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Perception and production of Chinese vowel finals by Hungarian learners – Some relevant difficulties

SUMMARY

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1. General introduction

Mandarin Chinese teaching was introduced to Hungary in the 1950s (Józsa, 1988), and Chinese education is becoming more and more important among foreign languages in Hungarian language education. The country has established one Sino-Hungarian bilingual school, six Confucius Institutes, and two Confucius classrooms. Additionally, an increasing number of local Hungarian educational institutions have introduced Chinese language programs. According to the Director of the Confucius Institute at Eötvös Loránd University, by 2020, the number of people learning Chinese language in Hungary had reached 6,259 (Li et al., 2021). Based on the present state of Chinese studies in Hungary, research on Chinese phonetics and phonology is becoming increasingly important. This dissertation focuses on vocalic segments. Compiling the experiments of the dissertation, a multi-step approach was employed. First, a questionnaire was administered to explore students' beliefs of their difficulties with Chinese vowel finals. Following this, interviews were conducted with Chinese language teachers to gather their insights on the challenges their students face. Qualitative interviews provided a better understanding to this topic. Finally, two experimental studies were designed to examine in detail the vowel finals [ɤ] and [ɿ]/[ʅ]. Thus, this dissertation explores the use of Chinese vowels among Hungarian learners of Chinese, with a focus on the perception and production of the mid vowel [ɤ] and the high vowels [ɿ] and [ʅ].

I am aware of the classification issues of the high vowels [ɿ] and [ʅ] in relation to vowel-consonant distinctions. However, I adhere to traditional Chinese phonological theories, and the matter is discussed in detail in the thesis.

Hungarian learners of Chinese have difficulty in pronouncing Chinese vowel finals. There are several studies on this matter. Zhang (2015) conducted a study on the pronunciation of Hungarian learners of Chinese in which 18 Hungarian university students from Károli Gáspár University of the Reformed Church in Hungary participated, who learnt Chinese as a regular L2-learner. The learners were asked to read aloud a text which contained 57 monosyllabic words and 67 disyllabic words. According to this study, Hungarian learners of Chinese made the most mistakes with the [ɤ] sound, with an error rate of 71.67%, followed by [o] at 54.17% and [y] at 26.73%. [ɤ] was pronounced as [ə]/[e]/[ʅ]/[ɿ]. The two high vowels had the error rates, with [ʅ] at 25% and [ɿ] at 20.83%, respectively. [ʅ] was pronounced as [ə]/[i]/[ʮ]/[ɿ] and [ɿ] was pronounced as [ə]/[i]/[ʮ]/[ʅ]. Jia (2017) also studied Hungarian learners' Chinese pronunciation. 42 Chinese learners from ELTE Confucius Institute. According to the results,

[ɤ] sound showed the highest error rate (70.26%). As Jia only reported error rates above 40%, and he did not mention the two high vowels, therefore we assume that these were pronounced correctly in more than 60%. Based on formant patterns in the production of 5 native Chinese and 10 Hungarian speakers of Chinese who were BA students of Chinese, Juhász (2020) showed that Hungarian learners produced the velar [ɤ] significantly different from native Chinese speakers. She suggested that Hungarian learners of Chinese produced the [ɤ] with higher F1, F2 and F3 than native Chinese speakers. [ɿ] and [ʅ] were close to the native pronunciation, in other words there is no significant difference between native Chinese speakers and native Hungarian speakers of Chinese. The 10 L2 speakers were divided into beginner and advanced groups (1st and 3rd years), however, their results did not show significant difference. The present study also investigates the production of [ɤ], [ɿ] and [ʅ] by Hungarian learners of Chinese and native Chinese speakers. To summarize the previous findings, Hungarian learners of Chinese encountered difficulty in the pronunciation of [ɤ]. The present dissertation aims to expand previous studies in several specific directions. The first is to give an insight not only on production but also on perception. The second is to give an insight not only on studying experience of learners but also on their teachers' background. The third is to attest the vowel differentiation in production, i.e., attesting the vowels classification, not (only) the group differences. The fourth is that in the present research, the speaker groups are different: while Juhász's subjects were undergraduate students majoring in Chinese, the speakers in this study are studying in an extra-curricular language course at a university. This also means a lower number of language classes per week.

