A statistical argument for the homophony avoidance approach to the disyllabification of Chinese

Wen Jin

Department of Chinese Studies, National University of Singapore

Under the homophone avoidance (HA) theory (Guo 1928, Wang 1944, Karlgren 1949, Lü 1963, Li and Thompson 1981), monosyllabic words are disyllabified to avoid homophonous ambiguities. Lü 1963 predicts that the more monosyllabic homophones there are in a language, the more likely disyllabic words would be created. Duanmu 1999 argues against the HA approach and claims that no supporting evidence has been found in Chinese. This paper argues for the HA approach and provides supporting evidence from corpora of Mandarin Chinese and Cantonese. Our discoveries support the HA motivation for the disyllabification of Chinese. Additionally, the HA theory applies cross-linguistically. The HA theory has interesting implications about the disyllabification of Chinese from a diachronic perspective, which are supposed to accompany the simplification of syllable structures in archaic Chinese.

1 Introduction

It has been widely accepted that Chinese monosyllabic words were disyllabified to avoid ambiguities of interpretation that would otherwise have arisen because of homophony (Guo 1928, Wang 1944, Karlgren 1949, Lü 1963, Li and Thompson 1981). For example, both 'wood' and 'to shampoo' are pronounced [mu^{51}] in Mandarin. In order to avoid ambiguities of interpretation caused by this pair of monosyllabic homophones, we use [mu^{51} tou] 'wood' to contrast with [mu^{51} y^{51}] 'to shampoo' (Duanmu 2007:152). Similar phenomena are observed cross-linguistically (see e.g., Arcodia 2007, Kaplan 2010, Baerman 2011). For example, in Teiwa, a Papuan language spoken in the Alor Island of Indonesia, possessed nouns may be prefixed for person and number of a possessor. A CV-prefix is attached to C-initial noun stems and the vowel of the prefix is deleted when it is attached to V-initial noun stems. The prefixes of 1SG and 1PL are *na-* and *ni-*, respectively. Thus, both the 1SG and 1PL forms of the V-initial stem *-uar wa'* 'ear' would expectedly be *n-uar wa'*. However, to avoid homophony the 1PL form of –*uar wa'* is *ni-uar wa'*, which contrasts with the 1SG form *n-uar wa'*. See Baerman 2011 for a detailed discussion.

Lü 1963 predicts that the more monosyllabic homophones there are in a language, the more likely disyllabic words would be created. For example, Mandarin is expected to

have more disyllabic words than Cantonese, which has more syllable types and therefore fewer monosyllabic homophones than Mandarin. Cross-linguistically, if a language has more syllable types, it should have more monosyllabic words than a language with fewer syllable types, because monosyllabic homophones can be reduced by an increase in syllable types.

Duanmu 2007 argues that homophony avoidance (HA) did not play a clear role in the increase of disyllabic words in Chinese. Instead, a large number of disyllabic words were introduced into Chinese either because they were polysyllabic names in the first place or because they consisted of two or more morphemes in the source language such as Japanese. He further argues that word length in Chinese is restricted by metrical constraints (Duanmu 2007: 172). Duanmu claims that no supporting evidence for the HA approach has been found in Chinese (Duanmu 2007:154).

Moreover, Feng 2000 argues that the disyllabification in Chinese arose because of the unmarkedness constraint FOOT-BINARY, which requires a foot to consist of two syllables cross-linguistically. Chinese words are mostly disyllabic because they satisfy this constraint, assuming that a word consists of only one foot. Feng 2000 therefore predicts that disyllabic words would predominate cross-linguistically.

I argue in favor of Lü 1963 and show that the HA approach plays a significant role in the disyllabification of Chinese. Additionally, I argue that the disyllabification of Chinese arose mainly because of HA, and the so-called 'minimal word' phenomena are mainly by-products of HA.

This paper argues for the HA approach and provides comparative evidence from the corpora of Mandarin, Cantonese, American English and Japanese. Mandarin has about 1,300 types of syllables (Lin and Wang 1992) while Cantonese has 1,795 ones (Kao 1971) given that Cantonese has more contour tones than Mandarin. The HA theory predicts that Cantonese should have more monosyllabic words than Mandarin because Cantonese has more syllable types, which makes disyllabification less necessary, assuming that the main function of disyllabification is to avoid homophones, which will cause ambiguities of interpretation.

The HA theory further predicts that any language with a smaller number of syllable types tends more to have multisyllabic words, because otherwise its syllable types would not suffice to differentiate words. This paper compares Chinese to English and Japanese. English has complex syllable structures while the syllable structure of Japanese is much simpler compared to Chinese. As a consequence, English is expected to have more monosyllabic words than Chinese, while Japanese is expected to have fewer monosyllabic words. The predictions of the HA theory are borne out by our statistics.

