# A Comparative Acoustic Analysis of Kazakh and Mandarin First-class Vowels

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## ABSTRACT

*In recent decades, an increasing number of learners from Kazakhstan have visited China to study Mandarin Chinese. Hence, it is necessary to pay more attention to the acquisition of Mandarin Chinese by Kazakh-speaking learners. The purpose of the present paper is to provide helpful countermeasures for Chinese teaching practice. This study will enrich the achievements of Kazakh and Mandarin first-class vowels comparison and improve the teaching quality of Mandarin Chinese among Kazakh-speaking learners. A total of 14 Kazakh speakers and six Chinese speakers participated in a word-list reading task. For acoustic analysis, we measured the formant frequencies (F1 and F2) through Mini-speech Lab software developed by Nankai University, Tianjin, P.R. China. Results demonstrate that the tongue position of (1) /a/ in the Kazakh language is higher than that in Mandarin Chinese, (2) / ə i u y / in the Kazakh language is lower than that in Mandarin Chinese, (3) / ə u / in the Kazakh language is more fronted than that in Mandarin Chinese, and (4) / a i y / in the Kazakh language is more backward than that in Mandarin Chinese.*

*Keywords: Kazakh language; Mandarin; first-class vowels; acoustic analysis*

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# INTRODUCTION

Kazakhstan is the largest country in Central Asia, which has been closer to China in education since 2013. It also has been the most crucial importing country of international students to China from Central Asia. The number of Kazakhstan students in China in 2018 was 11,784, accounting for 39.4 % of the total 29,885 in Central Asia. In such a situation, the high quality Mandarin teaching for Kazakhstan learners is essential, especially in phonetic instructions. Many previous studies have been achieved on Mandarin phonetic acquisition by Kazakh students, such as Meng (2020), Ma (2018), Gao (2017), Jia (2014), He (2009), etc. However, as mentioned above, these researches are mainly based on an impressionistic description. They fail to concentrate on comparing first-class vowels between Kazakh and Mandarin acoustic. It is noted that the Kazakh language here refers to the one spoken in Kazakhstan, not the one in China.

With the advancement of technology, acoustic analysis can be widely employed in linguistic domains, including second language acquisition studies. First-class vowels are the cardinal vowels in one particular language, which will be an excellent foundation for the whole phonetic system in the future. The primary purpose of our study is to investigate the comparison of the first-class vowels of the two languages utilizing acoustic measurement. The study reported in the presented work aims to fill the gap by overcoming the abovementioned limitations hence, contribute significantly to Kazakh speakers' research areas of Chinese first-class vowels production.

# LITERATURE REVIEW

## FIRST-CLASS VOWEL

A first-class vowel is a phonetic term proposed by Shi (2002). He assumes that in Chinese, the vowel that occurs in a single vowel is the first-class vowel, which can also be called the cardinal vowel. In other languages, the vowel that can form syllables by itself or appear alone after consonants is the first-class vowel. In Mandarin, there are ten single vowels, namely [A i u ɿ ʅ y ɤ ɛ o ɚ]. Only [A i u ɿ ʅ y ɤ] are considered as the first-class vowels (Shi,2002; Wang, 1999). Contrary, the Kazakh language includes only nine single vowels which are [ɑ æ ə i u y e Ø o] (Zhang, 2009). Based on Shi (2002), we can conclude that only [ɑ æ ə i u y] are classified as first-class vowels.

## RELATED STUDIES OF FIRST-CLASS VOWELS IN KAZAKH AND MANDARIN

There is a limited number of literature on Kazakh first-class vowels. Zhang (2009) detailed the classification of single vowels between Kazakhstan and China saying while it is agreed that there are nine vowels (ɑ æ ə i u y e Ø o) in the Kazakh language, some differences remain in the academic communities of the two countries. Specifically, while deemed as front single vowels in China, the vowels [æ e i] are considered central vowels, and [e] is regarded as a compound vowel in Kazakhstan. Another difference is that, the vowel [Ø] is a single front vowel in China, while it is a central compound vowel in Kazakhstan.

Most literature on the first-class vowels of Chinese as L2 by foreign learners is written in Chinese. Wen (2005) compared the acquisition process of seven Chinese first-order vowels by

Chinese learners and Mandarin children whose mother tongue is Chinese in the United States and Japan from accuracy and concentration of vowel pronunciation. The results show that, as far as the acquisition order of second language vowels is concerned, the similarity between the mother tongue and the target language determines the acquisition speed. In contrast, the markedness of vowels only restricts the acquisition of new vowels. As far as Chinese vowel pronunciation is concerned, the errors and development of articulation and the discreteness of second language learners' pronunciation are systematic.