2. Research questions

Building on the growing interest in Chinese language education in Hungary and the phonological contrasts between Chinese and Hungarian, this dissertation investigates the specific perceptual and articulatory challenges Hungarian learners face when acquiring Chinese vowel finals. The study pays particular attention to the mid vowel [ɤ] and the apical vowels [ɿ] and [ʅ], which are absent from the Hungarian sound system. The research aims to uncover how learners perceive and produce these sounds, the extent to which these vowels are confused, and the influence of general factors such as learning experience and instructional background. The overall goal is to better understand L2 phonological acquisition in a typologically distant language pair and to inform teaching strategies that address these specific phonetic challenges. The following research questions guide this inquiry.

2.1 The research questions of the questionnaire study

RQ1. What are the Mandarin Chinese vowel finals Hungarian learners of Chinese regard most difficult to pronounce?

RQ2. What can be the general factors behind the difficulty of specific Mandarin vowel finals for Hungarian learners of Chinese?

2.2 The research questions of the interview study

RQ3. Which Chinese vowel finals do Chinese teachers consider the most difficult for Hungarian learners of Chinese to pronounce?

RQ4. What discrepancies exist between Hungarian learners' self-assessments and their teachers' evaluations regarding the pronunciation of Chinese vowel finals?

RQ5. What phonetic, phonological, or pedagogical factors contribute to the difficulty of specific Mandarin Chinese vowel finals?

2.3 Research questions of perception research

Based on theoretical considerations, the production study by Juhász (2020), and the questionnaire and the interview results of section 6.1 and 6.2, the following questions were formulated:

RQ6. Do the Chinese vowels [ɤ], [ɿ], and [ʅ] cause perceptual difficulties for Hungarian learners of Chinese?

RQ7. Do advanced Hungarian learners of Chinese perform better than beginners in the perception of [ɤ], [ɿ], and [ʅ]?

RQ8. Does the L1 of the teacher affect the perception of Hungarian learners of Chinese?

RQ9. Does the consonant context affect the perception of Chinese vowels?

2.4 Research questions of production research

Based on theoretical considerations, the production study by Juhász (2020), the questionnaire, the interview and the perception results of section 6.1, 6.2 and 6.3, the following questions were formulated:

RQ10. Are Hungarian learners of Chinese capable of diffrenciating [ɤ], [ɳ], and [ɭ] in their production?

RQ11. How can the between speaker variance be interpreted in the production of [ɤ], [ɳ], and [ɭ] among L2 learners, as suggested by previous research and the effects of orthography and perception performance?

RQ12. Does the L1 of the teacher affect the production of Hungarian learners of Chinese?

RQ13. Do advanced Hungarian learners of Chinese show better pronunciation of [ɤ], [ɳ], and [ɭ] compared to beginner learners?

RQ14. What phonetic, phonological, or pedagogical factors contribute to the production difficulty of specific Mandarin Chinese vowel finals?

3. Methodology and research design

3.1 Survey of Hungarian students of Chinese

In order to know the views of Hungarian learners of Chinese, an adapted version of the questionnaire from Fan & Myintzu (2022) was designed based on the 21 vowel finals (See the questionnaire in Appendix A).

107 respondents completed the questionnaire from 8 universities and 4 Confucius Institutes in Hungary providing Chinese courses. The data set was constructed for the responses received from the Hungarian learners of Chinese.