The format of this paper is as follows. Section 2 discusses the syllable structures of both Mandarin Chinese and Cantonese, and compares Mandarin Chinese with Cantonese in terms of syllable types. We show that Cantonese has more monosyllabic words than Mandarin as predicted by our HA approach. Section 3 discusses the syllable structures of English and Japanese, and compares them with Chinese in terms of syllable types. We
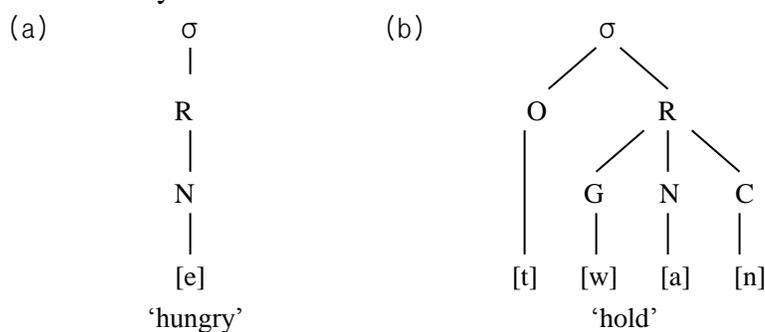
show that our HA approach makes right predictions again. Section 4 compares the HA theory with two alternative accounts such as Duanmu 1999, 2007 and Feng 2000. We also show that the HA theory has interesting implications about the disyllabification of Chinese from a diachronic perspective, which were supposed to accompany the simplification of syllable structures in archaic Chinese. Section 5 concludes and discusses some residual issues.

2 The Homophone Avoidance theory and Mandarin and Cantonese syllables

In this section, we discuss both Mandarin and Cantonese syllable types. We show that Cantonese has more syllable types than Mandarin. The HA theory predicts that Cantonese should therefore have more monosyllabic words than Mandarin because it is less necessary for Cantonese to undergo disyllabification to avoid homophones. This prediction is proved by our statistics.

A full Mandarin Chinese syllable (σ) has been traditionally considered to consist of an onset (O) and a rhyme (R). A rhyme consists of a glide (G), a nucleus (N) and a coda (C). Mandarin Chinese does not allow complex onsets and only nasal consonants such as [n] and [ŋ] can occur as a coda. The simplest Mandarin Chinese syllable consists of a nucleus only, e.g., [e^{51}] 'hungry'; see (1a). By contrast, a complex one consists of an onset, a glide, a nucleus and a coda, e.g., [twan^{55}] 'hold'; see (1b).[1]

(1) Mandarin Syllable Structures

(a)   σ   (b)   σ
             | /   \
             R   O   R
             | | / | \
             N | G N C
             | | | | |
            [e]   [t] [w] [a] [n]
          'hungry'   'hold'

Mandarin Chinese has 21 different onsets and 37 different rhymes. Putting contour tones aside, there are 410 syllable types in Mandarin Chinese because some syllable types such as *[fi], *[ki] do not exist (Lin and Wang 1992). If we take into consideration the four lexical tones in Mandarin Chinese, there are about 1,300 syllable types given that lexical tones do not freely combine with a syllable. For example, only three tones can attach to [san]: [san^{55}] 'three', [san^{214}] 'umbrella', and [san^{51}] 'distribute'.

---

[1] The syllable structure of Mandarin is controversial. See Bao 1996 for a comprehensive review of possible syllable structures in Chinese.

coda. Cantonese also allows obstruent codas such as [p, t, k] and a nasal coda [m], e.g., [pik] 'must', [kip] 'suitcase' (Kao 1971: 142). Additionally, in Cantonese a nasal can independently act as a syllable, for example, [m^{13}] 'not', [ŋ^{33}] 'noon'. Kao 1971 shows that Cantonese has 1,795 syllable types; see also Duanmu 1999.

The HA theory predicts that it would be more likely for Mandarin Chinese to use other strategies such as disyllabification to avoid ambiguities of interpretation. The reason is that if both Mandarin and Cantonese used monosyllabic words only to express the same amount of meanings, there would be more monosyllabic homophones in Mandarin, which would result in ambiguities of interpretation, since Cantonese has more syllable types than Mandarin. For example, both 'beer' and 'leather' are pronounced [p^{h}i^{35}] in Mandarin, but in Cantonese 'beer' is pronounced [pe^{55}] while 'leather' is pronounced [p^{h}ei^{13}]. Native speakers of Mandarin must say [p^{h}i^{35}. tɕiu^{214}] 'beer' to avoid ambiguity of interpretation due to homophony while Cantonese speakers still use the monosyllabic form [pe^{55}] in colloquial speech. As a consequence, the HA theory further predicts that Cantonese should have more monosyllabic words than Mandarin.

We present several types of statistical evidence to show that Cantonese has more monosyllabic words than Mandarin, which proves the predictions of the HA theory. Based on the corpora created in 1959 by Zhongguo Wenzi Gaige Weiyuanhui Yanjiu Tuiguang Chu [Chinese Language Reform Committee Research and Popularization Office] (ZWGW hereafter), monosyllabic words amount to 29% of all the 3,624 words in the corpora. The corpora show that disyllabic words predominate in the vocabulary of modern Chinese. He and Li 1987 and ZWGW 2008 get similar results. According to Li and Bai 1987 and Yu 1993, there are few monosyllabic neologisms in modern Mandarin.

We calculated the number of monosyllabic words in Cantonese, based on a list of words drawn from various Cantonese textbooks. Our statistics shows that the ratio of monosyllabic words in Cantonese is 34.7%, see Table 1.

