Temporal Organisation of Syllable Production in Cantonese Chinese

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ABSTRACT

The purpose of this study is to investigate the temporal organisation of syllable production in Cantonese Chinese. Results show (i) temporal compensation does not take place between C and V in the CV syllables, however, the duration of V is affected by the initial C type; (ii) tone plays a part in determining the temporal pattern of the syllables; and (iii) the reduction of vowel duration is correlated with the temporal pattern of the syllables. The purpose of this study is to investigate the temporal organisation of syllable production in Cantonese Chinese. Results show (i) temporal compensation does not take place between C and V in the CV syllables, however, the duration of V is affected by the initial C type; (ii) tone plays a part in determining the temporal pattern of the syllables; and (iii) the reduction of vowel duration is correlated with the temporal pattern of the syllables.

INTRODUCTION

The temporal aspect of speech production has been extensively studied [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16]. The purpose of this study is to demonstrate certain regularities that have been found to be characteristics of the temporal structure of syllable production in Cantonese. By local time control, Allen [1] refers to the "specification of segment durations within syllables and possibly syllable durations within rhythmic phrases", and by global time control, he refers to "speech rate or tempo" (p. 222). The paper also shows whether temporal compensation takes place between C and V in the CV syllables, however, the duration of V is affected by the initial C type; (ii) tone plays a part in determining the temporal pattern of the syllables; and (iii) the reduction of vowel duration is correlated with the temporal pattern of the syllables. The present study investigates the temporal structures in syllables of different types associated with different tones in Cantonese. Due to page limit, the only temporal data to be discussed in this paper are those of syllables CV, CV:S, CVS, CD, and CV:N, where V = [a], [e], [i], [u], [n], D = [a], [i], and N = [n]. More specifically, the paper shows (1) whether temporal compensation takes place between C and V in the CV syllables, however, the duration of V is affected by the initial C type; (ii) tone plays a part in determining the temporal pattern of the syllables; and (iii) the reduction of vowel duration is correlated with the temporal pattern of the syllables. The purpose of this study is to demonstrate certain regularities that have been found to be characteristics of the temporal structure of syllable production in Cantonese. Results show (i) temporal compensation does not take place between C and V in the CV syllables, however, the duration of V is affected by the initial C type; (ii) tone plays a part in determining the temporal pattern of the syllables; and (iii) the reduction of vowel duration is correlated with the temporal pattern of the syllables.
The mean duration of [p\textsuperscript{\text{\textbackslash n}}] in [pa\text{\textbackslash n}] associated with a 21 tone is 93.00 ms (n = 5, s.d. = 13.06), whereas the mean duration of [p\textsuperscript{\text{\textbackslash n}}] in [pa\text{\textbackslash n}] associated with tones 55, 33, and 35 are 69.80 ms (n = 5, s.d. = 5.07), 73.21 ms (n = 5, s.d. = 9.05), and 85.20 ms (n = 5, s.d. = 5.02), respectively. The mean duration of the [ts\textsuperscript{\text{\textbackslash n}}] in [tsa\text{\textbackslash n}] associated with a 21 tone is 140.40 ms (n = 5, s.d. = 20.07), whereas the mean duration of [ts\textsuperscript{\text{\textbackslash n}}] in [tsa\text{\textbackslash n}] associated with tones 55, 33, and 24 are 113.40 ms (n = 5, s.d. = 12.22), 133.00 ms (n = 5, s.d. = 22.66), and 125.00 ms (n = 5, s.d. = 10.40), respectively. Similar results are obtained for CD syllables, where the initial consonant is a fricative, [s], and [ts], and [ts\textsuperscript{\text{\textbackslash n}}].

The syllable-initial consonant [s] in CV: syllables has the longest duration, followed by [ts\textsuperscript{\text{\textbackslash n}}], [p\textsuperscript{\text{\textbackslash n}}], and [t\textsuperscript{\text{\textbackslash n}}] in descending duration, for example, in CV: syllables which are associated with a 21 tone, the mean durations of [s] = 69.80 ms (s.d. = 12.44), 113.40 ms (s.d. = 12.22), 69.80 ms (s.d. = 5.07), 54.00 ms (s.d. = 12.69), and 8.40 ms (s.d. = 2.51), respectively.

CONCLUSION

Temporal compensation does not seem to take place between syllable-initial consonant and the post-consonantal vowel or diphthong in the Cantonese CV: and CV:S syllables. The observation is evidenced by the fact that invariant syllable duration in Cantonese is not maintained, for example, the mean durations (n = 5) of the syllable-initial consonants [p], [ts], [ts\textsuperscript{\text{\textbackslash n}}], and [s] in CV: syllables associated with a 33 tone are 8.40 ms (s.d. = 2.30), 52.80 ms (s.d. = 10.62), 133.00 ms (s.d. = 22.66), and 150.60 ms (s.d. = 14.05), respectively, whereas the mean durations (n = 5) of the following vowel [a] in the syllables are 338.20 ms (s.d. = 14.91), 350.40 ms (s.d. = 18.48), 348.40 ms (9.61), and 353.80 ms (s.d. = 23.78).

The reduction of the vowel or diphthong duration in the syllables where the initial consonant is aspirated is not viewed as an effect of the speaker to maintain invariant syllable duration, rather a result of reduced subglottal pressure caused by the production of aspiration of the syllable-initial consonant.

The further reduction of the duration of the vowel or diphthong in CV: and CD syllables which are associated with a 21 tone and where C is an aspirated stop or fricative is assumed to be contributed by both the reduced subglottal pressure and the 21 tone. The duration of the vowel or diphthong in CV: syllables which are associated with a 21 tone is shorter than the duration associated with a non-21 tone even if the syllable-initial is zero or an unaspirated stop or fricative. This shows that tone does play a part in determining the temporal structure of the syllables. That the vowel or diphthong duration in the CV: and CD syllables to have a slight temporal compensation does not take place among the syllable-initial consonants [p], [ts], and [ts\textsuperscript{\text{\textbackslash n}}].

REFERENCES

[15] [Phonetica, 1981]