Phonetic and Respiratory Prosodic Analysis of Cantonese Song Ci Chanting

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Introduction

Respiration serves dual roles as a physiological necessity and a speech production mechanism. While contemporary phonetic research prioritizes vocalization, resonance, and articulatory movements, respiratory prosody remains underexplored.

Despite these advances, respiratory prosody research remains Mandarin-centric, neglecting dialectal variations. This study addresses this gap by analyzing Cantonese Song Ci chanting, specifically examining the coordination between acoustic and respiratory prosodic features to expand our understanding of Chinese dialectal prosody.

Methodology

➢Despite these advances, respiratory prosody research remains Mandarin-centric, neglecting dialectal variations. This study addresses this gap by analyzing Cantonese Song Ci chanting, specifically examining the coordination between acoustic and respiratory prosodic features to expand our understanding of Chinese dialectal prosody.

➢The study utilized a microphone, mixer, electroglottograph (EGG), respiratory belts (thoracic and abdominal), and a 16-channel acquisition system to record speech, vocal fold vibrations, and respiratory signals.

➢Following the collection of speech, EGG, chest breathing, and abdominal breathing signals through field investigation, the analysis was conducted using a speech breathing prosody analysis platform program developed in Matlab, as illustrated in Figure 1.

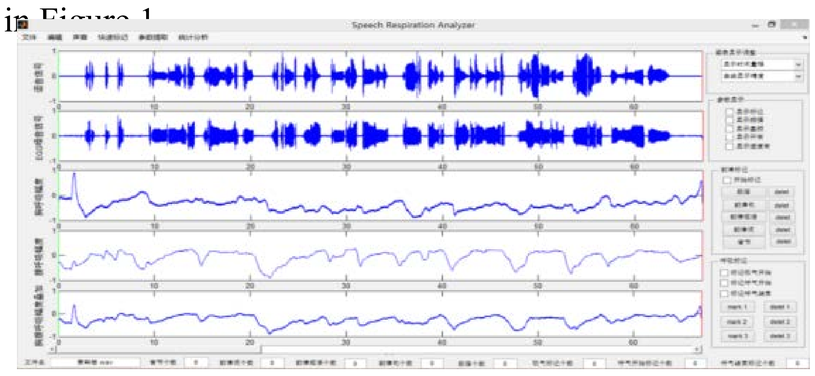

Figure 1. Respiratory Prosody Analysis Platform

➢Terminology

Respiratory Reset Duration: The time interval from the onset of inhalation to the onset of exhalation.

Respiratory Reset Amplitude: The magnitude of change in the respiratory signal during a reset, classified into three levels: primary (L1), secondary (L2), and tertiary (L3).

Respiratory Jitter: Small, non-resetting fluctuations in the respiratory signal.

Speech Pause Duration: The total duration of syllable elongation and pauses following each syllable.

This study delineates the hierarchical structure of speech and breathing prosody based on pause duration and breathing reset levels. Specifically:

Speech Prosodic Sentence: Defined as the speech unit characterized by the longest pause at its boundary.

Speech Prosodic Phrase: Identified as the speech unit with a substantial pause at its boundary.

For breathing prosody:

Breathing Prosodic Sentence: Designated as the unit with a primary-level breathing reset at its boundary.

Breathing Prosodic Phrase: Classified as the unit with a secondary-level breathing reset at its boundary.

Discussion and Conclusion

Following an analysis of Cantonese lyric recitations across varying sentence lengths, we identify systematic correspondences between respiratory and phonetic prosody:

(1) Cantonese recitation exhibits a two-tiered respiratory hierarchy through chest-abdominal breathing patterns. First-level breathing resets (L1) predominantly initiate sentence beginnings (excluding tri-syllabic sentences), while second-level resets (L2) occur mid-utterance. Phonetically, vocal pauses manifest as maximum pauses (typically sentence-final, except in three-word units) and large pauses (mid-sentence), demonstrating direct alignment: L1 respiratory resets correspond to maximum voice pauses, while L2 resets synchronize with large pauses.

(2) Tri-syllabic sentences generally lack autonomous prosodic status in either domain. Contextual exceptions permit independent three-syllable respiratory phrasing despite their phonetic dependence on larger units.

(3) Quadrisyllabic and pentasyllabic sentences function as complete prosodic units, characterized by initial L1 respiratory initiation and terminal maximum phonetic pauses. Internal prosodic phrase boundaries remain flexible without fixed positional constraints.

(4) Extended six-to-seven-syllable sentences maintain L1-initiated respiratory cycles with terminal maximum pauses. Crucially, the fourth syllable position serves as a nexus where major voice pauses align with L2 respiratory resets.

(5) A structural isomorphism emerges between phonetic prosodic units (sentences/phrases) and their respiratory counterparts, confirming intrinsic coordination between acoustic discontinuities and physiological breathing patterns in Cantonese recitation.

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