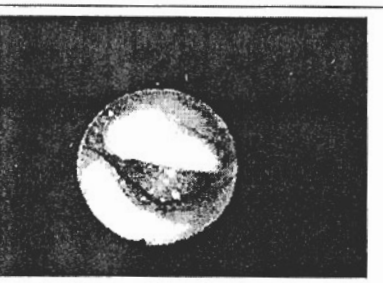

Figure 6: Lowered epiglottis on a stressed syllable in chanting

4. Discussion

From both the acoustic and physiology of the larynx as described in 3 above, the following correlation can be derived, the crescendo of the intensity contour on stressed syllables and the lowering of the epiglottis in tuneful reading styles. Although there is no direct evidence as to what was responsible for the crescendo of the intensity contour in this initial study , at least two possible causes can be postulated : the sub-glottal pressure and/or the lowering of the epiglottis. It is well studied that increasing sub-glottal pressure raises intensity as well as fundamental frequency. Although sub-glottal pressure may be the cause of the higher pitch and the crescendo of the intensity contour, it cannot be responsible for the lower formant frequencies observed (cf. 3.1.3). Also, we have yet to explain the role and control of the epiglottis on stressed syllables if sub-glottal pressure is the only cause for the crescendo of intensity. Another possible explanation is that the lowered epiglottis modulates the airflow resulting in pressure being built up underneath which causes increase of the intensity. It has been proposed by Esling (1998) that the lowering of the epiglottis as in the production of many pharyngeal consonants is in fact an aryepiglottic sphincter mechanism which inherently raises the larynx. The compression of the aryepiglottic folds and the tightened aryntenoid carilages seen in this study (Figure 5) seem to be quite similar to those reported in Esling for voiced pharyngeal, or 'epiglottal', consonants. Esling suggested that 'raised larynx is the default setting for all of these (pharyngeal) consonants, but they may be produced with lowered larynx'. That lowered larynx increases the length of the pharyngeal resonant chamber resulting in an overrall lower formant frequencies is quantifiable. An interconnection of the laryngeal and supra-laryngeal features seems clearly evident if the epiglottis is the cause of the crescendo of the intensity contour. What is seen in thai verse chanting seems to be parallel to the aryepiglottic sphincter manipulation resulting in a lowered epiglottis, perhaps as a mechanism of modulation of airflow. The example given in 3.1.3 above seems to be this same mechanism in conjuction with a separate control of lowering of the larynx. Hence, the correlation of lower F1 on stressed syllables in both chanting styles (cf. 3.1.3) and the lowering of the epiglottis (cf. 3.2.3). This lowering of the epiglottis by the aryepiglottic sphincter compression may as well correspond to the traditional Thai description of 'the use of the throat' in both verse chanting and Thai singing- - an issue which awaits further examination.

5. Summary

In this preliminary study of the correlation between the acoustic characteristics and laryngeal physiology in Thai poetic reading, the most interesting discovery is the involvement of the epiglottis on stressed syllables, especially in both tuneful reading styles. It leaves us with a challenge to uncover the real function of the epiglottis in verse chanting in Thai, its correlation to the increase of energy, mode of phonation and voice quality, and its relation with the so-called 'the voice from the throat'. These are issues for further detailed study.

Acknowledgments

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