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IS [ɤ] IN MANDARIN A TRANSITIONAL VOWEL? —EVIDENCE FROM TONGUE MOVEMENT BY ULTRASOUND IMAGING

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ABSTRACT

This study investigates tongue configuration and its changes during the production of [ɤ] using ultrasound imaging. By collecting data from four native Mandarin speakers, this paper compares the tongue movement of [ɤ], [i] and [a] in Mandarin Chinese, and finds that [ɤ] has clearly higher variations than the other two monophthongs in tongue intrinsic length, tongue intrinsic height and accelerations in both horizontal and vertical directions. By analyzing the tongue shape of [ɤ] between the 30% and 80% time points of articulation, this research found that the tongue underwent the following movements in the process of producing [ɤ]: the tongue first humped at the front of the dorsum. It then pivoted around the uvular region in small, continuous steps, namely, the tongue front lowered while tongue

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back rose. Simultaneously, the whole tongue underwent a de-arching movement, during which tongue dorsum lowered and the tongue stretched in the front-back direction. Under the mutual influence of the two movements, the whole tongue moved slightly backwards and declined in height. Finally, the tongue back and the rear of the tongue dorsum moved closer to the pharynx and uvula, while the tongue front lowered. Thus, the present paper partially validates Shi's (2002b) viewpoint that [ɤ] is a transitional monophthong in Mandarin Chinese.

KEYWORDS
Ultrasound **M**andarin **T**ransitional vowel **T**ongue movement **A**cceleration

1. INTRODUCTION

Although the number of underlying mid vowels in Standard Chinese is still under debate,[1] most phonologists have agreed that there is only one mid vowel, transcribed as /e/ or /ɤ/ in IPA (Cheng 1973; Wang 1994; Wu 1994; Duanmu 2007, 37–38; Lin 2007, 174; Ye 2013, 55). Among the allophones of the mid vowel, [ɤ] is the only one that can surface as a single vowel final (Cheng 1973, 21). Specifically, [ɤ] surfaces under three conditions: (I) when there is no glide preceding it, (II) when its onset is not a labial consonant, and (III) when it precedes the nasal coda [ŋ] (Ye and Xu 1997, 73–74). In a nutshell, phonologically, [ɤ] is a monophthong with a less-constrained status in the vowel system of Mandarin; it lacks phonemic counterparts both in the vertical and horizontal axes of the vowel chart of Mandarin Chinese.

Compared with the abundance of phonological studies on the flexibility of Mandarin mid vowels, however, the acoustic realization of [ɤ] has received limited attention. Howie (1976, 11) argued that this mid vowel surfaced as [ˈʌ] when it occurred as a single vowel final without any onset preceding it (e.g., /ɤ/, é, transcribed by Howie as [ˈʌ]) and as [ˠʌ] after a non-labial consonant (e.g., /ʂɤ/, shé, transcribed by Howie as [ʂˠʌ]). Namely, when [ɤ] is under the conditions of (I) and (II) proposed by Ye and Xu (1997), this mid vowel becomes a diphthong, an initial non-syllabic vowel [ˈ] or [ˠ] plus the main vowel [ʌ]. Therefore, [ɤ] is produced as a

汉语普通话中的[ɤ]是游移元音吗？
——基于超声波成像的发音舌体运动证据

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摘要

本文利用超声成像技术考察了四名汉语母语者汉语单元音[ɤ]发音时的舌体形态及其变化情况。通过对比[ɤ]与元音[i]、[a]发音时的舌体运动情况，本研究发现，[ɤ]在舌体内在长度、舌体内在高度、舌体各点在 X 轴和 Y 轴上的加速度等参数的变化上均显著高于稳定单元音[i]和[a]。通过对比[ɤ]在发音 30%和 80%时刻的舌体形态，本研究发现舌体[ɤ]的发音过程中经历了如下动作：首先，舌面中部隆起；其后，舌体以小舌下方区域为轴心，以连续但微小的幅度做旋转运动，即舌前部降低、舌背部升高；同时，整个舌体经历去拱运动，造成舌体中部高度降低、舌体向两端伸展。在两个同步舌体运动的共同作用下，这个舌体高度下降并稍向后移动。最终，舌根和舌面后分别靠近咽部和小舌区域、舌前部自然下垂。总之，从发音舌体运动角度，本论文可以部分证实石锋(2002b)的观点，即[ɤ]是普通话中的游移性单元音。

关键词

超声波 **普**通话 **游**移元音 **舌**体运动 **加**速度