CHAPTER 3

THE COMPARISON OF HUNGARIAN AND CHINESE PHONOLOGICAL SYSTEMS: A PEDAGOGICAL PERSPECTIVE

QIUYUE YE AND HUBA BARTOS

EOTVOS LORAND UNIVERSITY, BUDAPEST

This paper is intended to contribute to the teaching of Chinese as a foreign language in Hungary by filling a notable gap in the literature. There have been few studies of the specific differences between Hungarian and Chinese and none at all which apply contrastive analysis of phonetic and phonological systems for pedagogical purposes. After a brief general introduction of Hungarian and Chinese, the paper offers an in-depth comparison between the segmental and suprasegmental phonetic systems of the two languages. The comparison is divided into separate sections, each of which is further subdivided, dealing with consonants, vowels, syllable tones, syllable structure, stress and intonation. The paper continues with a discussion of which of the identified differences are likely to cause difficulties both in terms of acquisition by Hungarian learners and in terms of communicative efficiency. The two features that emerge as the most problematic are suprasegmental intonation and syllable tone. The latter, given its essential and pervasive semantic value, is proposed as the feature that deserves the most attention of teachers and learners.

1 Introduction

The very nature of Chinese pronunciation determines the important position of phonology in the teaching of Chinese as a foreign language (TCFL). In the mid-twentieth century Chao Yuen Ren[1] used his *Guoyu Rumen* (*Mandarin Primer)* as teaching material when teaching Chinese abroad. "Most teaching is about pronunciation; then [we] move on to the teaching of other aspects". During that period, pronunciation teaching was highlighted. During the more recent boom in TCFL, however, this discipline has developed in an uneven manner. Considerable progress has been made in many aspects, but these have not included pronunciation teaching. Lin Tao even claims[2] that "pronunciation teaching has not advanced. On the contrary, it has greatly regressed." This may be over-pessimistic, but it does seem that research not only into pronunciation teaching but into pronunciation itself has attracted less attention than other fields. Nevertheless, during the past few decades a certain amount of valuable research on Chinese pronunciation and pronunciation teaching has emerged, much of it concerned with similarities and differences between Chinese and specific other languages. The present paper is intended to contribute to the latter current, focusing on Chinese and Hungarian. After a brief summary of the overall differences between the two languages, we provide a comparative phonological analysis, mentioning areas of particular difficulty for Hungarian learners. The paper concludes with a discussion of which aspects of Chinese pronunciation are the most likely to cause problems for Hungarian learners.

---

1 Chao (1948).

2 Lin (1996).

2 General description of Hungarian and Chinese

Siptár & Törkenczy (2000: 13) describe Hungarian as "a Uralic language spoken in Central Europe". In terms of the number of speakers, it is the twelfth largest language of Europe. The majority of speakers reside in Hungary itself, but Hungarian-speaking minorities are found in the neighbouring states: Slovakia, Austria, Romania, Serbia, Croatia, Slovenia and Ukraine; there are also groups of Hungarian speakers in more distant countries such as Canada and the United States, resulting from waves of emigration during the nineteenth and especially the twentieth centuries.

Hungarian is not only very different from the majority of (mainly Indo-European) European languages, but also unusual among the members of the Uralic family. Siptár & Törkenczy (2000: 13) point out that it has no close relatives: "The Ob-Ugric languages (Vogul & Ostyak), traditionally bundled together with Hungarian into the Ugric branch Of Finno-Ugric languages, are radically different from Hungarian in their phonology, syntax, and vocabulary."

Hungarian is defined by Kornai (1994) as a language of agglutinating morphology, with non-configurational syntax (Kiefer & Kiss, 1994), and syllable-timed prosody (Roach, 1982; Crystal, 1995). Its vocabulary includes large numbers of loanwords.

The variety of Hungarian discussed here is what Nádasdy (1985) defines as Educated Colloquial Hungarian (ECH), which is typically used by the university- and academic secondary school-based populations that are most likely to study Chinese, and which differs somewhat from Standard Literary Hungarian and various types of non-standard speech.

Chinese is a Sino-Tibetan language used mostly in mainland China, Taiwan, Hong Kong, Macau, and Singapore. In terms of the number of speakers, it is undoubtedly the "largest" language on the planet, being spoken by about one fifth of the population of the world. Not surprisingly there are many, more or less distinct, varieties of Chinese (see e.g. Li (1972) and Norman (1988) for the division of these varieties into main groups). Whether these dialects, many of which are not mutually intelligible, should be regarded as separate languages is perhaps more of a political than a linguistic question and as such will not be discussed here. Two major varieties are most often taught as second or foreign languages outside China: Standard Chinese and Cantonese; the former is far more common. Standard Chinese is known as 普通话*pǔtōnghuà* 'common spoken language', and is officially regarded as the common language of China, which means that it is taught in the schools and employed in all governmental and official transactions. It is based on the Northern varieties, with the Beijing phonological system as its norm of pronunciation and the modern vernacular literary language as its syntax specification. It has other names such as 国语*guóyǔ* 'national language', 汉语*hànyǔ* 'Han language', 中文*zhōngwén* 'the language of China', and so on. Henceforth, we will refer to *pǔtōnghuà* 'common language' with the term 'Chinese', unless explicitly said otherwise.

While Hungarian is agglutinating, Chinese is an analytic, isolating language. It also differs radically from European languages in its character-based writing system and in the existence of phonemic tones: the first, the second, the third and the fourth. For a more detailed description of tones, see section 2.3.1. Below.

3 The contrastive analysis of the phonological systems of Hungarian and Chinese

The following section provides a comparative phonological analysis of Hungarian and Chinese, noting both similarities and differences between the two languages, with particular reference to points where differences are likely to lead to real problems for Hungarian learners. The analysis begins with broad, systemic differences and continues with the detailed examination of specific consonants, vowels and suprasegmental features.

At a general level, five broad systemic differences may be observed. The first and most obvious of these is the fact that Chinese is a tonal language in which the rising, falling, falling-rising or steady pitch of individual syllables regularly carries lexical, and sometimes grammatical, meaning – a feature which is completely absent from Hungarian. The second systemic difference is that Hungarian makes use of the voiced-voiceless contrast among consonants, where Chinese does not, while Chinese uses the aspirated-unaspirated contrast among consonants where Hungarian does not. The third is that vowel length is contrastive in Hungarian but not in Chinese. The fourth is that Hungarian includes phonemic oppositions between the mid-high vowels [ɛ, o, ø], and lacks [ə, ɤ], while in Chinese all of the mid-vowels [e, ɛ, o, ə, ɤ] are allophones of a single phoneme.[3] The fifth systemic difference is that unlike Chinese, Hungarian in general lacks genuine semi-vowels, and thus opening/falling diphthongs (Siptár & Törkenczy, 2000: 16)[4].

We will now consider individual speech sounds, starting with the consonants, which are first described language-by-language and then compared with reference first to their place of articulation and then to their manner of articulation. We will then move on to vowels, categorized as high, mid- and low, then to syllable structure, and finally to the suprasegmental areas of stress and intonation.

Except where otherwise specified, the descriptions of Hungarian phonological features in the rest of this chapter are based on Siptár & Törkenczy (2000)[5], while the descriptions of Chinese phonological features are based on Huang and Liao (1991).

3.1 The contrastive analysis of consonants in Hungarian and Chinese

Detailed tables of Hungarian and Chinese consonants based on Siptár & Törkenczy (2000) and Huang & Liao (1991) respectively are provided in appendices A and B. Briefly, the Hungarian consonant system includes twenty-four items: p, b, t, d, ty, gy, k, g, f, v, sz, z, s, zs, h, c, cs, dzs, m, n, ny, l, r, j (ly), in phonetic transcription: [p, b, t, d, c, ɟ, k, g, f, v, s, z, ʃ, ʒ, h, ts, tʃ, dʒ, m, n, ɲ, l, r, j]. Among them, there are nine pairs of consonants in which each pair shares exactly the same articulatory place, the only difference between members of each pair being whether they are articulated with or without the vibration of the vocal folds. The ones which are articulated with the vibration of the vocal folds are named "voiced" consonants, and those articulated without the vibration of the vocal folds are "voiceless". The nine pairs are shown in the following table. We will discuss specific classifications of all the consonants later in this section.

Table 1: Hungarian voiced and voiceless consonants

The Chinese consonant inventory consists of twenty-two items; they are as follows: b, p, m, f, d, t, n, l, g, k, h, j, q, x, zh, ch, sh, r, z, c, s, ng; in phonetic transcription: [ɓ, p^h, m, f, ɗ, t^h, n, l, ɠ, k^h, χ, tɕ, $tɕ^h$, ɕ, tʂ, $tʂ^h$, ʂ, ʐ, ts, ts^h, s, ŋ]. They can be incorporated into different categories in terms of manner and place of articulation. In contrast to the Hungarian consonant system, lexical voiced/voiceless pairs do not exist in Chinese, but there are unaspirated/aspirated pairs. Members of each pair share exactly the same place of articulation; the main difference between them is whether they are articulated with or without extra airstream. In each pair the one which is articulated with extra airstream is named the "aspirated" consonant; the one which is articulated without is the

[3] The question of how many different mid-high vowels there are in Standard Chinese, and whether they are all allophones of a single phoneme has for long been a matter of dispute – here we accept Xu's (1980: 194) analysis as correct. For some discussion, see for example Duanmu (2000: 39ff).

[4] There are exceptions: a limited set of recent loan-words such as "auto", which sometimes preserve the diphthongs used in their original languages.

[5] Note that Siptár & Törkenczy do not treat 'dz' as an independent consonant, but merely as the d + z cluster.

"unaspirated" consonant. The six pairs of unaspirated/aspirated consonants are shown in the following table. More details of categories will be discussed later in this section. The distinction between "fortis" (pronounced with tense muscles of the oral cavity) and "lenis" (pronounced with lax muscles) articulation is also an important feature of the apirated~unaspirated pairs.