After designing the questionnaire, it was distributed online or within physical classrooms to the Hungarian learners of Chinese. After collecting learners' responses to the questionnaire, factor analysis was used to categorize the difficulty groups. Factor analysis of perceived difficulty of Chinese sounds was supported by both Bartlett's test and the KMO measure of sampling adequacy. The sample size was the 107 respondents who filled in the questionnaire. Median score was used to measure the perceived difficulty level. In the questionnaire, a seven-point Likert-scale has been used, in which 1 = "no difficulty at all", 2 = "very easy", 3 = "somewhat easy", 4 = "neutral", 5 = "somewhat difficult", 6 = "very difficult", 7 =

"extremely difficult", was used to investigate to what extent each vowel final was considered to be difficult by learners to pronounce.

3.2 Interviews with Chinese teachers

The participants of the study were 20 Chinese foreign language teachers (10 native Chinese teachers and 10 native Hungarian L2-speaker of Chinese) with B.A, M.A, and Ph.D. degrees, 13 being male and 7 being female. Among 10 native Chinese teachers, only one could speak Hungarian. The ten native Hungarian teachers had studied Chinese in China before. All these 20 teachers had at least 4 years of Chinese language teaching experience to non-native Chinese learners and 3 years of teaching Chinese language experience to Hungarian learners of Chinese.

The interviews were mainly one-on-one face-to-face interviews, and online interviews were also used. The interviews (see Appendix B) included questions regarding the teachers' educational background, their knowledge of Hungarian, and their approach to teach Pinyin. Teachers were asked to identify which vowel finals or graphemes they found most problematic for learners and to describe the nature of the difficulties, such as articulation issues or confusion between sounds. Additional questions explored views on pronunciation error correction, factors influencing learners' phonological acquisition (e.g., academic background, multilingualism), and the impact of co-teaching with native Chinese or Hungarian instructors. Finally, teachers were invited to offer suggestions for improving pronunciation teaching. These interviews were designed to provide contextual data that would inform the experimental results on perception and production.

3.3 Perception experiment

31 native Hungarian speakers participated in a discrimination task. They were divided into four groups: The intermediate group (IntMix) included 10 subjects who had been learning Chinese for five semesters, and they were taught by both a native Hungarian speaker of Chinese and a native Chinese speaker. The rest of the participants were divided into three groups. All these participants had been learning Chinese for one semester at the time the experiment was administered. 7 of them were taught exclusively by a native Chinese speaker in begChi, 6 of them by a native Hungarian speaker of Chinese in begHun, and 8 of them by both a native Hungarian L2-speaker of Chinese and a native Chinese speaker in begMix. The native Chinese teacher was consistent across all three groups. All participants use Hungarian

as their primary language in daily life, and they were university students aged between 18 to 22 years.

The participants perceived the whole syllable in Table 1. To exclusively attest vowel differentiation and exclude the possible effect of the tones, the present study introduces only the results for items in tone 4, because all 14 test items are meaningful words in Chinese with tone 4, and not all of them exist with other tones. The items were recorded isolated, along with fillers (additional items for future analysis). The actual test was preceded by a short training period with 3 non-test items. The test items were recorded by 6 native speakers in a sound-treated room using a head-mounted microphone (Speech Recorder: Draxler & Jänsch , 2004). Among the 6 native speakers, a male speaker was selected.

Table 1. Stimuli of the perception research (consonant context as a variable)

Non-retroflex [ts, tsh, s]		Retroflex [tʂ, tʂh, ʂ, ɻ]	
Pinyin	Sounds	Pinyin	Sounds
<zè> - <zì> ‘tone’ - ‘letter’	[tsɤ] - [tsɿ]	<zhè> - <zhì> ‘this’ - ‘sign’	[tʂɤ] - [tʂɻ]
<cè> - <cì> ‘side’ - ‘time’	[ts^{h}ɤ] - [ts^{h}ɿ]	<chè> - <chì> ‘remove’ - ‘red’	[tʂ^{h} ɤ] - [tʂ^{h}ɻ]
<sè> - <sì> ‘color’ - ‘four’	[sɤ] - [sɿ]	<shè> - <shì> ‘club’ - ‘be’	[ʂɤ] - [ʂɻ]
		<rè> - <rì> ‘hot’ - ‘day’	[ɻɤ] - [ɻɻ]