Table 1 monosyllabic words in Mandarin and Cantonese (%)

	Total	Monosyllabic	%	Language
ZWGW (1959)	3624	1046	29	Mandarin
He and Li (1987)	3000	809	27	Mandarin
ZWGW (2008)	3000	1000	33.3	Mandarin
Cantonese textbooks	2291	796	34.7	Cantonese

It seems that in Table 1 the ratio of monosyllabic words in Mandarin calculated by ZWGW 2008 (33.3%) is pretty close to that in Cantonese (34.7%). But a closer look will tell more difference. ZWGW 2008 gives a list of 56,008 commonly used words, which includes 3,181 monosyllabic words (5.7%), 40,351 disyllabic words (72.0%), 6,459 tri-syllabic words (11.5%), 5,855 quadri-syllabic words (10.5%), and 126 longer words (0.2%). A majority of its 3,000 most frequently used words are function words, which

tend to be short cross-linguistically. If we put aside function words and only calculate the ratios of monosyllabic lexical words (nouns, verbs, adjectives, adverbs) in both Mandarin and Cantonese, we can see that the ratio of monosyllabic words in Cantonese (31.3%) is much higher than that in Mandarin (25.5%); see Table 2.

Table 2: Monosyllabic lexical words (%)

	Total	Monosyllabic	%monosyllabic	Language
ZWGW(2008)	2479	633	25.5	Mandarin
Cantonese Textbooks	2047	642	31.4	Cantonese

Our statistics prove the prediction of the HA theory that Cantonese has more syllable types and therefore more monosyllabic words than Mandarin. If we compare the ratio of the number of Mandarin (M) syllable types divided by that of Cantonese (C) syllable types to the ratio of the number of Mandarin monosyllabic lexical words (Wds) divided by that of Cantonese monosyllabic lexical words, we can see the proximity of the two ratios ($p > 0.05$); see (2). This shows that syllable types play a clear role in determining the length of words and the necessity to resort to disyllabification.

(2) Syllable types and monosyllabic lexical words in Mandarin and Cantonese

1) $\dfrac{\text{M-}\sigma \text{ types}}{\text{C-}\sigma \text{ types}} = \dfrac{1300}{1795} = 72.4\%$

2) $\dfrac{\text{M-monosyllabic lexical Wds \%}}{\text{C-monosyllabic lexical Wds \%}} = \dfrac{25.5\%}{31.4\%} = 81.2\%$

3) $\dfrac{\text{M-}\sigma \text{ types}}{\text{C-}\sigma \text{ types}} \approx \dfrac{\text{M-monosyllabic lexical Wds \%}}{\text{C-monosyllabic lexical Wds \%}}$

In the vocabulary of *New Cantonese Today* (2006), if we consider lexical words only, 41.4% of the monosyllabic Cantonese words have monosyllabic Mandarin glosses and the other monosyllabic Cantonese words correspond to disyllabic Mandarin words. In (3), the Mandarin sentence uses 7 syllables while the Cantonese one uses 5 syllables. Mandarin uses disyllabic forms while Cantonese uses monosyllabic forms to express the same meanings, e.g., *zen.me* vs. *med* 'why', *na.me* vs. *gem* 'so', *huang.miu* vs. *meo* 'ridiculous'. See also Table 3, which shows that there are more monosyllabic words in Cantonese than in Mandarin based on *New Cantonese Today* (2006).

(3)   (a) *Zen.me   ni   na.me   huang.miu   ne*?   (Mandarin)
          how   2Sg   so   ridiculous   PRT
          'How can you be so ridiculous!'

(b) *Med   neih   gem   meo   ga*?   (Cantonese)
     how   2Sg   so   ridiculous   PRT
     'How can you be so ridiculous!'

Table 3: Percentage of monosyllabic words in *Xinbian Jinri Yueyu (2006)* [*New Cantonese Today*]

	Total	Number of monosyllabic words	Monosyllabic words %
Cantonese words	**613**	**145**	**23.7**
Mandarin glosses	**613**	**60**	**9.8**

We also asked twelve bilingual speakers of Mandarin and Cantonese to translate some commonly used Cantonese words into Mandarin. We obtained the same result that Mandarin tends less to use monosyllabic words. See Table 4.

Table 4. Mandarin vs. Cantonese

	Total	Monosyllabic words	Monosyllabic words %
Mandarin	1174	297	25.4
Cantonese	1174	388	33

3 The HA theory and cross-linguistic evidence

In this section, we show that the predictions of the HA theory in terms of syllable types and word length are borne out cross-linguistically. English, for example, has more syllable types than Mandarin and therefore more of its most frequently used words are monosyllabic. Japanese, by contrast, has fewer syllable types than Mandarin and therefore its most frequently used words tend to be multi-syllabic.

3.1 English syllable types and word length

English has 15 vowels and 24 consonants, and allows complex onsets and codas (Hammond 1999). The English syllable structure is $(C)(C)(C)V(C)(C)(C)(C)(C)$[2]. Compared to Mandarin and Cantonese, English syllable structures can be much more complex. Additionally, English has supra-segmental features such as vowel length and stress. English has more than 10,000 different syllable types, many more than those in Mandarin. According to HA theory, English's most frequently used words tend much more to be monosyllabic because the amount of English syllable types makes it less necessary for English words to be longer than those in Mandarin.