Table 2: Chinese unaspirated and aspirated consonants

Contrastive analysis of consonants in Hungarian and Chinese by place of articulation

Labials

The Hungarian labials are [b, p, m, f, v], the nearest Chinese equivalents being [b̥, p^h, m, f]. In other words, both languages have bilabials and labiodentals, with no notable articulatory difference. However, the second systemic difference mentioned above applies: Hungarian distinguishes between voiced and voiceless unaspirated semi-fortis consonants while Chinese distinguishes between voiceless aspirated fortis and unaspirated lenis, and while Hungarian contrasts the voiced and voiceless fricatives [f, v], Chinese has only the voiceless [f].

Dental / alveolar stops

The Hungarian alveolar stops are [d, t, n, l], the nearest Chinese equivalents are [d̥, t^h, n, l]. In other words, both languages have dentialveolars, with no significant articulatory difference. However, the same systemic difference applies as with labials: Hungarian distinguishes between voiced and voiceless unaspirated semi-fortis consonants while Chinese contrasts voiceless aspirated fortis and unaspirated lenis. One particular feature of Chinese that Hungarian learners find hard to master is the fact that in Chinese [n] is pronounced slightly differently when it is in final position, but this does not normally give rise to confusion or cause any loss of comprehensibility.

Alveolar affricates and fricatives

The same systemic difference applies here too: Hungarian with [ts, s] contrasts voiced and voiceless unaspirated semi-fortis while Chinese with [ts, ts^h, s] contrasts voiceless unaspirated lenis and aspirated fortis.

Palatals

Unlike the speech sounds discussed so far, palatals present relatively serious difficulties for Hungarian learners of Chinese because both languages have two specific articulatory regions here with completely different places (and manner) of articulation. Hungarian contrasts palato-alveorals (or laminal palatals) [tʃ, dʒ, ʃ, ʒ] with (dorso-)palatals [c, ɟ], while Chinese contrasts alveolar-palatal doubly articulated[6] (*apda*): [tɕ, $tɕ^h$, ɕ] with retroflex [tʂ, $tʂ^h$, ʂ, ʐ]. Problems arise because Hungarian learners tend to associate (or even equate) Chinese retroflexes with Hungarian palato-alveolars, and Chinese *apda*'s with Hungarian dorso-palatals.

Velars

In the case of velars the place of articulation is identical in the two languages, though once again the second systemic difference mentioned above applies: Hungarian contrasts the voiced and voiceless unaspirated semi-fortis [g, k], while Chinese has the voiceless unaspirated lenis vs. aspirated fortis [g̊, k^h]. Problems may arise with the Chinese [ŋ], because although this sound occurs in the native speech of Hungarian learners it does not usually appear in isolation but is "completed" with a [g]. If they are unaware of this fact, when speaking Chinese they are

[6] '[A]pico-anterodorsal or lamino-anterodorsal alveolo-palatal' in Lee & Zee's (2003) terminology, 'alveolo-palatal' in Lin (2007). The complex term used here (and abbreviated as '*apda*') is our own coinage, and purports to be more helpful in teaching the articulation of this sound.

likely to pronounce two separate phonemes in the sequence [ŋg] or even [ng] when [ŋ] would be correct. Their attention must be drawn to this, and appropriate practice needs to be provided, so that they can begin to learn to pronounce the various sounds in isolation when necessary.

Postvelars

In this case there is a marked difference between the Hungarian glottal-laryngeal [h] and Chinese uvular approximant [χ][7] (though in several Chinese dialects such as Shanghainese, the 'velar' fricative is actually much like Hungarian glottal [h]). It is certainly worth drawing the Hungarian learner's attention to the difference, but in practice there is relatively little perceptible difference and no confusion arises when s/he replaces [χ] with [h].

Contrastive analysis of consonants in Hungarian and Chinese by manner of articulation

The stop/affricate 'pairs'

Here the second systemic difference applies again: in Chinese the usual opposition is between an unaspirated lenis (rather like a voiceless variant of the English voiced stops) and an aspirated fortis. Both are clearly voiceless, though they may become voiced in certain phonetic environments, especially in toneless/unstressed syllables, e.g.: 的 [d̥i] → [d̥ə] → [də]). In Hungarian there is no such fortis/lenis difference between members of these pairs: both have a medium degree of tenseness ('semi-fortis'), and no aspiration, but there is a clear voiced/voiceless distinction. Hungarian learners tend to equate Chinese unaspirated lenis consonants with the semi-fortis voiceless ones that occur in Hungarian. In practice, this does not often lead to serious problems, as although aspiration is completely absent from Hungarian, if Hungarian learners are made aware of this feature they can easily perceive and reproduce it. The use of *pinyin* can cause problems here, as the letters used in *pinyin* to denote voiceless unaspirated lenis stops and affricates actually denote voiced consonants in Hungarian. Learners need to be made aware of this; they also need to learn to pronounce the Chinese unaspirated lenis consonants with lax muscles.

The semi-vowels, functioning as rime- initial/final glides.

Chinese has three such items: [j, w, ɥ], all of which appear in rime initial position, though only the first two also appear rime-finally. Only one of these, [j] is found in Hungarian with the status of a proper consonant, having a voiceless allophonic variant [ç] in voiceless contexts ([–voice] _ [–voice] or [–voice] _ #). Hungarian learners therefore need to be introduced to the glide variants of the full vowels [u] and [y], ([w] and [ɥ], respectively). The [w] sound usually causes fewer problems, since a similar semi-vowel exists in English (the most frequently learned foreign language in Hungary), though it must be noted that the Chinese [w] and English [w] are not identical.[8] The [ɥ] sound, with no easily available equivalent, is somewhat more difficult. Hungarian learners need to beware of the common temptation to replace these glides with the corresponding full vowels ([i, u, y]), resulting in vowel-sequences instead of diphthongs in these rhymes.

3.2 The contrastive analysis of vowels in Hungarian and Chinese

[7] Again, it is both a matter of dispute, and of dialect- and speaker-level variation, whether this is really and always an uvular aproximant [χ] (e.g., Chao 1968, Pulleyblank 1984), or a velar fricative [x] (Duanmu, 2000; Lee & Zee, 2003), but whichever sound one perceives, or whichever description one subscribes to, it is certainly rather different from Hungarian glottal-laryngeal [h].

[8] Chinese [w] is more vocalic in nature, more like a brief but properly articulated [u], whereas English [w] is more consonant-like, and often also has a secondary velar articulatory trait which is absent from its Chinese 'counterpart'.

Detailed tables of Hungarian and Chinese vowels based on Siptár & Törkenczy (2000) and Huang & Liao (1991) respectively are provided in appendices C and D. Briefly, there are fourteen vowels in Hungarian. The vowel inventory of Hungarian consists of a, á, e, é, i, í, o, ó, ö, ő, u, ú, ü, ű; in phonetic transcription: [ɔ, aː, ɛ, eː, i, iː, o, oː, ø, øː, u, uː, y, yː]. A phonetic classification of the Hungarian vowel system is shown in the following table, which is classified in terms of the duration of vowels.

Table 3: Hungarian short and long vowels

According to the relative position (front or back) of the body of the tongue in the mouth during articulation, here we also roughly divide them into two groups; see the following table. More specific classifications will be discussed later in this section.

Table 4: Hungarian high and low vowels

Huang and Liao (1991) list thirty-nine finals in Chinese language. According to the number of vowels and with or without a nasal consonant, they can be divided into four groups as follows:

monophthongs (10): a [a], o [o][9], e [ɤ], ê [ɛ][10], i [i], u [u], ü [y], -i [ɿ][11], -i [ʅ][12], er [ɚ];

diphthongs (9): ai [aj], ei [ej], ao [ɑʊ], ou [oʊ], ia [ja], ie [jɛ], ua [wa], uo [wo], üe [ɥɛ];

triphthongs (4): iao [jɑʊ], iou [joʊ], uai [waj], uei [wej];

nasal finals (16): an [ɑn], en [ən], ian [jɛn], uan [wɑn], üan [ɥən], in [in], uen [wən], ün [yn], ang [ɑŋ], iang [jɑŋ], uang [wɑŋ], eng [əŋ], ing [iŋ], ueng [wəŋ], ong [ʊŋ], iong [jʊŋ].

In the traditional way, the final is divided into a medial, a main vowel and a final/ending. Not every syllable has a medial or an ending, only the main vowel is obligatory. To take 普通话*pǔtōnghuà* ‘common spoken language’ and 想*xiǎng* ‘think’ as examples, the details are shown on the table:

Table 5: Chinese medial, main and final vowels

The contrastive analysis of monophthongs in Hungarian and Chinese

[9] This sound occurs lexically only in interjections.

[10] This sound occurs lexically only in interjections.

[11] This sound only occurs after apico-dental affricates or fricatives.

[12] This sound only occurs after retroflex consonants.

There are fourteen monophthongic vowels in Hungarian and ten in Chinese.

A pair of vowel charts (based on the "quadrilateral" or "trapezium" method of depiction devised by the British linguist Daniel Jones (1917)) can be used to present every vowel both in Hungarian and Chinese. Note that high vowels are at the top and low vowels at the bottom, back vowels are on the right and front vowels on the left. A contrast between rounded and unrounded vowels in the same position cannot be easily represented: they appear in the same position on the chart.

Figure 1: Vowel charts of Mandarin Chinese (left) and Hungarian (right)

In order to further analyze the phonological systems of Hungarian and Chinese, it will be useful to present a comparative table of the vowels of these two languages, based on Huang & Liao, (1991) and Siptár & Törkenczy (2000).

Table 6: Comparison of vowels in Hungarian ("H") and Chinese ("C")

We will now describe the salient differences in detail.

High vowels

Hungarian has [i, y, u, iː, yː, uː]; while Chinese has [i, y, ɿ, ʅ, u]. The issue of vowel length has been mentioned earlier as a systemic difference between the two languages, and will be further discussed below. Apart from this feature, [i, y, u] are exactly alike in the two languages. Chinese [ɿ, ʅ] are different, but they are easily perceived as being different from both [i] and [y] by Hungarian learners, and it is important to teach such learners that in order to pronounce them properly the tongue must simply be kept in the same position as when the preceding consonant (alveolar and retroflex, respectively) is pronounced.