Wen (2010) selected 30 American male Chinese language learners whose native background are English, and mainly analyzed the acquisition of Chinese primary vowels produced by these learners. The result shows that the acquisition sequence of [i]>[y ɿ ʅ] >[u a ə ] is not entirely consistent with the order of acquisition proposed by the comparative analysis hypothesis. This finding also corrects the markedness hypothesis and the new transfer hypothesis. Hu (2011) analyzed the pronunciation of first-class vowels in Chinese by international students from Pakistan, who were all studying intermediate level in Chinese proficiency class, and conducted an acoustic experiment on their phonetic pronunciation using some samples. The experimental results showed that the vowels i[i], u[u], a[A], and e[ə] tended to be pronounced in a higher or fronted position due to the influence of the students' native language, while [y] [ɿ] and [ʅ] were the most difficult to acquire because these vowels do no exist in Pakistani language. Liao (2011) selected 50 Chinese language learners whose mother tongue is pure Bangkok Thai accent to practice pronunciation and recorded the pronunciation process. He used the recording editing software Cool Edit Adobe Audition and the speech analysis software Praat to investigate the acquisition of six vowels, nine complex vowels (diphthongs), and four triplets produced by the students. On this basis, the difficulty levels of Chinese vowel acquisition are classified. Mao (2012) also adopts the analysis method of phonetic experiment. The experiment compares Korean and Chinese vowel systems and determines the similar reasons and unfamiliar vowels of the two vowel systems. The experiment, then, continues to study the acquisition process of the seven first-level vowels of Chinese by Korean students. The results show that the acquisition order of the Korean students is [ɿ u ə]＞[a y ʅ], with the acquisition of male vowel i[i] is better than that of female students. The experiment concluded that it is easier for Korean students to master unfamiliar vowels when learning Chinese vowels. The acquisition order of unfamiliar vowels will be affected by the markedness of vowels, which are also new. The acquisition speed of vowels with strong markers is slower than that of vowels with weak markers. Xu (2013) used a combination of mathematical statistics and experimental linguistics to investigate and analyze the primary Italian-Chinese interlanguage vowel system. The article pointed out that the order in which Italian students construct the seven first-level Chinese vowels is /ɑ/＞/i/＞/ɤ/＞/ʮ/＞/ɿ/＞/u/＞/y/ ("＞" means earlier than). The experimental results further show that at the beginning of the establishment of the Italian-Chinese interlanguage system, mother tongue transfer played an important role, and the phonetic paradigm of the seven basic Chinese vowels has not been fully established. The article also believes that the closer the native language and the target language are, the easier it is for the learners to acquire the almost native-like vowel pronunciation. This view, however, is flawed. In this interlanguage system, acquiring similar vowels is more difficult than acquiring new vowels. Finally, Xu argues that the acquisition of the basic vowels of Chinese could only be confirmed when the accuracy and dispersion are comparable to those of Chinese vowels. Kang (2014), based on language transfer theory, interlanguage theory, bias analysis theory, and phonetic pattern theory, conducted experiments on 12 Chinese and 12 Thai students and compared the Chinese and Thai first-class