Consider the 5,000 most frequently used lemmas in the Word Frequency Lists and Dictionary, which was created on the basis of Brigham Young University's Corpus of Contemporary American English (COCA). A lemma can be either lexical or functional. A

---

[2] An example of a five-consonant coda is *angsts* /ˈæŋksts/.

lexeme and its inflected forms belong to one lemma. For instance, *send*, *sending*, and *sent* belong to one lemma. As a result, the effects of inflectional morphology on word length cannot be considered. For example, if both the monosyllabic forms *send* and *sends* are among the most frequently used words, only one will be counted. To make our analysis consistent, we did not consider the English morphologically complex words of this lemma-corpus, either inflectional or derivational. If we put aside functional words in addition, we can see that monosyllabic words amount to almost half of the vocabulary; see Table 5.

Table 5: Length of English lexical words based on COCA[3]

	Noun	Verb	Adjective	Adverb	TOTAL	percentage
monosyllabic	836	474	169	77	1556	48.34%
disyllabic	669	313	181	48	1211	37.62%
tri-syllabic	197	77	73	20	367	11.40%
others	40	19	23	3	85	2.64%
total	1742	883	446	148	3219	100.00%

English has more monosyllabic words than Chinese because the complexity of English syllable structures helps reduce potential homophones in English and ambiguities of interpretation so that there is less necessity for English words to undergo disyllabification.

3.2 Japanese syllable types and word length

In Japanese there are 136 syllables in terms of the combinations of segments and moras (Tamaoka & Makioka 1987). As predicted by the HA theory, Japanese frequently used words should be longer than those in English and Chinese.

We calculated both the number and ratio of lexical words in terms of the number of syllables in each of them, based on a list of words drawn from various textbooks of basic-level Japanese. Our statistics show that tri-syllabic and quadri-syllabic words predominate in Japanese; see Table 6.

Table 6. Number and ratio of Japanese lexical words[4]

	mono-	di-	tri-	quadri-	quintuple-	sextuple-	septuple-	TOTAL
No.	12	183	419	353	78	39	1	1085
%	0.1%	16.9%	38.6%	32.5%	7.1%	3.6%		
*loanwords are not counted.								

---

[3] We do not count 93 words with tricky syllabic structures in this words list, such as 'theory' /θi.ə.ri/ or /θiə.ri/

[4] Loanwords are not counted because the number of syllable of loanwords in Japanese depend on the original word length of borrowing languages

Our results prove the predictions of the HA theory. As shown in Table 7, Japanese has much fewer mono-syllabic words than Mandarin and English because it has much fewer syllable types so that it is much more likely for Japanese to have mono-syllabic homophones. As a result, it is more likely for Japanese to refer to combinations of syllables to avoid potential ambiguities of interpretation. See also (4), which presents a diagram based on Table 7.

Table 7: Number and ratio of Mandarin, American English, and Japanese words

	mono-	di-	tri-	quadri-	quintuple-	sextuple-	septuple-	TOTAL
Mandarin	**633**	**1772**	**56**	**16**	**2**			**2479**
percentage	25.5%	71.5%	2.3%	0.6%				
English	**1556**	**1211**	**367**	**85**	**1**		**1**	**3219**
percentage	48.3%	37.6%	11.4%	2.6%				
Japanese	**12**	**183**	**419**	**353**	**78**	**39**	**1**	**1085**
percentage	0.1%	16.9%	38.6%	32.5%	7.1%	3.6%		

(4) A diagram of the number and ratio of Mandarin, American English, and Japanese words
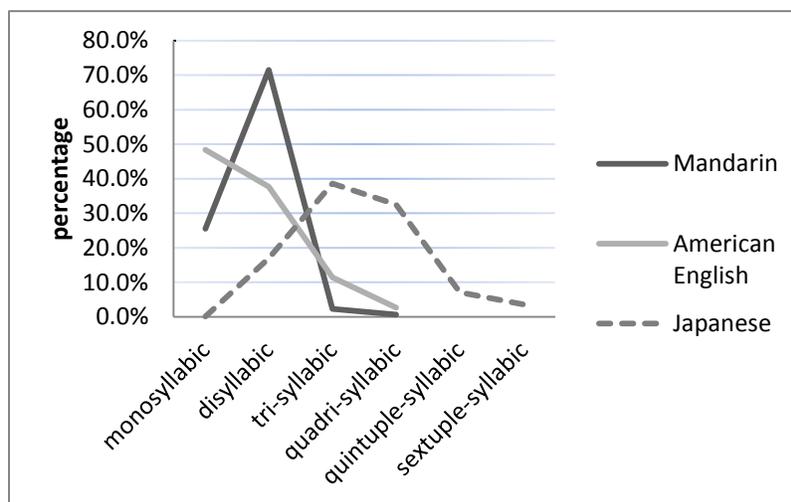
Since our cross-linguistic evidence proves the predictions of the HA theory that the number of syllable types in a language will (partially) determine the length of words, we conclude that the HA theory plays an important role in the disyllabification of Chinese words.

