

An articulatory study of prenuclear glides in Southwestern Mandarin

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Abstract

This study investigates the articulatory characteristics of prenuclear glides in Southwestern Mandarin (SWM) using electromagnetic articulography (EMA). Analyzing gestural timing between onset consonants and glides in six speakers in their twenties, we measured onset plateau (C1) duration and Consonant-Glide (C-G) lag, fitting least-squares regression lines to the data. Results for /p^hien/, /t^hien/, and /t^hʷan/ show flat regression slopes, indicating in-phase coordination characteristic of complex segments. The /k^han/ pattern was less definitive but did not exhibit typical anti-phase coordination. These findings suggest that SWM prenuclear glides should be analyzed as secondary articulations of the onset consonant, forming complex segments rather than segmental sequences.

Keywords: glides, Southwestern Mandarin, EMA, articulatory timing.

Introduction

The phonological status of prenuclear glides (*jìèyīn*, or “medials”) remains a central question in Chinese phonology. Traditional accounts have mainly relied on phonotactic or corpus-internal evidence, whereas recent studies emphasize gestural timing as a more revealing diagnostic. Shaw et al. (2021), for example, argue that complex segments exhibit in-phase gestural coordination, with onset and glide gestures co-articulated synchronously, as in Russian palatalized stops /pj-/. By contrast, segment sequences display anti-phase coordination, where the consonant and glide are executed sequentially, as in American English /pj-/. This distinction parallels the long-standing debate over the status of prenuclear glides in Mandarin Chinese. Chao (1970), among others, treats the *jìèyīn* as part of the rhyme, whereas Bao (1990) analyzes it as belonging to the onset cluster. More recent proposals by Duanmu (2007) and Lin (2007) view prenuclear glides as secondary articulations, comparable to complex segments. The present study revisits this issue by examining the timing relationships of prenuclear glides in Southwestern Mandarin using electromagnetic articulography (EMA), a technique that provides fine-grained measurements of articulatory coordination.

The study focuses on Southwestern Mandarin (SWM), an understudied dialect that shares a similar prenuclear glide inventory with Beijing Mandarin (i.e., /j/, /w/ and /ɥ/). By examining the temporal coordination between onset and glide gestures, we determine whether these glides function as complex segments or segmental sequences.

Method

This study examined prenuclear glides in SWM, focusing on the Chengdu–Chongqing dialect group. Six native speakers in their twenties participated in the EMA experiment. All participants were born and raised in Hubei and reported no history of speech or hearing disorders. Articulatory data were recorded using the NDI Wave system, which tracks lip and tongue movements in real time at 200 Hz. Target stimuli consisted of CGVN syllables: /pjen/, /tjen/, /twan/, and /kwan/. Each target was embedded in the carrier phrase “__ *pa* __ *pa*” (‘__ give __ [sentence-final particle]’) and produced in randomized order at a normal speaking rate.

For each token, six repetitions were recorded, and the second occurrence of the target stimulus was analyzed. The corresponding gestures for each target item are as follows: /pjen/ (C: LA vs. G: TBz), /tjen/ (C: TTz vs. G: TBz), /twan/ (C: TTz vs. G: LA), and /kwan/ (C: TDz vs. G: LA). Abbreviations denote: C = onset consonant, G = glide, LA = lip aperture, TT = tongue tip, TB = tongue body, TD = tongue dorsum, *x* = front-back dimension, *z* = up-down dimension (Table 1). EMA data were analyzed with the help of MView (Tiede, 2005).

Table 1. The corresponding gestures for onsets and glides.

Target syllables	Onset Consonants	Glides
/pjen/	LA	TBz
/tjen/	TTz	TBz
/twan/	TTz	LA
/kwan/	TDz	LA

Results

To assess the coordination between consonant and glide gestures, we measured the onset plateau duration (C1) and the consonant–glide (C-G) lag, defined as the temporal offset between the glide and consonant gestures (Shaw et al. 2021). Both measures were normalized using the reference token *pa* from the second occurrence of each trial. For each consonant–glide (CG) combination, the data were plotted as scatterplots, and least-squares regression lines were fitted to examine the relationship between C1 duration (x-axis) and C-G lag (y-axis).