vowel patterns. The paper also analyzes the experimental data of primary, intermediate, and advanced Thai students' Chinese first-level vowels, examines the pattern of Chinese students' first-level vowels in Thai, and analyzes the errors. The article proposes that the acquisition of each vowel is unbalanced in the process of acquiring Chinese first-level vowels. /i ɑ u/ have been mastered in the early stage of learning from elementary to advanced level and, with the continuous improvement of Chinese proficiency, the pronunciation of /y and ɤ/ has greatly improved. However, the pronunciation skills of the vowels /ɿ ʅ/ have not been fully mastered until the advanced stage of Chinese language learning. Ma (2014) experimented with 10 Cambodian and 10 Chinese students using the desktop voice studio and SPSS as analysis software to study Chinese first-class vowels, second-class vowels, third-class vowels, and the deviation of the fourth vowel, and the reasons behind the deviation. The article points out that the process of students' acquisition of Chinese first-level vowels, /i/, /u/, and /ɑ/ is similar in both Chinese and Cambodian languages. The result is good, the error in vowel pronunciation is less, but the students' tongue position of /ɑ/ is placed at the front, hence there is a bias. The four vowels /ɿ/ /ʅ/ /ɤ/ and /y/ are unique to Chinese, however, are nonexistent in the Cambodian language, resulting in an unsatisfactory acquisition result. In addition, the six Cambodian vowels /o/, /e/, /ɛ/, /ɒ/, /ɔ/, /ɯ/ are unavailable in Mandarin Chinese. Based on vowel pattern theory, Liu (2017) used Praat and Cool Editpro 2.1 software recordings to examine the correct pronunciation rates of Chinese vowels of Thai primary school students and investigate the order of acquisition of the seven first-class vowels in Chinese language for this group of students. The experimental results showed that Thai primary school students firstly acquired the vowels [A] and [i]. The vowels [ɿ] and [ʅ] were acquired before the vowel [y], and the vowels [u] and [ə] were acquired in a different order. The last vowel acquired was [y], which was generally consistent with the acquisition order of native Chinese learners. The acquisition process is also similar, but fossilization occurs in the acquisition process of the Thai students. Wang (2017) took 10 Cambodian students studying Chinese at the Confucius Institute in Wangjia, Cambodia as experimental subjects and dissected the pronunciation performance and bias analysis of these ten students' Chinese two-character group from three levels: tonal type, tonal domain, and tonal value. She also conducted a comparative study of male and female pronunciation and designed a series of Chinese tonal practice methods for learners of non-tonal languages. On this basis, she also provided some targeted methods of tone practice, such as the intuitive and music-assisted methods.

These achievements have significantly contributed to the study of L2 Chinese acquisition by learners (mostly non-native) from other countries. However, one significant limitation of the aforementioned studies is that, none of them were able to shift focus on comparing first-class vowels between Kazakh and Mandarin.

## METHOD

### PARTICIPANTS

A total of 14 Kazakhstan participants (seven males, seven females) were recruited from a state-owned university in China. Their mother tongue is Kazakh, and they are equipped with elementary Mandarin proficiency. By contrast, six Mandarin speakers (three males, three females) are also participating in the present work. They all volunteer to participate in this study.

Male participants are marked as M and female as W. M1 denotes the first male speaker, and W1 denotes the first female speaker.

## WORD LIST

In this study, we invited participants to read words in Tables 1 and Table 2 below and record their sounds through Audition 3.0 software. Table 2 is well designed, which is quoted from Wen (2008). The words are listed as follows:

**Table 1**

*Word list of Kazakh first-class vowels*

| Vowel | Word | | |
|---|---|---|---|
| ɑ | ɑқ | ɑл | ɑт |
| ə | əл | əр | ən |
| i | ic | тic | тic |
| ы | тic | тыс | қыс |
| ұ | ұл | ұт | ұр |
| ү | үп | түс | күт |

**Table 2**

*Word list of Mandarin first-class vowels*

| Vowel | A | ɤ | i | u | y | ɿ | ʅ |
|---|---|---|---|---|---|---|---|
| Word | 阿 | 哥 | 衣 | 屋 | 鱼 | 资 | 知 |

## INSTRUMENT

Mini-speech Lab software is mainly employed to measure the formant frequency of vowels. It was developed by several scientists and linguists of Nankai University in Tianjin, P.R China, as shown in Figure 1. The software comes in two versions; professional and teaching.

The professional and teaching editions have both access to speech files, display speech waveforms, pitch curves, broadband, narrowband speech maps, reference, and training speech maps, and edit speech with various functions. The address and its teaching, "oral and ear learning," becomes quantitative, qualitative, visual, graphical, and data-oriented. The professional edition, however, is equipped with extra function which is the anti-noise correction.

This software is of a great help in teaching and research on Chinese language, foreign languages, Chinese as a foreign language, education, psychology, law, medicine, and other related disciplines.