Mid vowels

Hungarian has [ɛ, ø, o, eː, øː, oː], while Chinese has [ɛ, e, o, ʊ, ɤ, ə]. Some of these are very similar; for example Hungarian [ɛ], as in *hülyé* 'idiot' corresponds to Chinese [ɛ] in the rhyme *-üe*, as in 月 [y ɛ] 'moon', and Hungarian [o], as in *por* 'dust' to Chinese [o] in a rhyme like *-uo*, as in 多 [d̥ʊo] 'many' (disregarding vowel length), but there are some key differences and problems here. First of all, the vowel of the *-ong* rhyme "falls halfway" between Hungarian [o] and an [u] (IPA [ʊ]). Hungarians tend to perceive it as [u], though once they have been made aware of the difference they usually have little difficulty in pronouncing the Chinese sound. On the other hand, [ɤ] can cause serious problems: Hungarians usually perceive it as something close to their own [ø] sound, but in fact the two sounds are very different: the front rounded [ø] is quite unlike the back unrounded [ɤ], and once Hungarian learners fall into the habit of pronouncing [ɤ] as [ø], it is probably the hardest vowel mispronunciation to correct.

Low vowels

Hungarian has [ɔ, aː][13], while Chinese has [a, ɑ]. Hungarians tend to equate both Chinese [a] and [ɑ] with their own [aː] in Hungarian, and this causes no problems in understanding as the difference is relatively small, and there is no chance of confusion with any other phoneme: the issue has more to do with the esthetics of pronunciation. Hungarians are also often familiar with [a] because of their knowledge of foreign languages where it occurs and because of its presence in loan-words that have become part of their own language. Another possible problem is

[13] Note that in present-day Hungarian [ɔ] tends towards being pronounced with less lip-rounding as [ɒ].

equating Chinese [ɑ] (as in 王 [wɑŋ] 'king') with Hungarian [ɔ]. This, again, results in "ugly" pronunciation, but not in misunderstanding.

Vowel length

One of the main systemic differences between Hungarian and Chinese, mentioned above, is that in the former vowel length is contrastive (compare, for example, *tör* [tør] 'break' with *tőr* [tøːr] 'dagger'). In Chinese, vowel length carries no meaning and is purely derivative: a vowel is long if and only if it is a syllable-final monophthong in a stressed syllable. Although this may be considered a major difference, and can be expected to cause communication problems for Chinese speakers learning Hungarian, it does not cause such difficulties for Hungarians learning to speak Chinese: most long Chinese vowels exist in Hungarian as well: [iː, yː, oː, uː], the two exceptions being [ɤː], and [aː]. The former needs to be practised, especially since its short form is also difficult for Hungarian learners, as already mentioned.

Syllable-initial vowels[14]

The last "individual sound difference" to be noted is that concerning syllable-initial high vowels ([i, y]), where the syllable does *not* begin with a consonant (声母). In Standard Chinese the pronunciation of such vowels begins with 'smooth' initiation: the closing of the glottis is simultaneous with the launching of the airflow, while many Hungarians initiate such syllables in a more abrupt fashion (glottal attack: the glottis closes *before* the launch of the airflow).[15] This explains why many Hungarian learners are liable to hear an initial [j] in syllables like *yi* [iː] or *yu* [yː], as if they were *[jiː],*[jyː], and it should be noted that *pinyin* spelling reinforces this confusion, denoting the 'smooth' initiation with an extra letter: *y-*. The situation is rather similar for syllables like *wu*, which are erroneously perceived by Hungarian learners as *[wuː] (and occasionally even reproduced as *[vuː]), instead of [ʷuː]. However, although this represents a distinct difference, it seldom leads to actual miscomprehension. Note, also, that mid and low vowels are initiated less smoothly in Chinese, too, and may optionally begin with glottal attack, often represented as an initial glottal stop in phonetic transcription.

The contrastive analysis of compound vowels in Hungarian and Chinese

As we mentioned before, there are thirteen compound vowels in Chinese: nine dipthongs and four triphthongs. Strictly speaking, standard Hungarian has continuous vowels, but not normally compound vowels, although diphthongs do appear in some loan-words. 'Compound vowel' and 'continuous vowel' are totally different concepts. A compound vowel is a part of a syllable and cannot be divided. For example, in words like 好*hǎo* 'good', 有*yǒu* 'have/exist', 家*jiā* 'home', *ao* [ɑʊ], *ou* [oʊ] or [əʊ], and *ia* [ja] are compound vowels. A continuous vowel occurs when two vowels appear side by side in a sequence and can be divided into two syllables. For instance, Hungarian *tea* [te.ɔ]/[teʲɔ] 'tea', *piac* [pi.ɔc]/[piʲɔc] 'market', *diák* [di.aːk]/[diʲaːk]'student', *fiatal* [fi.ɔ.tɔl]/[fiʲɔ.tɔl] 'young' can be divided into syllables, *te-a*, *pi-ac*, *di-ák*, *fi-a-tal* respectively. The pronunciations of a compound vowel and a continuous vowel are also different. Take [i.a] for example, as a continuous vowel, "i" and "a" both keep their own characteristics as full vowels, the durations of the two sounds are the same. As a compound vowel, [i] and [a] cannot be divided. In a single syllable, when [ia] = [ja] is pronounced, the position of tongue slides from [i] to [a], and the durations of the two sounds are not the same: [i] is short and weak, [a] is long and strong. Note that there are three types of compound vowels in terms of the position of the main vowel: falling diphthongs, rising diphthongs and middle-rising triphthongs with a main vowel in the middle, as shown in the following table:

[14] We are indebted to Andrea Deme (Research Institute for Linguistics, Hungarian Academy of Sciences) for a very thorough discussion of this subsection. Note, though, that these passages do *not* represent her views.

[15] See Seikel at al. (2010) and Gósy (2004) for a general overview on possible initiations.

Table 7: Compound vowels in Chinese

The differences between a continuous vowel and a compound vowel are illustrated in the following table.

Table 8: Compound and continuous vowels

3.3 Tones in Chinese

The four tones

Before we move on to the comparison of syllable structures in Hungarian and Chinese, it is worth considering syllabic tone, a well-known characteristic of Chinese (and of many other languages) which does not exist at all in Hungarian. Not surprisingly, syllabic tone causes severe difficulty to Hungarian learners, as it does to the speakers of any non-tone language.[16] Conscious knowledge about the nature and functioning of tone is usually not problematic: the phenomenon is quite easy to describe and to understand; but recognising and interpreting tone when listening to Chinese speech and, to an even greater extent, producing tone automatically and accurately when speaking, are skills which require a great deal of effort to acquire.

Tone, which pertains to the entire syllable and may distinguish meanings (i.e., is phonemic), is primarily characterized by voice pitch contour, although length and intensity also play a role in its perception. There are four regular tones in the standard Chinese language: the first tone (or *Yīnpíng* 阴平*)*, the second tone (or *Yángpíng* 阳平), the third tone (or S*hǎngshēng* 上声) and the fourth tone (or *Qùshēng* 去声).

Chao (1983) devised the following system for describing the four tones (the "neutral tone" or *Qīngshēng* 轻声 will be discussed separately):

Pitch is plotted on a vertical scale which covers the normal voice (pitch range) of a speaker. The scale is divided into five points, such that 1 shows the lowest point (the lower limit of a speaker's normal pitch range) and 5 the highest (the upper limit of a speaker's normal pitch range); 3 is mid pitch, 2 half-low and 4 half-high. From 1 to 5 means from the lowest to the highest. A tone can be described by indicating its beginning and ending point, while if it is a falling-rising tone, the point dividing the falling and rising stretches is also indicated. The four tones can be described as follows:

The first tone, T1 (also called *Yīnpíng*, or high level) is at a continuous high level. The value of tone in Chao's system is 55, which means it starts at point 5 and ends at the same level 5. In *pīnyīn* the diacritical mark of the first tone is ¯.

The second tone T2 (also called *Yángpíng* or high rising) is at mid-to-high level. The value of tone in Chao's system is 35, which shows it begins at mid pitch 3, and then rises to the highest pitch 5. The diacritical mark of the second tone is ´.

The third tone T3 (also called *Shǎngshēng* or rising tone) begins at the half-low point 2 and falls to the lowest level 1, then rises to the half-high level 4. The value of the tone in Chao's system is therefore 214 and its diacritical mark is ˇ.

The fourth tone T4 (also called *Qùshēng* or departing tone) starts at the highest level and falls to the lowest. The value of tone is therefore 51 and its diacritical mark is `.

[16] And for that matter also for speakers of tone languages where tone is not a syllabic phenomenon.

The following table shows the details of the four tones:

Table 9: The four main syllabic tones in Chinese

They may be represented graphically, as in the following figure, where they are exemplified by the four different words *mā* (mother妈), *má* (numb麻), *mǎ* (horse马) and *mà* (scold骂):

Figure 2: Graphical representation of the four tones

The "neutral tone" or *Qīngshēng*

The "neutral tone" or *Qīngshēng* is a somewhat controversial feature. In Huang & Liao (1991) argue that *Qīngshēng* should not be regarded as the fifth tone, but rather as the weakened form of tones. In fact, *Qīngshēng* cannot exist in an independent syllable on its own; it occurs only in combinations of syllables such as words or phrases, and it does not have a lexically fixed pitch. According to Huang and Liao (1991:158): "Generally speaking, the *Qīngshēng* which occurs after a third tone (or *Shǎngshēng*) usually has relatively high pitch (at point 4 in the pitch range), the one that follows a first (*Yīnpíng*) or second (or *Yángpíng*) tone has relatively lower pitch (at point 2 or 3, respectively), and the one that appears after a fourth tone (or *Qùshēng*) therefore has the lowest pitch (at point 1)."[17]

Huang and Liao also list the categories of morphemes in which *Qīngshēng* occurs, which are as follows:

- Particles "的 *de*, 地 *de*, 得 *de*, 着 *zhe*, 了 *le*, 过 *guo*" and interjections "吧 *ba*, 嘛 *ma*, 呢 *ne*, 啊 *a*";
- Non-initial elements in reduplicated words, as in "娃娃 *wáwa*, 弟弟 *dìdi*, 看看 *kànkan*, 玩玩 *wánwan*";
- Word suffixes like "子 *zi*, 头 *tou*"and the word "们 *men*", which indicates plurality;
- Words which indicate directions such as "来 *lai*, 去 *qu*, 起来 *qǐlai*, 下来 *xiàlai*";
- The measure word "个 *ge*";
- Orientation morphemes or words which occur after nouns or pronouns;
- The second syllable in some very commonly used bisyllabic words is customarily uttered with *Qīngshēng*.