In Table 1, the retroflex feature indexes the consonant context, since [tʂ, tʂ^{h}, ʂ, ɻ] are retroflex sounds. The perception test was administered in a quiet room through headphones by Praat Experiment MFC (Boersma & Weenink, 2022). The subjects were instructed to select the word they heard as soon as possible after listening to the stimulus. The subject listens to a single stimulus and must make a choice between two possible responses in Pinyin: <zè>/<zì>, <cè>/<cì>, <sè>/ <sì>, <zhè>/<zhì>, <chè>/<chì>, <shè>/<shì> and <rè>/<rì>. The response and the reaction time were recorded.

The present study uses error rate to analyze the perception difficulty of Hungarian learners of Chinese. The correct answers were analyzed in R (R Core Team, 2022). Generalized mixed models were run: Binomial Generalized Linear Mixed Models (BGLMM) for the correctness

of the answers, and Mixed Effects Logistic Regression for the reaction times (lme4: Bates et.al., 2015; lmerTest packages: Kuznetsova et.al., 2017). Tukey post hoc test was run to attest the effects of the interactions (emmeans package: Lenth, 2021). The models were built in a top-down selection method: the simplest model was chosen and that was still not significantly different from the largest possible largest, converging model.

The correctness of the answer was set as dependent variable. The factors were: phoneme category (i.e., mid or high vowel), learner group (intermediate, beginner with Chinese teacher, beginner with Hungarian teacher, beginner with joint teachers), and tongue tip position (retroflex or not). The models including all three factors did not converge, therefore the tongue tip position was eliminated and attested separately. The *p*-value of the final model was extracted by Anova (car package: Fox & Weisberg, 2019). In order to analyze the possible effect of the retroflex context and own feature of the vowel on the correct identification, the results for the mid and high vowels were tested separated by two further BGLMMs. The correctness of the answer was set as dependent variable, and the retroflex feature and the learner group were set as factors. The model selection and the extraction of *p*-value were run as described above. All figures were drawn by ggplot2 (Wickham, 2016).

3.4 Production research experiment

The acoustic experiment consisted of several subject groups. There are one group of six native speakers of Chinese (CNS, 3 women and 3 men), and the four groups of native speakers of Hungarian (HNS, total n = 30). None of the six native speakers can speak Hungarian. They were all born and raised in Mainland China until they moved to Hungary. The participants of the HNS group are all university students whose age is from 18 to 22 years old, and they were born and raised in Hungary, so Hungarian was used in their daily lives. Similar to perception, the production participants of the HNS group were also divided into four groups. The intMix group included 9 members (5 females and 4 males), who had been learning Chinese for five semesters. The beginner group arrived from three sub-groups based on their Chinese teachers. In the first group (7 participants: 3 males and 4 females) the teacher was a native Chinese (begChi), the second group (6 participants: 4 males and 2 females) the teacher was a native Hungarian (begHun), and the third one (7 participants: 7 females) was taught by these two teachers together (begMix). They had been learning Chinese for one semesters,

And the primary focus of the present study is on differences among vowels, Table 2 shows the number of tokens analyzed for this study.

Table 2. Stimuli of the production research

(an empty cell means there is no meaningful words with that tone in Chinese.)