**Figure 1**

*Mini-speech Lab*


### PROCEDURE

The primary measurement for vowels is the acoustic study's first and second formant (F1 and F2). F1 represents the height of the tongue position, while F2 represents the backness of the tongue position. Precisely, the larger the F1 value, the lower the tongue position. The larger the F2 value, the more fronted the tongue position. We utilized Mini-speech Lab to extract the formant frequency of each vowel in the Kazakh language. Each word in Table 1 (refer above) is read three times, so 14 Kazakh-speaking learners produce 756 data samples (6 vowels×9 times ×14 participants). Next, the data collected were transferred onto Microsoft Excel sheets to calculate the average formant of each vowel. Similarly, the formant frequency of each vowel in Mandarin is measured through 378 data samples (7 vowels×9 times×6 participants) produced by the Mandarin speakers. After the mean value is calculated, the average formant values of first-class vowels between Kazakh and Mandarin are compared.

## RESULTS

### AVERAGE OF THE FIRST-CLASS VOWELS IN KAZAKH

The average values of first-class vowels by each speaker in the Kazakh language are demonstrated in Table 3.

**Table 3**

*The average values of first-class vowels by each speaker in Kazakh*

| | [ɑ] | | [æ] | | [i] | | [ə] | | [u] | | [y] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| M1 | 693.3 | 1140.7 | 647.9 | 1533.1 | 341.8 | 2073.9 | 451.8 | 1158.0 | 344.0 | 817.7 | 348.9 | 1329.9 |
| M2 | 643.3 | 1127.7 | 580.7 | 1644.5 | 351.2 | 2052.4 | 427.8 | 1293.9 | 406.3 | 1028.4 | 327.1 | 1324.9 |
| M3 | 717.4 | 1143.1 | 662.0 | 1571.2 | 351.3 | 2057.2 | 406.3 | 1662.3 | 358.4 | 750.6 | 348.9 | 1559.4 |
| M4 | 674.2 | 1236.4 | 639.0 | 1638.1 | 372.8 | 1959.1 | 456.4 | 1274.7 | 394.6 | 898.9 | 396.8 | 1468.7 |
| M5 | 746.1 | 1217.2 | 638.1 | 1638.4 | 346.4 | 2009.3 | 425.4 | 1260.2 | 442.1 | 875.1 | 425.4 | 1475.8 |
| M6 | 686.3 | 1071.4 | 631.2 | 1573.7 | 375.2 | 1851.3 | 415.9 | 1224.4 | 353.7 | 956.7 | 356.0 | 1444.7 |
| M7 | 731.9 | 1207.6 | 633.4 | 1657.4 | 399.0 | 1959.0 | 420.7 | 1212.3 | 341.7 | 911.1 | 372.7 | 839.2 |
| W1 | 645.4 | 1235.4 | 383.0 | 918.8 | 422.5 | 2233.0 | 587.4 | 1384.1 | 440.1 | 1076.2 | 428.0 | 1705.3 |
| W2 | 748.3 | 1179.0 | 694.3 | 1926.8 | 427.9 | 2227.2 | 463.7 | 1289.1 | 468.4 | 1243.7 | 439.9 | 1667.1 |
| W3 | 288.7 | 913.3 | 305.7 | 899.0 | 449.3 | 2485.3 | 509.1 | 1466.2 | 461.2 | 1102.6 | 403.9 | 1745.9 |
| W4 | 915.9 | 1392.1 | 884.7 | 2057.1 | 490.0 | 2607.4 | 609.6 | 1478.1 | 486.6 | 1017.9 | 470.7 | 1851.4 |
| W5 | 1030.9 | 1478.0 | 868.0 | 2167.1 | 478.1 | 2638.4 | 647.7 | 1265.1 | 486.1 | 886.7 | 435.0 | 1846.6 |
| W6 | 913.3 | 1385.0 | 822.6 | 1968.6 | 406.3 | 2396.9 | 525.9 | 1332.2 | 434.4 | 910.4 | 406.2 | 1714.9 |
| W7 | 856.0 | 1305.8 | 722.2 | 1729.3 | 447.0 | 2411.1 | 494.8 | 1550.0 | 444.6 | 1025.8 | 475.3 | 1735.2 |

Based on the statistics in Table 3, an average value of each vowel is hereby presented in Table 4 below.