Qīngshēng (in opposition with any/all of the four primary tones) can carry semantic value. For example, 东西 *dōngxī* means "east" and "west", but东西 *dōngxi* (with *Qīngshēng* on the second syllable) refers to "thing".

The importance of tone in both the receptive and the productive use of Chinese is indicated by the existence of the four words used in the preceding figure (*mā 妈*, *má 麻*, *mǎ 马* and *mà 骂*), which have completely different meanings and are distinguished only by their syllabic tones. Nor should we forget that there is yet another "ma吗", the *Qīngshēng* version without a tone, which does not occur in isolation but can be added to the end of a declarative

[17] The translation is ours.

sentence to make it into a question.[18] It is not difficult to find examples of minimal pairs distinguished by tone, such as: *mǎi huà* 买画（to buy paintings）and *mài huā* 卖花（to sell flowers); *dōngxi* 东西（things) and *dōngxī* 东西 (east and west); or *jiéshù* 结束 (to finish) and *jiè shū* 借书 (to borrow books).

Sandhi (*biàndiào* 变调)

As we have seen, standard Chinese has four tones: the first tone (or *Yīnpíng)*, the second tone (or *Yángpíng*), the third tone (or S*hǎngshēng*) and the fourth tone (or *Qùshēng*). Generally speaking, a Chinese syllable corresponds to a Chinese character, so as Huang and Liao (1991) point out, tones are also called "character tones (*zìdiào*)". However, as Huang and Liao also note, single tones affect each other in words, phrases and sentences. This phenomenon is called "sandhi" (*biàndiào*). Sandhi (*biàndiào*) takes various forms, including: sandhi of *Shǎngshēng*, sandhi of *Qùshēng*, sandhi of "一 *yī"* and "不 *bù*", sandhi of reduplicated adjectives. The first type can be illustrated with the example of the greeting phrase 你好 *nǐhǎo* 'hello'. Both of the words in the phrase carry a lexical third (or S*hǎngshēng*) tone, and in isolation they are pronounced accordingly. But when they are combined in the greeting phrase the sandhi effect causes the word *nǐ* to be pronounced with the second tone instead: *ní*. For *Qùshēng* sandhi, in the combination of *Qùshēng* syllables, such as 介绍 *jièshào* 'introduce', the actual value of the tone on the first syllable *jiè* should be 53, rather than 55. The nature of sandhi is not particularly difficult to explain to learners; and common expressions where it occurs (such as你好 *nǐhǎo*) are not particularly difficult to learn. Applying it systematically in general conversation is much harder, but it could be argued that sandhi problems cannot really arise until the learner has mastered the basic syllable tones, so sandhi is unlikely to be an immediate priority for CFL teachers and learners.

3.4 The contrastive analysis of syllable structure in Hungarian and Chinese

Syllable structure in Hungarian and Chinese

The syllable is the basic unit of a phonotactic system. The sequence of one or more phonemes constitute a syllable.

A Hungarian word can be divided into syllables, each of which contains a vowel. In other words, how many syllables a word contains is decided by how many vowels it has. A syllable which ends with a vowel is defined as an open syllable, such as, *ceruza* 'pencil', *zene* 'music', *ajtó* 'door', etc. And a syllable which ends with a consonant is called a checked syllable, for example, *igen* 'yes', *vonat* 'train', *kövér* 'fat', etc. A syllable can consist of a vowel, or a vowel and a consonant, or a vowel and several consonants. There are no words in Hungarian which do not contain at least one vowel.

A Hungarian syllable can contain an onset, a nucleus, and a coda. The onset is not compulsory; therefore, both vowel-initial and consonant-initial syllables are possible. Disregarding the possible complexity of the onset, the nucleus and the coda, the basic types of Hungarian syllable are as follows:

Table 10: Syllable patterns in Hungarian

[18] Note that even so, the rate of morphemic homophony is rather high in Standard Chinese: usually there are several morphemes with identical segmental AND tonal content for each possible syllable.

The above table reveals that in Hungarian:

(1) Any type of syllable can occur in any position in the word, no matter whether in initial, medial or final position.

(2) The distribution of long and short vowel syllables is the same in the word.

(3) Neither open syllables nor closed syllables are restricted to word-final position.

Note that the examples listed above are polysyllables; monosyllables also exist in Hungarian, such as *ír* 'to write', *jó* 'good', *és* 'and', *nap* 'day', *fal* 'wall' etc. In addition, besides the four basic syllable types, there are some other extra types due to the existence of consonant clusters. Two-member and three-member consonant clusters occur in word-initial position, too.

Chinese is a monosyllabic language, where almost every syllable corresponds to a morpheme. A syllable consists of an initial, a final and a tone. The initial is the consonant which is at the beginning of the syllable. For example, the word 普通话 *pǔtōnghuà* has three syllables, the initials of which are p, t, and h, respectively. Chinese has twenty-two consonants, all of which can occur as initials except for [ŋ], which can only be used as a coda, as in 听 *tīng* [tʰiŋ] 'listen', 中 *zhōng* [tʂʊŋ] 'middle' and so on. In other words, there are twenty-one consonantal initials in Chinese. There are syllables which have no consonant as an onset; they are defined as "zero-initial syllable". For instance, 爱*ài* [aj] 'love' or 儿 *ér* [ɚ] 'son'. Note that in *pinyin* the letters *y* and *w* only occur at the beginning of a zero-initial syllable, as in 一*yī* [iː] 'one', 五*wǔ* [ʷuː] 'five', or 要 *yào* [jɑʊ] 'will, want', so they either just mark 'smooth initiation' of the main vowel (see 2.2.3. above), or encode a rhyme-initial glide, but they do not represent initials.

The final is essentially the segmental material of the rhyme, i.e., the rhyme minus the tone. A final can be a single vowel or can consist of a vowel complex, i.e., a diphthong or a triphthong – see both cases illustrated in the word 老鼠 *lǎoshǔ* [lɑʊ.ʂuː] 'mouse'. There is only a single vowel [u] functioning as the final in the syllable 鼠 *shǔ,* while there is a diphthong [ɑʊ] in the final in the morphosyllable 老 *lǎo*. Some finals contain a consonant in coda position, as in the two syllables of 冬天 *dōngtiān* [ʈʊŋ.tʰjɛn] 'winter', where the finals contain the consonants [ŋ] and [n], respectively.

The various types of syllable structure in Chinese can be roughly divided into two categories: with and without an initial. Then, according to the distribution of consonants and vowels, they can be classified as more detailed types. See the following tables[19]:

Table 11: Syllable patterns in Chinese (with initial)

Since zero-initial syllables exist in the Chinese phonological system, too, the types of syllable structure can also be as follows:

Table 12: Syllable patterns in Chinese (without initial)

Contrastive analysis of syllable structure in Hungarian and Chinese

[19] As above, "C" represents a consonant, "V" represents a vowel. "G" represents a glide, a shorter vowel that immediately precedes or follows the main vowel of a syllable.

From the introduction to syllable structure in Hungarian and Chinese presented above, we can make a contrastive table, comparing the available syllable structures in the two languages.

Table 13: Comparison of Hungarian and Chinese syllable patterns

The table presented above summarises the similarities and differences between syllable structure in Hungarian and Chinese. The main similarities are as follows:

(1) Both Hungarian and Chinese syllables can begin with a vowel.

(2) The two languages share some patterns of distribution of consonants and vowels, such as CV, V, VC, CVC, though it should be noted that the range of consonants that can occur in final position is far more limited in Chinese than in Hungarian.

(3) A vowel is normally obligatory in a syllable in both Hungarian and Chinese, though the latter language contains a few exceptions in the form of interjections which consist only of (syllabic) consonants, such as 嗯 *ng* [ŋ].

As for the differences, they are as follows:

(1) Chinese is a tone language while Hungarian is not. This is one of the most notable differences between these two languages. Every syllable in Chinese has a tone specified, even if this is the neutral tone (*qīngshēng*) described in 2.3.2 above.

(2) Compound consonants (consonant clusters) exist in Hungarian, where they can occur in initial, mid- or final position, but they are absent in Chinese.

(3) The maximum number of phonemes that a Chinese syllable can contain in a sequence is four (disregarding the non-linear tonemes), as, for example, in the CGVG and CGVC types; the minimum number of phonemes in a Chinese syllable is one, such as the V type. In Hungarian the number of phonemes in a syllable ranges from one (e.g. the V-type in *ó* “old”) to six or possibly even more, especially in loan-words with initial consonant clusters such as CCCVCC *sztrájk* [stra(:)jk] ‘strike’. The fact that Hungarian, like other European languages, has words with many syllables and consonant clusters is very often problematic for Chinese learners; the relatively simple nature of Chinese in this respect is an advantage for Hungarian learners.

3.5 Stress and intonation in Hungarian and Chinese

Stress in Hungarian and Chinese

Stress is a feature of pronunciation: it refers to the degree of force used in producing a syllable, realized as increased loudness and raised pitch level. In most languages two kinds of stress can be distinguished: word (or lexical) stress and sentence (or prosodic) stress. Every polysyllabic word when uttered separately may have its own stress pattern, which is called word stress, while in a sentence, some (relatively important) words are stressed and others are not. This phenomenon is therefore called sentence stress.