Phonetic context	Sounds	Tone 1	Tone 2	Tone 3	Tone 4
Retroflex [tʂ, tʂ^{h}, ʂ, ɻ]	[tʂɤ] - [tʂɿ]	<zhē> <zhī> 蛰 之 ‘sting’‘of’	<zhé> <zhí> 折 值 ‘fold’‘cost’	<zhě> <zhǐ> 者 纸 ‘ -er’‘paper’	<zhè> <zhì> 这 志 ‘this’‘sign’
	[tʂ^{h}ɤ] - [tʂ^{h}ɿ]	<chē> <chī> 车 吃 ‘car’‘eat’		<chě> <chǐ> 扯 尺 ‘pull’‘ruler’	<chè> <chì> 撤 赤 ‘remove’‘red’
	[ʂɤ] - [ʂɿ]	<shē> <shī> 奢 师 ‘luxury’‘master’	<shé> <shí> 蛇 十 ‘snake’‘ten’	<shě> <shǐ> 舍 使 ‘shed’‘make’	<shè> <shì> 社 是 ‘club’‘be’
	[ɻɤ] - [ɻɿ]				<rè> <rì> 热 日 ‘hot’‘day’
Non-retroflex [ts, ts^{h}, s]	[tsɤ] - [tsɿ]		<zé> <zí> 则 蓐 ‘then’‘bud’		<zè> <zì> 仄 字 ‘tone’‘letter’
	[ts^{h}ɤ] - [ts^{h}ɿ]				<cè> <cì> 侧 次 ‘side’‘time’
	[sɤ] - [sɿ]	<sē> <sī> 閟 斯 ‘lost’‘this’			<sè> <sì> 色 四 ‘color’‘four’

Altogether 34 words (17 minimal pairs) were selected. The wordlist included 94 distractors as well. Each item was repeated 3 times (total Number: 384, target Number: 34*3 = 102) in random order. The experiment was carried out in the phonetic laboratory at the HUN - REN Hungarian Research Center for Linguistics. The material was recorded in a sound-treated room using a head-mounted Beyerdynamic omnidirectional condenser microphone and Speech Recorder (Christoph & Klaus, 2004). The words/material were recorded at a sampling frequency of 44,100 Hz. Before the experiment, participants were asked to fill out a language background questionnaire first. After filling out the form, participants were asked to perform a training task, producing 3 trial items. Stimuli were presented isolated one-by-one in random order using Speech Recorder.

Segmentation was carried out in Praat (Boersma & Weenink, 2022). The start and cessation of F2 were used as V boundaries. In the case of [ɻɤ] and [ɻɿ], the spectrogram had to be set to the range of 0-8 kHz in order to let the higher frequency frication appear in the view range. In the case of these sequences, the loss of this higher frequency frication was considered as the start of the vowel. The first three formants of the stimuli were measured in Praat automatically by a script. The formant range was set to 5000 Hz for male speakers and 5500 Hz for female speakers, except in the case of the four [ɿ] vowels, where the F2 and F3 fall close to each

other leading to mismeasurements. After manual checking, the formant range was set to 4.5 kHz in these four cases. The further settings were left as standard (5 formants, window: 0.025 s, time step: 6.25 ms (automatic), pre-emphasis from 50 Hz). The median formant values were taken at the mid 40 ms of the vowels. The data were manually checked and manually corrected for the outliers by speaker and by vowel.

Data analysis and statistics were carried out in R (R Core Team, 2024; RStudio: Posit Team, 2025). The formant values were normalised into Z-scores by speaker. Linear Discriminant Analysis (LDA) models were trained on the 6 native speakers' data using all three formants. The testing was carried out on the L2 learners' data. The LDA were built in MASS package (Venables–Ripley, 2002). Figures were prepared in ggplot2 (Wickham, 2016) and ggord (Beck, 2024).

4. Results and Discussions

This research explored the acquisition of Chinese vowel finals by Hungarian learners, with a focus on the vowels [ɤ], [ɿ], and [ʅ], through a multi-method approach including a learner questionnaire, teacher interviews, a perception test and a production task. Each study offered a distinct perspective, and together, they form a comprehensive picture of the challenges learners face and the factors influencing vowel acquisition.

The questionnaire results indicated that Hungarian learners generally did not believe Chinese vowel finals as highly difficult, with median difficulty scores below 3 for all vowels. However, teachers identified specific vowels such as [ɤ], [ɿ], [ʅ], and [ou] as particularly problematic for learners, highlighting a mismatch between learner self-awareness and actual pronunciation difficulties. This discrepancy suggests that learners may lack metalinguistic awareness of their pronunciation errors, highlighting the importance of teacher insight for effective diagnosis of learner difficulties. The gap between learner and teacher perceptions underscores the need for more explicit pronunciation instruction, including targeted feedback and perceptual training to help learners recognize and correct persistent errors.