**Table 4**

*The average value of each first-class vowel in Kazakh*

| Vowel | F1 | F2 |
|---|---|---|
| [a] | 735.1 | 1216.6 |
| [ə] | 488.8 | 1346.5 |
| [i] | 404.2 | 2211.5 |
| [u] | 418.7 | 964.4 |
| [y] | 402.5 | 1550.6 |
| [æ] | 650.9 | 1637.4 |

The descriptive statistics from both Table 3 and Table 4 show that the average formant values of [a] are 731.5 and 1216.6, respectively. Regarding the vowel [ə], the first formant is 488.8, and the second formant is 1346.5. F1 and F2 values of the vowel [i] are 404.2 and 2211.5, separately. Concerning the vowel [u], the first and second formant values are 418.7 and 964.4. The first and second formant values for the vowel [y] are 402.5 and 1550.6. Contrary to the vowel [y], the F1 and F2 values of the vowel [æ] are 650.9 and 1637.4, respectively.

## AVERAGE OF THE FIRST-CLASS VOWELS IN MANDARIN

The average values of first-class vowels by each speaker in Mandarin are presented in Table 5.

**Table 5**

*The average value of each first-class vowel in Mandarin*

| Vowel | F1 | F2 |
|---|---|---|
| [A] | 889.2 | 1276.5 |
| [ɤ] | 420.3 | 1214.6 |
| [i] | 301.1 | 2452.4 |
| [u] | 328.2 | 784.4 |
| [y] | 301.9 | 2058.8 |
| [ɿ] | 405.7 | 1374.1 |
| [ʅ] | 378.8 | 1632.2 |

The descriptive statistics in Table 5 show that the average formant values of [A] are 889.2 and 1276.5, respectively. Regarding the vowel [ɤ], the first formant is 420.3, and the second formant is 1214.6. F1 and F2 values of the vowel [i] are 301.1 and 2452.4, separately. For the vowel [u], the first and second formant values are 328.2 and 784.4. The first and second formant values for the vowel [y] are 301.9 and 2058.8. The two vowels [ɿ] and [ʅ] are different from these vowels aforementioned; F1 and F2 values of the vowel [ɿ] are 405.7 and 1374.1, while F1 and F2 values of the vowel [ʅ] are 378.8 and 1632.2.

## COMPARISON OF FORMANT VALUES BETWEEN KAZAKH AND MANDARIN

Our main aim of this study is to compare the formant frequencies of first-class vowels between Kazakh and Mandarin. Based on the statistics tables above, Table 6 presented the comparison of formant value of first-class vowel between Kazakh and Mandarin.

**Table 6**

*Comparison of formant value of first-class vowel between Kazakh and Mandarin*[a]

| Vowel | Formant | Mandarin | Kazakh |
|---|---|---|---|
| /a/ | F1 | 889.2 | 735.1 |
| | F2 | 1276.5 | 1216.6 |
| /ə/ | F1 | 420.3 | 488.8 |
| | F2 | 1214.6 | 1346.5 |
| /ɪ/ | F1 | 301.1 | 404.2 |
| | F2 | 2452.4 | 2211.5 |
| /u/ | F1 | 328.2 | 418.7 |
| | F2 | 784.4 | 964.4 |
| /y/ | F1 | 301.9 | 402.5 |
| | F2 | 2058.8 | 1550.6 |
| /ɿ/ | F1 | 405.7 | |
| | F2 | 1374.1 | |

| | | | |
|---|---|---|---|
| /ʮ/ | F1 | 378.8 | |
| | F2 | 1632.2 | |
| /æ/ | | | 650.9 |
| | | | 1637.4 |

a. Here the vowels are written in phoneme for easier comparison between the two languages.