Concerning word stress in Hungarian, Siptár & Törkenczy (2000: 21) point out that "[i]n its citation form, a Hungarian word typically has a single primary stress, which falls on its initial syllable, no matter whether the word is simple (e.g. ***is***kola 'school') or derived (e.g. ***for***rósodik 'grows hot') or a compound (e.g. ***szé***nanátha 'hay fever')".

Meanwhile, there are two major types of stresslessness: spontaneous enclisis and stress eradication. The following examples which describe and compare these two types are from Kálmán & Nádasdy (1994):

(1) a. 'Géza 'táncolni *akar*

G. dance-to wants

"Géza wants to dance"

b. 'Géza 'táncolni *akar* a 'magas 'fekete 'lánnyal.

G. dance-to wants the tall black girl-with.

"Géza wants to dance with the tall black(-haired) girl"

c. 'Géza *bácsi*

G. uncle

"Uncle Géza"

d. 'Géza *bácsi* 'táncolni *akar* a 'magas 'fekete 'lánnyal.

G. uncle dance-to wants the tall black girl-with

"Uncle Géza wants to dance with the tall black(-haired) girl"

(2) a. 'Jenő 'táncolni *imád*

J. to-dance loves

"It is to dance that Jenő loves"

b. 'Jenő 'táncolni *imád* a magas fekete lánnyal.

J. dance-to loves the tall black girl-with

"It is to DANCE with the tall black girl that Jenő loves"

c. 'Jenő 'táncolni *akar*

J. dance-to wants

"It is to dance that Jenő wants"

d. 'Jenő 'táncolni *akar* a magas fekete lánnyal.

J. dance-to wants the tall black girl-with

"It is to DANCE with the tall black girl that Jenő wants"

In (1), the italicized words *akar*, *bácsi* are enclitic, they join the stress domain of the preceding word. The stress on *táncolni* eradicates the rest of the lexical stresses in its whole domain in (2). With regard to stress eradication, Siptár & Törkenczy (2000: 21) indicated that "two important facts about eradicating stress are that it need not be stronger than a non-eradicating stress; and that it cannot be followed by another stress within the same sentence unless that other stress is also of the eradicating type. A sentence with no eradicating stress is said to have flat prosody, corresponding to neutral interpretation; a sentence with eradicating prosody has a contrastive or emphatic interpretation."

Chinese is, as we have seen, a tone language. To some extent, tone is such a salient and distinguishable feature of the Chinese language that it is often classified as a non-intonation language. According to Jerry Norman's *Chinese* (1988: 148), "Some people […] apparently think that pitch cannot function at the lexical level (tone) and at the syntactic level (intonation) at the same time". This, as Norman points out, is of course not true: "In fact, in addition to tone, Standard Chinese possesses both stress and intonation" (ibid.).

The rule governing stress of Chinese words is relatively clear. As Luo & Wang (2002) point out, "in disyllabic words, there is a primary stress on the second syllable, and the first syllable is relatively light, except for those which end with a neutral tone", cf. 老师 *lǎoshī* [lɑʊ.'ʃʅ:] 'teacher', 汉语 *hànyǔ* [χan.'y:] 'Chinese language', 中国*zhōngguó* [tʂʊŋ.'ǧʊo:] 'China'[20]. Based on Luo and Wang's statement, Lu (2010) further indicates that "as for Chinese words or phrases which consist of three or more than three syllables, the primary stress is on the last syllable", as in 普通话 *pǔtōng**huà*** 'common language', 语言教师 *yǔyán jiào**shī*** 'language teacher', 中华人民共和国 *zhōnghuá rénmín gònghé**guó*** 'People's Republic of China'. The words or phrases which end with a neutral tone syllable are of course exceptions, because the primary stress is on the full-tone syllable closest to the neutral tone syllable on its left, for example, 妈妈 ***mā**ma* 'mother', 你好吗 *nǐ **hǎo** ma* 'how are you?', and 非常喜欢 *fēicháng **xǐ**huan* 'like very much'.

The primary stress mentioned above operates at lexical level and indicates a possible locus for sentence stress. Whether or not the syllable concerned actually contains marked stress in a sentence depends on syntactic structure and on intended meaning. In other words, it depends on the relative importance of a word. The more important a word is, the stronger its stress is. In Hungarian, content words such as nouns, adjectives, main verbs, adverbs, and demonstrative and interrogative pronouns are likely given more stress. Other categories of words like auxiliary verbs, conjunctions, prepositions, etc. are usually unstressed. The same is true of Chinese. When we speak Chinese, we tend to emphasize the content words including all the pronouns, by uttering them with more stress, but not the grammatical or function words.

Intonation in Hungarian and Chinese

Intonation plays a vital role in the appropriate use of spoken language. It has been defined in various ways, and may include pitch, volume, stress and rhythm; for our purposes we shall use a relatively simple definition: the way in which the speaker raises or lowers the pitch of the voice during speech, adding that we are using "intonation" to refer to phrase- or sentence-level rather than word-level patterns.

Intonation is an important way to express meanings and feelings. The same sentence with different intonations can convey very different messages. Mainly, the intonation of Hungarian has two types: falling tone and rising tone.

[20] Luo & Wang (2002: 156−157).

Specifically, the intonation of narrative sentences contains a falling tone. The intonation of wh-interrogative sentences usually contains a falling tone at the end of the sentence, and a primary stress accompanied by a rising tone on the interrogative word as well. The intonation of yes/no questions is more complicated: according to Siptár & Törkenczy (2000: 17) it "involves a rise-fall pattern (LHL) which spreads over the last three syllables provided that the major stress occurs on the antepenultimate (or earlier) syllable of the utterance. Thus, given a question whose focus is well before the third-last syllable, a bi-syllable final word will have a pitch on its initial syllable, whereas a trisyllable word will have one on its medial syllable".

As regards intonation in Chinese, briefly, there are two major types: falling and rising. With regard to the actual pitch of intonation itself, Jin (1992) distinguishes between high intonation, relatively low intonation and low intonation. But as far as the available patterns and actual significance of intonation are concerned, there are various views and opinions. According to the tone of comments, Chao (1929) divides Chinese intonation into as many as forty different types; Hu (1987) lists eight kinds of intonation according to the final pitch pattern of a sentence, defining them according to function as follows: *statements*, *questions*, *commands*, *imperatives*, *expressions of amazement*, *sighs*, invocations and *pauses preceding continuation*. Still working on a functional basis, Shen (1994) divides intonation into functional intonation and tone of comments intonation. Lin (2004) argues that Chinese intonation has two variables: pitch accent and boundary tone; he claims that only boundary tone plays the role of differentiating between questions and statements. Whether the first tone, the second tone, the third tone, or the fourth tone applies, the pitch pattern of a boundary tone in a question keeps its citation form.

Intonation of Chinese is, therefore, somewhat complicated. It shares the basic features of falling and rising pitch that are common to most languages, but the ways in which these operate are open to discussion. What makes intonation even more complicated in Chinese is the existence of syllabic tones. The relationship between tone and intonation is always a heated topic for linguists. As we know, tone and intonation are two different concepts. The former pertains to the syllable, and is primarily characterized by voice pitch, although length and intensity also play a role in its perception; the latter adds or refines meaning over stretches of speech including several words. To sum up, (1) the pitch is the determinant in both tone and intonation; (2) tone pertains to a syllable while intonation pertains to an utterance.

What, then, is the relationship between them? The most influential theory was put forward by Chao (1983), who used "small wave" and "big wave" as metaphors to describe tone and intonation, respectively. He proposed that the relation between tone and intonation is the algebraic sum of the "small wave" and the "big wave". Based on Chao's theory, Wu (1997) points out that the "algebraic sum" refers to the algebraic sum of register. In other words, the algebraic sum of "small wave" and "big wave" can be explained as the algebraic sum of the average pitch of tone and the average pitch of intonation; meanwhile, the shape of tone remains unchanged.

Although tone and intonation are independent concepts at an abstract structural level, in terms of actual pronunciation they are interrelated: intonation cannot be separated from tone; in fact, it is shown through the pitch movement of tone. On the other hand, within the intonation of an utterance, syllabic tones basically remain unchanged, but the register and tone shape are restricted by the intonation.

The semantic value of suprasegmental intonation becomes clear if we consider, for example, the difference between 今天是你的生日 *Jīntiān shì nǐ de shēngrì* 'Today is your birthday' and 今天是你的生日? *Jīntiān shì nǐ de shēngrì?* 'Is today your birthday?', in which the interrogative feature is indicated solely by intonation. Further examples of semantic differences carried by intonation are not difficult to find.

4 Contrastive analysis and difficulty

We will conclude this paper by considering the pedagogical implications of the preceding summary of phonological differences, the question being which of them deserve the most attention from teachers and learners of Chinese as a foreign language. One way to choose would be to use Prator's (1967) categorisation, which reflects a strong belief in the pedagogical value of contrastive analysis and ranks differences between languages according to the degree of

difficulty that they may be expected to cause to speakers of one language attempting to learn the other. [21] Prator defines six degrees, with 0 as the least problematic category and 5 as the most problematic.

Table 14: Categories of difference by level of difficulty, based on Prator (1967)

"Correspondence", referring to cases where there is no difference between the two languages and consequently no difficulty experienced by the learner, is ranked "0"; the "split" category, where a single item in the first language corresponds to two or more items in the target language, causes the most serious problems and comes at the top of the scale. Obviously the ranking of specific differences and similarities between languages depends on which language is "first" and which is "second": a problematic "split" from Hungarian to Chinese would correspond to a less problematic "coalescence" from Chinese to Hungarian and so on. It should also be noted that this is merely an ordinal, not an interval or ratio scale: it indicates for example that the "split" category is "more problematic" than the "new" category, but not "how much more problematic". Finally, we should also remember that the degree of difficulty experienced by the learner in recognizing and/or reproducing different sounds is not necessarily proportionate to the resulting problems in understanding or being understood by others. In cases where there is no risk of ambiguity the learner's inability to perceive differentiated sounds will hardly matter; his inability to produce sounds accurately will lead to "aesthetic" rather than communicative problems.