4 Alternative accounts for the disyllabification of Chinese words

In this section, we discuss two alternative accounts for the disyllabification of Chinese, i.e., Duanmu 1999 and Feng 2000. Duanmu 1999 remarks that the HA theory does not play a clear role in the disyllabification of Chinese and implies that there is no correlation between syllable types and word length. He argues that Chinese has always had many disyllabic words, which can become monosyllabic depending on stress requirements. Feng 2000, on the other hand, refers to the constraint Foot-Binary to explain why disyllabic words predominate in Chinese. Feng's theory predicts that disyllabic words should predominate cross-linguistically. We argue that neither of them is correct.

4.1 Duanmu 1999, 2007

Duanmu 1999, 2007 remark that the increase in the disyllabic vocabulary of Chinese is not due to the simplification of its syllable structures. Duannu 1999, 2007 argue against Lü's 1963 prediction that Cantonese should have more monosyllabic words than Mandarin, and remark that "no evidence for the prediction is offered." (Duanmu 2007: 154). Duanmu claims that "[the] HA approach does not play a clear role in the increase of disyllabic words in Chinese." (Duanmu 2007: 172) Duanmu's claim is incorrect because our results show that Cantonese does have more monosyllabic words than Mandarin. Additionally, our cross-linguistic evidence proves the correctness of the HA theory in terms of the relationship between syllable types and word length.

Duanmu 1999, 2007 argues that some monosyllabic items still remain monosyllabic though they can always cause ambiguity, and uses *ta* 'he', *ta* 'she' and *ta* 'it' as examples. However, as Mandarin is rarely regarded as having grammatical genders, these three pronouns may have the same underlying structure. Some other languages, such as Arabic, French, which are commonly regarded as having grammatical gender, each noun of these languages will belong to one of the genders. For example, the second pronoun 'you' in Arabic is distinguished by gender, an Arabic person will say *uḥibbuka* 'I love you' to male, and *uḥibbuki* 'I love you' to female. For the non-gender languages, such as Malay, Japanese, nouns in these languages do not belong to gender. In Malay, *Dia* can represent both 'he' and 'she'. No evidence shows that pronouns in Mandarin have been classified by genders. Thus, this example fail to argue against HA approach because there is no evidence offered against the third pronouns of Mandarin has three different underlying structures. Duanmu 1999, 2007 argues that most increase in disyllabic words comes from borrowings after the Opium War, whereby disyllabic (or longer) words are introduced either because they are polysyllabic names in the first place, or because they require two or more morphemes independent of the borrowing language (Duanmu 2007: 172). According to Duanmu 2007, most of the loanwords after the Opium War are borrowed from Japanese. We count for the loanwords from Japanese in *Chinese Loanwords Dictionary*, there are 853 loanwords from Japanese in total and 99% of them can be written in Kanji, which is similar to Chinese characters. Thus, there are two

methods of borrowing words from Japanese, borrowing phonetic features (5a), or borrowing Kanji (5b), while English and other Latin languages can only use the first method.

(5) (a)

Pronunciation in Japanese	*o.ba.san*		Pronunciation in Mandarin	*o.ba.san*
Kanji	老婦人	⟶	Chinese Characters	欧巴桑

jia.li.fo.ni.ya   'California'

niu.yue   'New York

(b)

Pronunciation in Japanese	*bo.ku.shi*		Pronunciation in Mandarin	*bo.shi*
Kanji	博士	⟶	Chinese Characters	博士

According to our data, Kanji tend to occur in a binary form. As a result, most words loaned from Japanese are disyllabic. Chinese prefer Kenji borrowing to phonetic borrowing because disyllabic template has been formed as a byproduct of HA.

We do not deny the metrical approach (Duanmu 1999, 2007) when dealing with disyllabic words of Chinese. Metrical approach proposes that word length variation in Chinese is influenced by stress, which is determined cyclically by Nonhead Stress and the each foot must have two syllables (Duanmu 2007: 159), and word lengths are constrained by metrical structure, hence, in that some position prefer a disyllabic words and others prefer a monosyllabic word.

4.2 Feng 2000

Feng 2000 argues that Chinese is obliged to the constraint of FOOT-BINARY, which is the internal reason for the disyllabification of Chinese. From archaic Chinese to modern Mandarin, Chinese syllable has been simplified by a large scale. Feng 2000 argues that in Archaic Chinese, every syllable has two moras and forms a heavy syllable while the syllable structure becomes simpler in the modern times. This argument has been admitted by large amount of scholars (Ding 1979, Yu 1985, Yip 2002, Arcodia 2007, etc.), two of them are given in (6).