Findings from all four studies underscore the influential role of L1-L2 phonological differences, especially in line with the Contrastive Analysis Hypothesis (Lado, 1957) and Markedness Differential Hypothesis (Eckman, 1977). None of the three target vowels [ɤ], [ɿ], [ʅ] appear to be fully acquired by the Hungarian learners in the sample. The problematic vowels are absent from Hungarian and typologically marked, which increases their acquisition difficulty. However, the findings also suggest that native language effect and

markedness donot fully explain the observed difficulties. For instance, [ɤ] was more difficult to identified than [ɿ] and [ʅ] in perception task, but [ɤ] was distinguished more accurately than [ɿ] and [ʅ] in production task, despite all three being absent in Hungarian. This indicates that additional factors play a role in shaping learner performance.

Orthographic interference emerged as s major factor. Across all data sources, orthographic interference consistently contributed to misperception and misproduction: i) questionnaire results showed that learners treated phonologically identical forms (e.g., <o> and <wo>, both realized as [wo]) as different due to spelling differences. ii) interviews revealed that students associated Chinese vowel symbols with Hungarian orthographic conventions, e.g., mispronouncing [ɿ]/[ʅ] as [i] due to the <i>. iii) Acoustic data demonstrated that learners failed to distinguish between [ɿ] and [ʅ]—all represented as <i> in Pinyin—leading to production patterns overly reliant on vowel height (F1) rather than backness (F2). These results suggest that orthography may override auditory input, distorting learners' phonological representations and impeding accurate perception and production.

Advanced learners are not doing better than the beginners either in perception task or production task. Tusor (2016) states that Hungarian learners of Chinese always rely on Pinyin transcription when they are studying Chinese characters and pronunciation. The students who are not made aware that the sounds written in Pinyin are not the same as the sounds represented by the same letters in the English and Hungarian alphabets will certainly tend to pronounce these speech sounds incorrectly. And the incorrect pronunciation may persist and become fossilised even after abandoning the daily use of Pinyin. Therefore, pronunciation instruction must address the limitations and inconsistencies of Pinyin, emphasizing phonetic awareness and auditory training early and consistently throughout instruction. Intermediate learners did not outperform beginners in perception or production tasks, suggesting that prolonged exposure without explicit phonetic training may lead to fossilization of mispronunciations.

The finding in perception results showed that the experience with a native language teacher may have a positive effect on Hungarian listeners' perception. The production study found that native vs. non-native teacher input influenced learner performance differently. Native Chinese teachers provided more accurate phonetic models, benefiting learners in distinguishing acoustically salient vowels like [ɤ]. Non-native (Hungarian) teachers offered explicit explanations, which helped with articulatory challenges. However, mixed

instruction did not consistently outperform either approach, suggesting a need for better coordination between native and non-native teaching methods. These findings are consistent with Loewen (2009), teachers play a critical role in enhancing the perceptual salience of L2 phonetic contrasts, especially in foreign-language contexts with limited natural exposure. Thus, the findings align with the SLM-r's notion that phonetic category formation depends not only on input quantity but also input quality.