Evidently categories 0, 1 and 2 are unlikely to be the direct causes of phonological problems for learners; the following summary of the problematic cases identified in the previous sections will therefore focus on categories 3, 4 and 5, with reference both to receptive (perceptual) features and productive (active pronunciation).

4.1 Split

Vowels:

- The contrast between Hungarian [i] and Chinese [i, ɿ, ʅ]. Hungarian learners have little difficulty in recognizing the difference, and are generally aware of what they need to produce, but find it hard to actually do so. This may lead to awkward or "odd" pronunciation, but seldom causes misunderstanding.

- The contrast between Hungarian [a] and Chinese [a, ʌ]. Hungarian learners do have real difficulty in distinguishing between these, but the difference is neither phonemic nor salient in Chinese, so the difficulty is not likely to cause communication problems.

- The contrast between Hungarian [u] and Chinese [u, ʊ]. As with the previous item, this causes few problems because although Hungarians find it hard to differentiate, in Chinese the difference is neither phonemic nor salient.

Consonants:

- The contrast between Hungarian voiceless stops/affricates and Chinese aspirated and unaspirated pairs. This is relatively easy to distinguish, both in production and in perception, because of salience of the articulatory differences.

4.2 New

[21] Prator (1967).

Vowels:

- The Chinese [ɤ] is difficult for Hungarians to produce, and hard to distinguish from [ə]: it is very difficult to prevent (or stop) Hungarian learners pronouncing it like their own [ø]. However, since the two sounds are allophones in Chinese, no misunderstanding is likely to result.

- The Chinese retroflecized schwa [ɚ] is very difficult to master for Hungarian learners, who often replace it with the standard Hungarian sequence *[ør], as in *sör* 'beer'. However, this is not too serious as the resulting problems are aesthetic rather than communicational.

Consonants:

- Chinese Retroflexes are difficult for Hungarians to produce accurately, and hard to distinguish perceptionally from Hungarian palato-alveolars, but are easy to distinguish from any other place-of-articulation in Chinese.

- Chinese *apda* consonants are very difficult to produce, and to distinguish from Hungarian dorso-palatals, but, like retroflexes, easy to distinguish from any other place-of-articulation in Chinese.

- The Chinese uvular approximant [χ] is not difficult for Hungarians to perceive, but is somewhat difficult to produce. However, its usual replacement by Hungarians learners with [h] does not lead to confusion.

Semi-vowels, diphthongs:

- Hungarian normally lacks proper semi-vowels or glides, and (with very few exceptions) has no diphthongs. As a result Chinese diphthongs are often replaced with sequences of the corresponding full vowels in Hungarian learners' speech. This in itself does not cause confusion, and CFL teachers at Eötvös Loránd University in Budapest (ELTE) report that once the difference has been explained, their Hungarian students find it relatively easy to produce the requisite diphthongs.

Tones and syllable structure

- The very existence of syllabic tone falls into the "new" category because this feature is completely absent in Hungarian. Once a speaker of a non-tone language has become familiar with the notion of the Chinese tone system, further difficulties may be caused by the existence of neutral tones and sandhi.

- Chinese is a monosyllabic language where each syllable constitutes a single morpheme, while the majority of Hungarian morphemes contain more than one syllable. This might tempt Hungarian learners to split a Chinese syllable that contains a diphthong into a sequence of vowel sounds. CFL teachers at ELTE report that although the results may sound "odd", they do not lead to confusion during communication.

Stress and Intonation

- The existence of syllabic tone tends to obscure the importance of suprasegmental intonation, to the extent that some Hungarian learners may find it difficult to perceive both and may concentrate on producing accurate tones in their speech, at the expense of intonation. This can cause problems in communication, given that for example in certain cases the difference between a statement and a question may be indicated purely by intonation, without the use of a final "question word".

4.3 Reinterpretation

Vowels:

- The vowels [ɛ, e, o] exist as independent phonemes in Hungarian, while in Chinese they only have allophonic status (realizing one and the same morpheme: "–high, –low V") in a context-dependent fashion. (*Modulo* the other allophonic occurrence of [ɛ] realizing the phoneme "+low V" in the context 'i_n', as in the rhyme *-ian*: [jɛn]). This is likely to cause difficulties for Chinese speakers learning Hungarian, but not vice versa.

Consonants:

- The Hungarian palatal fricatives [ʃ, ʒ] have the Chinese retroflex fricatives [ʂ, ʐ] as their nearest equivalents. Hungarians tend to replace the Chinese sounds with these "counterparts" from their own language. The results may be "ugly", but are unlikely to cause confusion.

- The velar nasal [ŋ] exists in Chinese in its own right as a phonemic element, while in Hungarian it occurs only as an allophone of [n], most frequently in the sound sequence [ŋg]. Hungarian learners need to be careful to pronounce it as a "bare" [ŋ] and not as the full sequence *[ŋg]. Once again, however, failure to produce the appropriate sound will result in awkward speech, but not in misunderstanding.

5 Conclusion: Choice of phonological features for further consideration

In the previous sections of this chapter we surveyed the main phonological features of Chinese and Hungarian, considering consonants, vowels, tones and syllables separately, and analyzed the differences between the two languages in these areas. On the basis of this analysis it is possible to identify the phonological features of Chinese which, according to Prator's (1967) categorization, are theoretically likely to cause difficulties to Hungarian learners. Many teachers would be happy to use this approach, typical of traditional structuralist "grammar translation" or behaviorist language teaching methods. They would start with linguistic elements that can be regarded as "relatively easy", and once these elements have been acquired, use them as "building blocks" from which to construct the rest of the language. While superficially attractive, this approach suffers from a number of weaknesses. Intuitive judgments (especially by native speakers) about what is "relatively easy" and what is "relatively difficult" are notoriously unreliable. Even if they are accurate - or if we accept the basic notion that the greater the "distance" between corresponding elements of two languages, the greater the likely difficulty, and therefore adopt the scale that emerges from Prator's (1967) categories[22] described above, there is no guarantee that a progressive structural syllabus based on them will be effective. In this respect we need only consider what Dulay & Burt (1974) demonstrated about the striking differences between the natural order of the acquisition of morphemes in English as a Foreign Language and planned text-book sequences[23].

A different, learner-centered view, would be imply the need to start with the learners' own priorities and expectations, originating partly in generally available knowledge about the target knowledge or skills (what might be described as "hearsay evidence") and partly in personal experience. Considering the vital importance of individual motivation and attitudes in any learning process, this approach has much to recommend it; indeed, it has become a central pillar of the powerful humanistic ethos in education that reaches back to such great nineteenth-century figures as John Dewey, and beyond, and has more recently been successfully propagated by writers such as Carl Rogers (1969)[24]. To put it briefly in practical terms, a learner of Chinese (or anything else, for that matter), is unlikely to make much progress unless s/he believes that what s/he is expected to learn is worth the effort. However, this is not in itself a sufficient basis for a reliable language-learning program. The learner's choices may be unrealistic or partly mistaken, and it is part of the teacher's and/or material writer's task to direct, or at least to guide, the learner in this respect.

---

[22] Prator (1967).

[23] Dulay & Burt (1974: 37−53).

[24] Rogers (1969).

In attempting to do this, the teacher will probably find utilitarian considerations to be useful - instrumental motivation can be created and fostered by pointing out the practical value of what needs to be learned, and this leads us to the third criterion for choosing phonological features that deserve priority. The criterion may be summed up in the phrase "potential for communicative efficiency"; or in this case, since we are considering phonological differences that might cause difficulty, "potential for avoiding communicative confusion". A choice made on this basis fulfills both the need to cater for the learners' perceived needs and the institution's educational responsibility for ensuring that students graduate from ELTE with (at the very least) an efficient working command of Chinese.

Looking at the categorized list of differences given above, we find two that represent both potential learning difficulty and potential communicative inefficiency: syllabic tone and, closely linked to it, interference by syllabic tone in suprasegmental intonation. Both of them belong to the "new" category, and should therefore represent a roughly equal degree of difficulty from the point of view of the Hungarian learner. However, as we saw above, suprasegmental intonation in Chinese is a complex and debatable issue: experts recognize its existence, but do not always agree over how it should be defined and described, or over how it interacts with syllabic tone. In experimental phonetics it is also difficult to plot Chinese intonation separately from syllabic tone, and therefore to analyze it satisfactorily. Above all, although intonation can certainly carry meaning, it seems to be less pervasively significant than syllabic tone, which affects virtually all Chinese words and very often carries semantic value.

To sum up, there would seem to be a clear case for choosing syllabic tone as the feature of Chinese phonology that deserves the most attention from both teachers and learners.

Appendix A

Hungarian Consonants:

In terms of place of articulation and manner of articulation, consonants in Hungarian and Chinese can be classified into the following categories:

Table 15: Categories of Hungarian Consonants (based on Siptár & Törkenczy, 2000)

Chinese Consonants:

Table 16: Categories of Chinese Consonants (based on Huang & Liao, 1991)

Hungarian vowels:

The descriptions of the vowels in Hungarian are shown on the following table, based on Siptár & Törkenczy (2000)

Table17: Hungarian vowels according to lip-shape and tongue-position

Chinese vowels:

The descriptions of the vowels in Chinese are shown in the following table, which is based on Huang & Liao (1991):

Table 18: Chinese vowels according to lip-shape and tongue-position

Some of the items in the above table are positional variants (allophones), so for example the sounds [a] and [ɑ] are allophones of a single phoneme /a/;[25] likewise, [o, ɤ, e, ɛ, ə] together constitute a single allophonic system,[26] and [i, ɿ, ʅ] are also positional variants of a single phoneme /i/. Finally, the main vowel [ʊ] can also be economically regarded as an allophonic variant of [u]. The allophonic relations are summarized in the following table:

[25] Some authors also assume the existence of a third allophone of /a/: [ʌ], occurring in open syllables, as distinct from [a, ɑ] occurring before nasals or glides, and Xu (1980) lists as many variants as seven(!). Here we ignore this distinction as relatively insignificant – for some discussion see Duanmu (2000: 43-44).