(6)
Ding (1979) and Yu (1985):

Early Archaic Chinese: (C)C(C)(G)(G)(V)VC(C)
Middle Archaic Chinese: Zhou-Qin Dynasty   (C)(C)(G)(G)(V)V(C)
Wei and Jin Accent to Middle Chines: (C)(G)(G)V(C)
Modern and Contemporary Chinese   (C)(G)V(N)

Arcodia (2007)

| Stage	Minimal Syllable	Maximal Syllable	Final consonants
Archaic Chinese	CVC	CCCMVCCC	At least ten different
Middle Chinese	CV	{C,S}V{C,S}	[m], [n], [ŋ], [p], [t], [k]
Modern Chinese	V	{C,S}VC	[n], [ŋ]

It is obvious that Chinese syllable has a complex structure during the ancient time. Feng 2000 argues disyllabification is caused by FOOT-BINARY. Feng 2000 discusses a foot obey binary branching condition. However, after the disappearance of consonant codas, the new syllable structure cannot form a foot because this structure violates the binary branching condition. As a result, disyllabification occurs. Feng 2000 fails to explain the reason why those syllables with entering tone, which have (C)VC structure, disyllabified; and no supporting evidence can be found to show that archaic Chinese syllables can form a single binary foot.

According to Feng 2000, the disappearance of entering tone should happen before the large scale of disyllabification. There is no evidence show that tone change occurred before disyllabification. In fact, contemporary Cantonese still has disyllabic words with entering tone syllables. Feng 2000 argues that the occurrence of contour tones balance duration, which can be summarized as below:

$$AB \xrightarrow{\text{T}} A$$
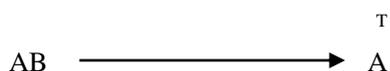
According to Feng 2000, archaic Chinese should not have any contour tones. However, no supporting evidence can be found. In fact, Zhang 2002 adds on that contour tones tend to occur on a phonemic long vowel, which has two moras, based on cross-linguistic statistical evidence. Thus, archaic Chinese has more possibility to have contour tones than modern Chinese. We hypothesize that FOOT-BINARY occurs after functional movement, that is, HA approach. In order to avoiding homophonous ambiguity, two-syllable combinations occur. A disyllabic morphological template has been modeled with the high type frequency of disyllabic items, then, FOOT-BINARY established. This process can be treated as Blocking, see (7).

(7): diachronic development of disyllabification (template)

HA approach

σ ⟶ σσ ⟶ [σσ] - - - - - - - - - ▸

FOOT-BINARY
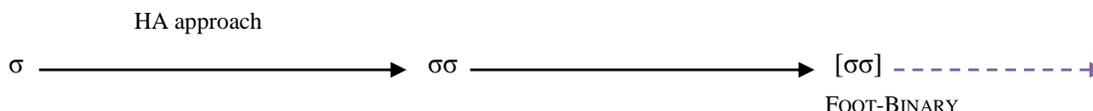
On the other hand, Feng 2000 also fails to explain the shortening of archaic Chinese syllables. If Chinese prefer binary foot, Chinese would like to keep the original heavy syllables, but evidence has shown that Chinese syllables get shortened since ancient time. This tendency still exist today, Wang 1992 argues contemporary Chinese syllable begins to shorten to (C)(G)Vnasal structure, which has already happened in Beijing dialects.

Heavy syllables may change into light syllables because simple syllables are unmarked cross-linguistically. Although Middle Chinese has contour tones, but there is no evidence showing that Archaic Chinese do not have contour tones, in fact, according to Zhang 2002, Middle Chinese may have fewer tonal changes than Archaic Chinese. Thus, we can strongly believe that Chinese loses syllable types diachronically, which then integrated ambiguities arises.

Additionally, languages tend to use short structures to explain semantic meanings may follow the Gricean theory, which is also called Cooperative Principle. According to Gricean theory, four rules[5] govern rational, cooperative conversational behavior in general. Among these four rules, Maxim of Quantity may contribute to the wide use of simple structures.

Maxim of Quantity: Be as informative as required.

Evidence can be found cross-linguistically. For example, in English, *be gonna*, which is in a tri-syllabic form, is shortened from a quadri-syllabic words, *be going to*. In oral conversations, speakers tend to say *be gonna* instead of *be going to*, because the rule, Maxim of Quality, contributes to the shorter one, *be gonna*, which is easier for speakers to say. Another rule of Griean theory may be applied to:

Maxim of Quality: Make your contribution true; so do not convey what you believe false or unjustified.

This rule contributes to conversation from a listener's aspect. As a listener, he would like to get enough information so that he can understand well. Thus, monosyllabic may not provide enough information because of integrated ambiguity.

Modern Chinese has about 1300 types of syllable, which can only explain 1300 different semantic meanings, while a disyllabic form can reflect 1300*1300 semantic meanings, which is more or less adequate for daily use. For those which cannot be explained in disyllabic forms, people tend to choose tri-syllabic forms or even polysyllabic forms. Word length depends on the both the Quality and the Quantity, there is no need for words can be well explained in disyllabic forms to have longer syllables.