Furthermore, the findings underscore that Chinese phonetic learning is shaped by both predictable patterns and unique individual differences. The questionnaire results show that some learners do have good awareness — they know what they struggle with. Others don't — they might misjudge what's hard for them. 14 out of 20 Chinese teachers emphasized that individual differences of students have a greater impact on Chinese phonetics learning, including personal language talent and degree of effort. When interpreted through the theoretical frameworks provided by Järvelä (2006), Glaser (1972), Jonassen & Grabowski (1993), and Tomlinson et al. (2003), these findings strongly support a personalised instructional approach. Järvelä's emphasis on balancing personal needs with collaborative learning is particularly relevant: although group-level trends provide useful diagnostic insight, they cannot replace instruction tailored to individual learner profiles. Glaser's notion of "adaptive education" is also validated here, especially his call for focusing on modifiable cognitive processes rather than fixed aptitudes like IQ. The study's findings echo Jonassen and Grabowski's view that individual differences in aptitude, cognitive style, and learning profile directly influence instructional effectiveness. Tomlinson et al.'s advocacy for differentiated instruction further reinforces the need for teaching that responds to student readiness and perceptual strengths. Personalisation must attend not only to what learners struggle with, but how they perceive, process, and regulate their own learning, making it a cornerstone of effective, inclusive phonetic instruction. These results also reinforce the SLM-r claim that the development of new phonetic categories is also influenced by individual differences.

Future research should focus on longitudinal studies such as tracking learners over time to examine how perception and pronunciation evolves with different instructional approaches, neurocognitive investigations such as using EEG or fMRI to explore how orthographic and auditory processing interact in L2 phonological acquisition, and comparative studies such as examining how learners from other L1 backgrounds (e.g., English, Japanese) acquire Chinese vowels, to disentangle universal vs. L1-specific challenges.

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Appendix

Appendix A

Questionnaire to investigate the perception of Hungarian learners of Chinese for their ability to pronounce Chinese vowel finals.

Amikor a kínai nyelvet tanulja, akkor az alábbi hangok megtanulása általában mennyire szokott nehéznek bizonyulni? Kérem, minden piros hanghoz ill. hangkapcsolathoz adja meg az Ön tapasztalata szerinti nehézségi fokot számértékkel egy 1-7 skálán, ahol 1 = ’egyáltalán nem jelent nehézséget’, 2 = ’nagyon könnyű’,3= ’kicsit könnyű’,4 = ’semleges’,5= ’kicsit nehéz’,6= ’nagyon nehéz’,7= ’rendkívül nehéz’

Nem:	□Férfi □Nő
Mennyi ideje tanul kínaiul (hónap):	

When you learn Chinese, how difficult is it to learn the following sounds in general? For each red sound please choose the degree of difficulty based on your experience, the scale is from 1 to 7, where 1 = ’very, very easy’, 2 = ’very easy’,3= ’easy’,4 = ’not easy not difficult’,5= ’difficult’,6= ’very difficult’,7= ’very, very difficult’

Sex:	□Male □Female
How long have you learned Chinese (months):	

1.	b/p/g/k/d/t/zh/ch/z/c + **ɑ**	1	2	3	4	5	6	7
2.	b/p/m/f + **o**	1	2	3	4	5	6	7
3.	g/k/h + **e**	1	2	3	4	5	6	7
4.	b/p/g/k/d/t/j/q/y + **i**	1	2	3	4	5	6	7
5.	j/q/x/d/t/n/l + **ie**	1	2	3	4	5	6	7
6.	j/q/x/d/t/n/l + **iɑ**	1	2	3	4	5	6	7
7.	b/p/g/k/d/t/zh/ch/z/c/w + **u**	1	2	3	4	5	6	7
8.	d/t/n/l/g/k/h/zh/ch/sh/r/z/c/s + **uo**	1	2	3	4	5	6	7
9.	g/k/h/zh/ch/sh/r/z/c/s + **uɑ**	1	2	3	4	5	6	7
10.	j/q/x/l/n/y **+ ü**	1	2	3	4	5	6	7
11.	j/q/x/y **+ üe**	1	2	3	4	5	6	7
12.	n/l/g/h/zh/sh/b/p/m/f/z + **ei**	1	2	3	4	5	6	7
13.	d/t/n/l/g/k/h/zh/ch/sh/r/z/c/s + **ou**	1	2	3	4	5	6	7
14.	d/t/n/l/g/k/h/zh/ch/sh/r/b/p/m/f/z/c/s + **ɑi**	1	2	3	4	5	6	7
15.	d/t/n/l/g/k/h/zh/ch/sh/r/b/p/m/f/z/c/s + **ɑo**	1	2	3	4	5	6	7
16.	j/q/x/d/t/n/l + **i(o)u**	1	2	3	4	5	6	7
17.	j/q/x/d/t/n/l + **iɑo**	1	2	3	4	5	6	7
18.	d/t/g/k/h/zh/ch/sh/r/z/c/s + **u(e)i**	1	2	3	4	5	6	7
19.	g/k/h/zh/ch/sh/r/z/c/s + **uɑi**	1	2	3	4	5	6	7