[26] This is sometimes disputed (especially as regards the status of [o]), but their complementary distribution, as well as the fact that they are all (and in fact the only) non-retroflex mid-high vowels constitutes a strong argument in favor a single-phoneme analysis. Note though, that this also necessitates lexically constraining these rules to apply to word-classes *other than* interjections, because in the latter category [o], [ɤ] and [ɛ] are in contrast, in fact.

Table 19: Allophones of /a/, /e/ and /i/ in Chinese

Appendix B

Table 1: Hungarian voiced and voiceless consonants

voiced consonants	b, d, ɡ, v, z, ʒ, dʒ, ɟ
voiceless consonants	p, t, k, f, s, ʃ, tʃ, c

Table 2: Chinese unaspirated and aspirated consonants

Unaspirated consonants	b̥, d̥, ɡ̊, ts, tʂ, tɕ
Aspirated consonants	p^h, t^h, k^h, ts^h, $tʂ^h$, $tɕ^h$

Table 3: Hungarian short and long vowels

short vowels	ɔ, ɛ, i, o, u, ø, y
long vowels	aː, eː, iː, oː, uː, øː, yː

Table 4: Hungarian high and low vowels

front vowels	ɛ, eː, i, iː, ø, øː, y, yː
back vowels	ɔ, aː, o, oː, u, uː

Table 5: Chinese medial, main and final vowels

syllable	medial	main	final
pǔ		u	
tōng		ʊ	ŋ
huà	w	a	
xiǎng	j	ɑ	ŋ

Table 6: Comparison of vowels in Hungarian ("H") and Chinese ("C")

		Blade vowel					Retroflex-ed vowel	Apical vowel	
		Front		Central	Back		Central	Front	Back
		Unround-ed	Round-ed	Unround-ed	Unround-ed	Round-ed	Unround-ed		
High	H	i [i], í [iː]	ü [y], ű [yː]			u [u] ú [uː]			
	C	i [i]	ü [y]			u [u]		-i [ɿ]	-i [ʅ]
High-mid	H	é [eː]	ő [øː]			ó [oː]			
	C	e [e]			e [ɤ]	o [o], o [ʊ]			
Mid	H		ö [ø]			o [o]			
	C			e [ə]			er [ɚ]		
Low-mid	H	e [ɛ]				a [ɔ]			
	C	e [ɛ]							
Low	H			á [aː]					
	C			a [a]	a [ɑ]				

Table 7: Compound vowels in Chinese

compound vowel	**Members**	**Type**	**Explanation**
Diphthongs	ai [aj], ei [ej], ao [ɑʊ], ou [oʊ]	falling diphthong	The first V strong, the second is weak.
	ia [ja], ie [jɛ], ua [wa], uo [wo], üe [ɥɛ]	rising diphthong	The first V is weak, the second is strong.
Triphthongs	iao [jɑʊ], iou [joʊ], uai [waj], uei [wej]	middle-rising triphthong	The main V is in the middle, so the middle part is strong.

Table 8: Compound and continuous vowels

Name	**Tongue-position feature**	**Type**	**Loudness/Strength**
continuous vowel (H)	fixed	V V	equal
compound vowel (C)	slide	V v	not equal
		v V	

		v V v	

Table 9: The four main syllabic tones in Chinese

type of tone	**value of tone**	**shape of the tone**	**diacritic**	**examples**
The first tone T1 (*Yīnpíng*)	55	high level	¯	摸 *mō* 'touch', 星 *xīng* 'star'
The second tone T2 (*Yángpíng*)	35	high rising	´	桃 *táo* 'peach', 红 *hóng* 'red'
The third tone T3 (*Shǎngshēng*)	214	falling and rising	ˇ	马 *mǎ* 'horse', 水 *shuǐ* 'water'
The fourth tone T4 (*Qùshēng*)	51	high falling	`	坏 *huài* 'bad', 二 *èr* 'two'

Table 10: Syllable patterns in Hungarian

	Word-initial	Word-medial	Word-finial
CV	**ce.**ru.za (pencil) **Kí**.na (China)	fe.**ke**.te (black) vi.**lá**.gos (bright)	ka.to.**na** (soldier) sző.**lő** (grape)
V	**a**.pa (father) **í**.ró (writer)	fi.**a**.tal (young) i.di.**ó**.ta (idiot)	szi.**a** (hello) rá.di.**ó** (radio)
VC	**asz.**tal (table) **ér.**me (coin)	a.**or.**ta (aorta) ki.**ál**.tás (shout)	**is**.ten (god) di.**ák (**student)
CVC	**lec**.ke (lesson) **lám**.pa (lamp)	ke.**men**.ce (oven) ta.**nár.**nő (female teacher)	ti.**los** (forbidden) kí.**ván** (wish)

Table 11: Syllable patterns in Chinese (with initial)

Types of syllable structure	**Examples**
CV	妈 *mā* (mother); 米 *mǐ* (rice)
CGV	下 *xià* (below); 略 *lüè* (outline)
CVG	白 *bái* (white); 飞 *fēi* (fly)
CGVG	快 *kuài* (fast); 票 *piào* (ticket)
CVC	看 *kàn* (look); 很 *hěn* (very)
CGVC	脸 *liǎn* (face); 穷 *qióng* (poor)

Table 12: Syllable patterns in Chinese (without initial)[27]

Types of syllable structure	**Examples**
V	啊 *a* (interjection)；哦 *o* (interjection)
VG	爱 *ài* (to love)；傲 *ào* (proud)
GV	我 *wǒ* (I); 月 *yuè* [ɥɛ] (moon)
GVG	有 *yǒu* (to have)*；外 *wài* (outside)*
VC	暗 *àn* (dark)；昂 *áng* (expensive)
GVC	远 *yuǎn* (far)*；问 *wèn* (to ask)*

Table 13: Comparison of Hungarian and Chinese syllable patterns

[27] Note that in zero-initial syllables the rhymes *iou, uai, uei, uan* and *un* are spelt in *pinyin* as *you, wai, wei, wan, wen*, respectively.

	Distribution of consonants and vowels	**tone**
Hungarian	CV, V, VC, CVC[28]	–
Chinese	CV, CVG, CGV, CGVG, CVC, CGVC, V, VG, GV, GVG, VC, GVC	+

Table 14: Categories of difference by level of difficulty, based on Prator (1967)

Level	Category	Explanation
5	split	One item in L1 is split into two or more in L2.
4	new	The item exists in L2 but is absent in L1.
3	reinterpretation	The item is present in L1 but appears in a new form in L2.
2	absent	The item exists in L1 but is absent in L2.
1	coalescence	Two or more items correspond to one in the L2.
0	correspondence	The items are the same in both L1 and L2.

Table 15: Categories of Hungarian Consonants (based on Siptár & Törkenczy, 2000)

		Obstruents						Sonorants			
		Stops		Affricates		Fricatives		Nasals	Liquids		
		Voiced	Voiceless	Voiced	Voiceless	Voiced	Voiceless	Voiced	Voiced		
									Lateral	Trill	Approximant
Labial	Bilabials	b	p					m			
	labiodentals					v	f				
Dental/alveolars	Lamino-dentals	d	t					n	l	r	
	Lamino-alveolars				ts	z	s				
Palatal	Palato-alveolars			dʒ	tʃ	ʒ	ʃ				
	Dorso-palatals	ɟ	c					ɲ			j
Velars		g	k								
Postvelar							h				

Table 16: Categories of Chinese Consonants (based on Huang & Liao, 1991)[29]

		Obstruents					Sonorants	
		Voiceless					Voiced	
		Stops		Affricates		Fricatives	Nasals	Liquids (Lateral)
		unaspirated	Aspirated	unaspirated	Aspirated			
Labial	Bilabials	b̥ (*b*)	p^h (*p*)					m
	labiodentals					f		

[28] This is a simplification disregarding complex onsets/codas which can containg clusters of up to three consonants each, as well as complex nuclei in the small number of loanwords displaying true diphthongs (Siptár & Törkenczy 2000: 96). A possible generalized scheme could be C*VC* where * denotes {0, 1, 2, 3} occurrences of the preceding category.

[29] IPA symbols are used to specify the sounds; wherever the *pinyin* transcription differs, it is given in parentheses after the phonetic symbol.

Dental/alveolar	Apico-dentals			ts (*z*)	ts^{h} (*c*)	s		
	Apico - alveolars	d̥ (*d*)	t^{h} (*t*)					n
	Apico – post-alveolars(retrofle-x)			tʂ (*zh*)	tʂ^{h} (*ch*)	ʂ (*sh*)	ʐ (*r*)	
Alveolar-palatal doubly articulated(apda)					tɕ (*j*)	tɕ^{h} (*q*)	ɕ (*x*)	
Velar		g	g̊ (*g*)	k^{h} (*k*)				
Postvelar							χ/x (*h*)	

Table17: Hungarian vowels according to lip-shape and tongue-position

Vowel and IPA	Shape of lips	Tongue position	
	Rounded/ Unrounded	Front/Back	High/Low
a [ɔ]	Rounded[30]	Back	Low-mid
á [a:]	Unrounded	Central	Low
e [ɛ]	Unrounded	Front	Low-mid
é [e:]	Unrounded	Front	High-mid
i [i]	Unrounded	Front	High
í [i:]	Unrounded	Front	High
o [o]	Rounded	Back	Mid
ó [o:]	Rounded	Back	High-mid
ö [ø]	Rounded	Front	Mid
ő [ø:]	Rounded	Front	High-mid
u [u]	Rounded	Back	High
ú [u:]	Rounded	Back	High
ü [y]	Rounded	Front	High
ű [y:]	Rounded	Front	High

Table 18: Chinese vowels according to lip-shape and tongue-position

***pinyin* and IPA**	**lip-rounding**	**tongue position**	
		front/back	**high/low**
a [a]	–	central	low
a [ɑ]	–	back	low
o [o]	+	back	mid-high
e [ɤ]	–	back	mid-high
e/ê [ɛ][31]	–	front	mid-low
e [e]	–	front	mid-high
e [ə]	–	central	mid
i [i]	–	front	high
i [ɿ]	–	central	high
i [ɻ]	–	central (retroflex)	high

[30] According to Siptár & Törkenczy (2000), though not all analyses of Hungarian agree on this point.