---

[5] The four rules are: Maxim of Quality, Maxim of Quantity, Maxim of Relation, Maxim of Manner

For instance, Zhongguo Wenzi Gaige Weiyuanhui Yanjiu Tuiguang Chu [Chinese Language Reform Committee Research and Popularization Office] is shortened for Zi Gai Wei, not Zhong Zi Gai Wei, Gai Wei, or Zi Gai, etc. The reason is that only tri-syllabic form can explain this well, if we choose Gai Wei or Zi Gai, it may lead to ambiguity, such as 'reform committee' or 'language reform'. On the other hand, we do not have to use Zhong Zi Gai Wei and everyone can know that it is stand for 'Chinese language reform committee'. Both Gai Wei or Zhong Zi Gai Wei obeys FOOT-BINARY, but the output of this construction is Zi Gai Wei. Such examples also add evidence to HA approach. Thus, we may insist that word change is motivated by HA theory and Feng 2000's argument on FOOT-BINARY as the motivation of Chinese disyllabification may be wrong in this case. But we cannot deny FOOT-BINARY as an unmarked constraint for prosodic words cross-linguistically.

5 Concluding Remarks

This paper contributes to the debate of motivation of Chinese disyllabification and claim that disyllabic words are affected by several approaches, while HA is the most important one and can be treated as the motivation of Chinese disyllabification. But we do not deny metrical approach and FOOT-BINARY as important roles when dealing with disyllabic words in Chinese, especial prosodic words.

This paper argues against Duanmu 1999, 2007 that HA theory does play a clear role in the disyllabification of Chinese by providing supporting evidence for Lü 1963 prediction. Cantonese, the language has more types of syllables (1795), shows having more monosyllabic words (31.4%) than Mandarin (25.5%), the language with fewer types of syllables (1300) because the number of homophones can be reduced by an increase in the number of syllable types. According to our data, HA theory not only contributes to the disyllabification of Chinese, but also contributes to other language changes cross-linguistically. This can be proved by the evidence that languages with fewer syllable types have fewer monosyllabic words, such as Japanese, and languages with more syllable types have more monosyllabic words, such as American English, see (4). Duanmu 1999, 2007 fail to explain a relationship between syllable types and monosyllabic distributions.

This paper argues against Feng 2000 that FOOT-BINARY may not be the motivation of disyllabification of Chinese. Instead, it is a byproduct of HA approach. Mandarin has about 1300 syllable types, and disyllabification can create about 1300*1300 different new forms ideally, which is enough for daily use. In some languages, which have limited syllable types, like Japanese (about 136 syllable types), tri-syllabification may be applied to avoid homophonous ambiguities. In some other language, such as American English, which has more than 10,000 syllable types, there is no need to create too many disyllabic words.

This paper also argues against Feng 2000 that contour tone does not occur to

balance duration. In fact, according Zhang 2002, archaic Chinese has a higher possibility to have contour tones than middle Chinese. Thus, contour tone cannot be treated as a coordinator of duration. On the other hand, according to Baerman 2009, contour tone is a mechanism of HA. Baerman 2009 studies Chiquihuitlán Mazatec, a Mexico language. In this language, negation is marked partly by a distinct ending and partly by tonal alternations, that is, tonal alternations has been added to avoid integrated ambiguity. However, there is no significant evidence show that contour tone is another mechanism of HA approach in Chinese. This question needs further discussion.

The present discussion also raises some further questions. We discuss the relationship between syllable types and % monosyllabic words in section 2 and section 3, according to (4), syllabic distribution shows different curves in different languages, we would like to know to what extend HA can be explained as the motivation of polysyllabification cross-linguistically. Additionally, a lack of monosyllabic words in modern Chinese can be seen obviously, and Japanese may play an important role in this process. As we mentioned above, Japanese is a language with fewest monosyllabic forms because it has simplest syllable types and the Chinese loanwords from Japanese is a combination of both writing system and phonological system. Thus, to what extant Japanese influence the disyllabic words in Mandarin also needs further discussion.

Compare to Mandarin and Cantonese, which get similar ratio of the number of Mandarin syllable types divided by that of Cantonese syllable types to the ratio of the number of Mandarrin monosyllabic lexical words divided by that of Cantonese monosyllabic lexical words. American English does not apply to this rule. American English has more than 10,000 syllable types, which are seven times of Mandarin, but the % monosyllabic words in American (48.34%) only twice of that of Mandarin (25.5%). However, cross-linguistically, a complex syllable is marked and languages prefer a simple syllable. We calculated the number of syllable types (only simple syllables) in English and put aside those with complex onset or complex coda. There are about 3000 different simple syllable types in total. Interestingly, we can see the proximity of the two ratios (p > 0.05); see (8).

(8) Syllable types and monosyllabic lexical words in Mandarin and Cantonese

a) $\dfrac{\text{M-}\sigma \text{ types}}{\text{E-}\sigma \text{ types}} = \dfrac{1300}{3000} = 43.3\%$

$\dfrac{\text{M-}\%\text{monosyllabic lexical Wds}}{\text{E-}\%\text{monosyllabic lexical Wds}} = \dfrac{25.5\%}{49.3\%} = 51.7\%$

$\dfrac{\text{M-}\sigma \text{ types}}{\text{E-}\sigma \text{ types}} \approx \dfrac{\text{M-}\%\text{monosyllabic lexical Wds}}{\text{E-}\%\text{monosyllabic lexical Wds}}$

b) $\dfrac{\text{C-σ types}}{\text{E-σ types}} = \dfrac{1795}{3000} = 59.8\%$

$\dfrac{\text{C-\%monosyllabic lexical Wds}}{\text{E-\%monosyllabic lexical Wds}} = \dfrac{31.4\%}{49.3\%} = 63.7\%$

$\dfrac{\text{C-σ types}}{\text{E-σ types}} \approx \dfrac{\text{C-\%monosyllabic lexical Wds}}{\text{E-\%monosyllabic lexical Wds}}$

This shows that marked constraints of complex onset and complex coda also contribute to word length. We would like to know to what extent HA contribute to those language with complex segmental features and how HA and such constraints work out together. Such questions will be left for future research.