From Table 6, it can be seen that there are some differences between Kazakh and Mandarin first-class vowels in formant values. Regarding vowel /a/, the first formant in Kazakh is 735.1, smaller than that in Mandarin (F1=889.2), which indicates that the tongue position of /a/ in Kazakh is higher than that in Mandarin. Similarly, the second formant in Kazakh is 1216.6 while that in Mandarin is 1276.5. It indicates that the tongue position of speakers in Kazakh is more backward than that of speakers in Mandarin. Regarding the second vowel /ə/, F1 in Kazakh is 448.8 while that in Mandarin is 420.3, showing that it is lower in Kazakh than that in Mandarin from the perspective of the tongue position. F2 in Kazakh is 1346.5 while that in Mandarin is 1214.6, showing that it is slightly fronted in Kazakh than in Mandarin from the perspective of tongue position. To the third vowel /i/, F1 in Kazakh is 404.2 larger than that in Mandarin (F1=301.1), showing that it is lower in Kazakh than that in Mandarin from the perspective of the tongue position. F2 in Kazakh is 2211.5 while that in Mandarin is 2452.4, showing that it is slightly backward in Kazakh than in Mandarin from the perspective of tongue position. As for the vowel /u/, the first formant in Kazakh is 418.7, more prominent than that in Mandarin (F1=328.2), which indicates that the tongue position of /a/ in Kazakh is lower than that in Mandarin. The second formant in Kazakh is 964.4, while that in Mandarin is 784.4. It indicates that the tongue position of speakers in Kazakh is more fronted than that of speakers in Mandarin. For the vowel /y/, the first formant in Kazakh is 402.5 larger than that in Mandarin (F1=301.9), which indicates that the tongue position of /a/ in Kazakh is lower than that in Mandarin. The second formant in Kazakh is 1550.6, while that in Mandarin is 2058.8. It indicates that the tongue position of speakers in Kazakh is far more backward than that of speakers in Mandarin. These three vowels /æ ɿ ʮ/ are pretty different from the other vowels. Specifically, /æ/ occurs in the first-class vowels of Kazakh while it is excluded in the first-class vowel list of Mandarin, with F1 650.9 and F2 1637.4. The two vowels /ɿ ʮ/ are unique in Mandarin, which are also the most difficult for Kazakh-speaking learners to master. The first formant of /ɿ/ is 405.7, the second formant is 1374.1, the first formant of /ʮ/ is 378.8, and the second formant is 1632.2.

## DISCUSSION

The previous studies mainly employing impressionistic descriptions concerning the Mandarin Chinese vowels acquisition by Kazakh-speaking learners (Meng, 2020; Ma, 2018; Gao, 2017; Jia, 2014; He, 2009). Some common production errors of Chinese vowels by Kazakh speakers can be concluded as follows: (1) the dorsal vowel e [ɤ] is pronounced as the retroflex er [ər]; (2) the rounded vowel [o] is replaced by the unrounded vowel [ɤ]; (3) the high rounded vowel [y] is often pronounced as the compound vowel iou [iou]; (4) [ɿ] and [ʮ] are mixed in si [si] and shi [tʂi]. These findings are different from those in the current paper, because we only compare the formant values of first-class vowels between Kazakh language and Mandarin Chinese and do not involve the vowel acquisition of Mandarin Chinese by Kazakh-speaking learners. Unlike previous studies based on impressionistic depictions, the acoustic method used in the current

work provides a new vision for studying second language acquisition and teaching practice. Through the software of Mini-speech Lab, formant frequency is measured to analyze the acoustic features of first-class vowels between Kazakh and Mandarin. Systematic and objective data concerning first-class vowel production by Kazakh and Mandarin speakers are presented, which can be more convincing for the results we conclude. It could give us a good understanding of Kazakh speakers in L2 Chinese acquisition. Moreover, it could also provide helpful hints for teachers and scholars in Chinese as a second language. Though several papers analyze the first-class vowels of Kazakh language (NiLuopar, 2019; Dawel et al., 2018; Zheng, 2009), these three papers examine the first-class vowels of Kazakh language spoken in China, not in Kazakhstan. Therefore, they also differ from our present paper, which investigate the first-class vowels of Kazakh language spoken in Kazakhstan.

Some achievements are achieved in the present paper. However, it is essential to consider the limitations in using new technology in the study of second language acquisition based on the main results obtained in this systematic work and the main results obtained in previous research. we fail to focus on the V value. V value is normalized and not subject to factors such as age, gender, and so on, which can be more persuasive in the results.

## CONCLUSION AND IMPLICATIONS FOR FUTURE WORK

The current study, as presented here, shows that the acoustic-oriented method can be incorporated into the domain of phonetic research. With the help of Mini-speech software developed by several experts, some conclusions are drawn: (1) the tongue position of /a/ in the Kazakh language is higher than that in Mandarin Chinese; (2) the tongue position of / ə i u y / in the Kazakh language is lower than that in Mandarin Chinese; (3) the tongue position of / ə u / in the Kazakh language is more fronted than that in Mandarin Chinese; (4) the tongue position of / a i y / in the Kazakh language is more backward than that in Mandarin Chinese.

Future researches considering first-class vowels using Mini-speech Lab software should carefully consider the size of the Chinese participants. Another factor that should not be neglected is that the V value should be considered. We also hope that such an acoustic-based method can pave the way for analyzing phonetic teaching and second language acquisition to contribute to our endeavors to improve the quality of teaching for Mandarin learners from Kazakh and other countries.

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