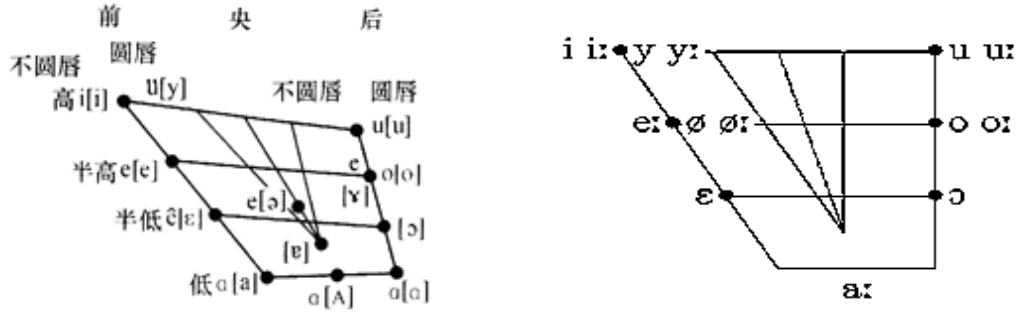
[31] In one particular rhyme it is rendered by the letter *a* in *pinyin*: -ian [jɛn].

u [u]	+	back	high
o [ʊ]	+	back(-central)	mid-high
ü [y]	+	front	high
er [ɚ]	–	central (retroflex)	mid

Table 19: Allophones of /a/, /e/ and /i/ in Chinese

V-phoneme	**allophones**	**phonetic conditions (rhymes)**
/a/	[a]	a [a], ia [ja], ua [wa], ai [aj], an [an]
	[ɑ]	ao [ɑʊ], ang [ɑŋ]
/e/	[e]	ei [ej]
	[ɛ]	ie [iɛ], üe [ɥɛ], ian [jɛn]
	[ə]	en [ən], eng [əŋ], üan [ɥən]
	[o]	uo [wo], ou [oʊ], o [o][32]
	[ɤ]	e [ɤ]
/i/	[i]	ji [tɕi], qi [tɕ^{h}i], xi [ɕi], as well as i [i] when it is *not* after a retroflex or dentialveolar obstruent
	[ɿ]	zi [tsɿ], ci [ts^{h}ɿ], si [sɿ]
	[ʅ]	zhi [tʂʅ] , chi [tʂ^{h}ʅ], shi [ʂʅ], r [ʐʅ]
/u/	[u]	u [u]
	[ʊ]	ong [ʊŋ]

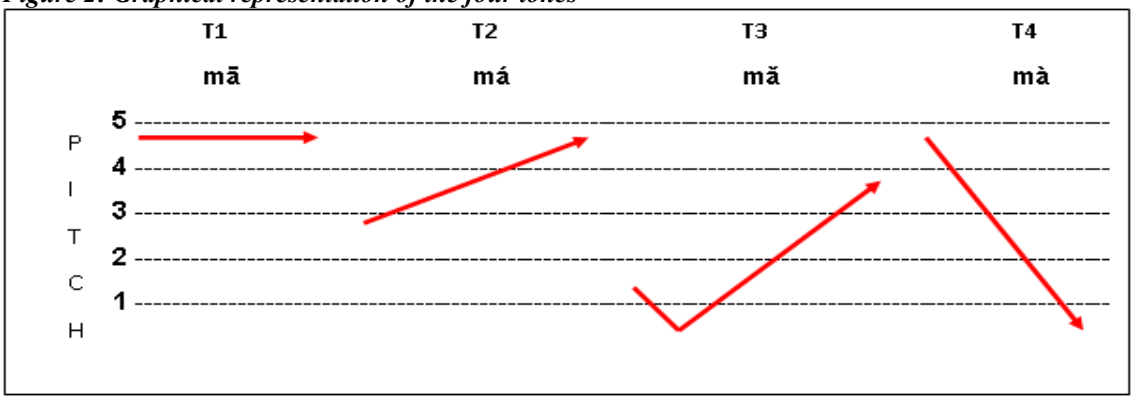
Figure 1: Vowel charts of Mandarin Chinese (left) and Hungarian (right)[33]



[32] In an open syllable, where no glide or coda consonant follows the nuclear vowel, it depends on the preceding segment whether the surface realization is [o] or [ɤ]: after labial consonants ([ɸ, p^{h}, m, f]) or the velar labial glide ([w]) it is realized as [o], and elsewhere as [ɤ].

[33] The authors are indebted to Katalin Mady of the Research Institute for Linguistics of the Hungarian Academy of Sciences for supplying the Hungarian vowel chart.

Figure 2: Graphical representation of the four tones



References

Chao, Y. R. (1948). *Mandarin primer: An intensive course in spoken Chinese*. Cambridge, MA: Harvard University Press.

Chao, Y. R. (1968). *A grammar of spoken Chinese*. Berkeley: University of California Press.

Chao, Y. R. (1983). *Tongzi fang'an* (*A project for general Chinese*). Beijing: Commercial Press.

Crystal, D. (1995). Documenting rhythmical change. In J. Lewis (Ed.), *Studies in general and English phonetics: Essays in honor of Professor J. D. O'Connor* (pp. 174-179). London: Routledge.

Duanmu, S. (2000). *The phonology of standard Chinese.* Oxford: Oxford University Press.

Dulay, H., & Burt, M. (1974). Natural sequences in child second language acquisition. *Language Learning,* 24, 37-53.

Gósy, M. (2004). *Fonetika, a beszéd tudománya (Phonetics: The science of speech)*. Budapest: Osiris Kiadó.

Hu, M. (1987). *Beijinghua chutan (A preliminary study of the Peking dialect).* Beijing: Commercial Press.

Huang, B., & Liao, X. (1991). *Xiandai hanyu (Modern Chinese)*. Beijing: Higher Education Press.

Jin, S. (1992). Beijinghua yudiao de shiyan tansuo (An empirical study of the tones in Beijing dialect). *Language Teaching and Linguistic Studies*, 2, 71-96.

Kálmán, L., & Nádasdy, A. (1994). A hangsúly (Stress). In F. Kiefer (Ed.), *Strukturális Magyar Nyelvtan 2. – Fonológia (A structural grammar of Hungarian vol. 2. – Phonology)*. Budapest: Akadémiai Kiadó, 393-467.

Kiefer, F., & Kiss, K. E. (Eds.). (1994). *The syntactic structure of Hungarian: Syntax and semantics (Vol. 27)*. San Diego/New York: Academic Press.

Kornai, A. (1994). On Hungarian morphology (*Linguistica, Series A: Studia et Dissertations*, 14). Budapest:

Linguistics Institute of HAS.

Lee, W. S., & Zee, Eric. (2003). Standard Chinese (Beijing). *Journal of the International Phonetic Association,* 33, 109–112.

Li, F.-K. (1972). Language and dialects in China. *Free China Review,* 22(5).

Lin, M. (2004). *Hanyu yudiao yu shengdiao (Intonations and tones in Chinese). Applied Linguistics*, 3, 57-67.

Lin, T. (1996). Yuyin yanjiu he duiwai hanyu jiaoxue (Phonology study and teaching Chinese as a second language). Paper presented at *the Fifth International Conference on Chinese Language Teaching*, Beijing.

Lin, Y.-H. (2007). *The sounds of Chinese.* Cambridge: Cambridge University Press.

Lu, J. (2010). Duiwai hanyu yuyin jiaoxue jige jiben wenti de zai renshi (Revisiting the fundamental problems in Chinese as a second language teaching). *Journal of Dalian College*, 5, 1-4.

Luo, C., & Wang, J. (2002). *Putong yuyanxue gangyao (Xiuding ben) (General linguistics)*. Beijing: Commercial Press.

Norman, J. (1988). *Chinese*. Cambridge: Cambridge University Press.

Prator, C. (1967). Guidelines for planning classes and teaching materials. *Working papers in English as a second language, matter, methods, materials.* Los Angeles: University of California.

Pulleyblank, E. (1984). *Middle Chinese: A study in historical phonology.* Vancouver: University of British Columbia Press.

Roach, P. (1982). On the distinction between stress-timed and syllable-timed languages. In D. Crystal (Ed.), *Linguistic controversies* (pp. 73-79). London: Edward Arnold.

Rogers, C. (1969). *Freedom to learn: A view of what education might become*. Columbus, OH: Charles E. Merrill.

Seikel, A., King, D., & Drumright, D. (2010). *Anatomy & physiology for speech, language and hearing* (4th ed). Cliffon Park, NY: Delmar Language Learning.

Shen, J. (1994). Hanyu yudiao gouzao he yudiao leixing (Chinese intonation structure and patterns). *Dialect*, 3, 221-228.

Siptár, P., & Törkenczy, M. (2000). *The phonology of Hungarian*. Oxford: Oxford University Press.

Wu, Z. (1997). Cong shengdiao he yuelü de guanxi tichu Putonghua pudiao chuli de xinfangfa (A new

method of standard Chinese intonation processing based on the relation between tone and melody). In *Collected essays dedicated to the 45th anniversary of the Institute of Linguistics, CASS*. Beijing: Commercial Press.

Xu, S.(1980). *Putonghua yuyin zhishi (Chinese phonetics)*. Beijing: Language Press.