REFERENCES

Abby Kaplan, 2010, *How Much Homophony Is Normal?*. CUNY Conference on the Word in Phonology.

Chen, Huiying & Rao, Hui. 2002. *Cantonese--Putonghua in the Chinese language*. Beijing: Beijing Language and Culture University.

Ding, Bangxin, 1979. *Shanggu Hanyu de Yinjie Jiegou [The syllable structure of Archaic Chinese],* Taiwan: Taipei.

Duanmu, San. 1999. "*Stress and the development of disyllabic words in Chinese*". *Diachronica* 16: 1-35.

Duanmu, San. 2007. *The Phonology of Standard Chinese*. UK: The Oxford University Press

Feng Shengli, 2000, *The Origin of Disyllabicity in Chinese 漢語雙音化的歷史來源*, *Contemporary Research in Modern Chinese* (Zhongguoyu yanjiu 《現代中國語研究》) 2000, 1:123-138. Japan. Also included in the book From Semantic Information to Typolgical Study, ed. by Youwei Shi. Beijing Language and Cultural University Press. 2001: 22-47. Beijing.

Giorgio Francesco Arcodia, 2007. *Chinese: A Language of Compound Words? In Selected Proceedings of the 5th Décembrettes: Morphology in Toulouse*, ed. Fabio Montermini, Gilles Boyé, and Nabil Hathout, 79-90.

George Kingsley Zipf, 1949, *Human Behavior and The Principle of Least Effort*. New York: Hafner Publishing Company.

Grice, H. Paul. 1989, *Studies in the way of words*, Cambridge, Mass: Harvard University

Press.

Helen S. Eaton. 1961. *An English-French-German-Spanish Word Frequency Dictionary*. New York.

He, Kekang & Li, dakui. 1987. *Xiandai Hanyu Sanqian Changyongci Biao [Three thousands commonly used words in Mandarin]*. Beijing: Beijing Normal University.

John Xiang-Ling Dai, 1990. *Historical Morphologization of syntactic words. Evidence from Chinese derived verbs. Diachronica VII*: 1.9-46 (1990)

Kao. Diana L. 1971. *Structure of the syllable in Cantonese*. the Hague.

Katsuo Tamaoka, Shogo Makioka, 2009. *Japanese Mental Syllabary and Effects of Mora, Syllable, Bi-mora and Word Frequencies on Japanese Speech Production, Language and Speech*: 52(1), pp. 79-112, 2009

Lin, Tao & Wang, Lijia. 1992. *Yuyinxue Jiaocheng [The couse of phonetics]*. Beijing: Peking University

Lü, Shuxiang. 1963. "*Xiandai Hanyu dan shuang yinjie wenti chu tan*" [A preliminary study of the problem of monosyllabism and disyllabism in modern Chinese]. *Zhongguo Yuwen 1963*.1: 11-23.

Martin Haspelmath, 2005. *Against markedness (and what to replace it with)*, appear in Journal of Linguistics 41 (2005) or 42 (2006), Cambridge University Press.

Matthew Baerman, 2011. *Defectiveness and homophony avoidance. J. Linguistics 47 (2011), 1-29*. Cambridge University Press.

Rao, Bingcai, Ouyang, Jueya & Zhou, wuji. 1991. *Guangzhouhua Fangyan Cidian [Dictionary of Guangzhou dialect]*, Hong Kong.

Wang, Jenny. 1992, *The Geometry of Segmental Features in Beijing Mandarin*. Ph.D. Dissertation, University of Delaware.

Wayne A. Davis, 1998. *Implicature: Intention, convention, and principle in the failure of Gricean theory*. UK: Cambridge University Press.

Yu, Naiyong, 1985. *Shanggu Yinyi Yanjiu [A study of Archaic Chinese phonology]*, CUHK

Zhan, Bohui. 2002. *An outline of Yue dialects in Guangdong*. Guangzhou: Jinan Universiy.

Zhang, Jie (2002). *The effects of duration and sonority on contour tone distribution--A typological survey and formal analysis*. Routledge, New York.

Zheng, Ding'ou & Pan, Xiaoluo. 2006. *Xinbian Jinri Yueyu [New Cantonese today]*. Beijing: Beijing Language and Culture University.

The Corpus of Contemporary American English (COCA), created by Mark Davies of Brigham Young University in 2008

Zhongguo Wenzi Gaige Weiyuanhui Yanjiu Tuiguang Chu [Chinese Language Reform Committee Research and Popularization Office]. 2008. *Xiandai Hanyu Changyongci (Cao'an)* [A Draft of commonly used words in Standard Chinese]. Preliminary edition. Beijing: Wenzi Gaige Chubanshe.