20.	zh/ch/sh/r + **i**	1	2	3	4	5	6	7
21.	z/c/s + **i**	1	2	3	4	5	6	7

Appendix B

Sample interview questions for the semi-structured interviews with teachers

1. 请问，您在匈牙利教汉语教多长时间了？您是否会说匈牙利语？

How long have you taught Chinese in Hungary? And do you know Hungarian?

2. 您的学历及专业是什么？

What is your educational qualification and major?

3.您是怎么教授语音的？音节到声韵母到字母，还是声韵母到音节，还是字母到声韵母到音节？还是其他？为什么？

How do you teach Pinyin? On a syllabic basis, or from initials and finals to syllables, or from letters to initials and finals to syllables? Or any other way? Why? For example, "ge' is a syllable, "g' and "e' are an initial and a final respectively.

4. 您觉得哪些元音韵母或者字母对学生来说最难，换句话说，学生最容易出错？为什么？您能具体描述一下吗？(比如找不到发音位置，混淆，或者发得不好)

Which vowel finals are the most difficult to teach, in other words, which are the ones learners always make mistakes? And why, how would you describe the problems and difficulties? (For example, they miss the articulation place, or they mix them up, or they pronounce something inappropriately)

5. 您对纠音怎么看？

Do you think the pronunciation errors by learners should be corrected? Why or why not?

6. 您觉得哪些因素会影响到学生的汉语语音学习？比如学生的专业、学生知道更多语言等。为什么？

Which factors could influence the students' Chinese learning, particularly on their perception and pronunciation?

7. Do you teach Pinyin together with a Hungarian（Chinese） teacher? How to influence Pinyin learning of the students (perception and production)?

您和匈牙利老师或者中国老师一起教学生语音？您觉得会对学生的语音学习产生哪些影响(听辨与发音)？

8. Do you have any further suggestion on Chinese language teaching and learning for pronunciation?

对于汉语语音教学与语音学习您是否还有其他建议

The list of publications:

Simay, A. E., & Fan, L. (2020): A kínai nyelv magyarországi tanításának rövid története és jelene (Brief Historical Overview and Present State of Chinese Studies in Hungary). *Külügyi Szemle 19*(2), 3-20.

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Fan, L. (2024). Difficulties of Chinese vowel finals: A Study on Hungarian Learners and Teachers. In: Simon S., Baka P. & Litovkina A. (eds)., *15th International Conference of J. Selye University. Language and Literacy Section. Conference Proceedings.* pp.23-41. Komárno, Slovakia. Doi: 10.36007/4973.2024.23

Fan, L. (2024): 中文在匈牙利的传播阶段及特点(The stages and characteristics of Chinese dissemination in Hungary). *海外华文教育(Overseas Chinese Education)* 2024(2), 23-35.

Fan, L. (2025). A Phonological analysis of Standard Chinese and Standard Hungarian syllables. In: Baka P., Mészáros A., Simon S., & Litovkina A. (eds)., *16th International Conference of J. Selye University. Language and Literacy Section. Conference Proceedings.* pp.149-160. Komárno, Slovakia. Doi: 10.36007/5086.2025.149

Fan, L. (2025): Difficulties in the perception of Mandarin Chinese vowels [ɤ] and [ɿ]/[ʅ] by Hungarian learners of Mandarin. *Beszédtudomány - Speech Science* (in progress).