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Edited by Yun Xiao

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Yaodian (堯典) and (Gaoyao mo) 皋陶謨 in the *Shangshu* (尚書)

PREFACE

The 21st North American Conference on Chinese Linguistics (NACCL-21) was held at Bryant University on June 6-8, 2009. A total of 135 proposals were submitted to the conference organizing committee. Out of them seventy were selected for presentation at the conference, which covered a full range of issues in Chinese linguistics and applied linguistics and represented scholars from China, Hong Kong, Japan, Singapore, Taiwan, North America, and UK.

Two featured speakers with international reputation in Chinese linguistics were invited. They were Professor Yen-Hwei Lin (林燕慧) from Michigan State University and Professor Hong-yin Tao (陶红印) from University of California, Los Angeles. Both presentations were exemplary and highly regarded by the participants.

Although it took place amid the H1N1 flu scare, yet over 120 people attended the conference and actively participated in the presentation sessions, discussions, and networking. There were 94 pre-registered presenters, with the remainder being interested faculty and students from local schools or universities. The conference also attracted book exhibit from Cheng & Tsui Publishing Company and announced a new book entitled *The Syntax of Chinese* (2009), Cambridge University Press, by C. -T. James Huang, Y. -H. Audrey Li, and Yafei Li.

After the conference ended, the presenters were invited to submit their revised papers for publication of the Proceedings of the 21st North American Conference on Chinese Linguistics. Thirty-nine of the presented papers were submitted and included in the proceedings. Based on their research topics, the papers were placed in two volumes and divided into six theme-based parts, including the invited papers. (See Table of Contents for detailed information.)

The conference was organized by Yun Xiao, and the conference website was designed by professional website designer, Connecticut-based Normalkings, Inc. and maintained by Bryant University after the conference ended. The organizing committee included two faculty members in the Modern Language Department, Assistant to the Dean of Arts and Sciences, and the director of US-China Institute at Bryant university. In addition, a dozen of Chinese faculty members, US-China Institute staff, and student interns were involved in the preparation and operation of the conference.

Yun Xiao, Ph.D.

Smithfield, Rhode Island

December 2009

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NACCL-21 also profoundly acknowledges the help from the abstract reviewers and volunteers who worked diligently to assist in conference preparation and facilitating many of its activities.

NACCL CONFERENCES (1989-2009)			
Year	Conference	Host Institution	Organizers
1989	NACCL-1	The Ohio State University	James H.-Y. Tai Marjorie K.M. Chan Robert Sanders
1990	NACCL-2	University of Pennsylvania	Jerome L. Packard
1991	NACCL-3	Cornell University	C.-T. James Huang
1992	NACCL-4	University of Michigan	William Baxter San Duanmu
1993	NACCL-5	University of Delaware	Thomas Ernst
1994	NACCL-6	University of Southern California	Yen-hui Audrey Li
1995	NACCL-7 ICCL-4	University of Wisconsin at Madison	Tsai-Fa Cheng, Yafei Li Hongming Zhang
1996	NACCL-8	University of Illinois at Urbana-Champaign	Chin-chuan Cheng Jerome L. Packard
1997	NACCL-9	University of Victoria, BC Canada	Hua Lin
1998	NACCL-10 IACL-7	Stanford University	Chaofen Sun
1999	NACCL-11	Harvard University	Baozhang He
2000	NACCL-12	San Diego State University	Zhengsheng Zhang
2001	NACCL-13 IACL-10	University of California at Irvine	C.-T. James Huang
2002	NACCL-14	University of Arizona	Feng-hsi Liu
2003	NACCL-15	Michigan State University	Yen-Hwei Lin
2004	NACCL-16	University of Iowa	Chuanren Ke
2005	NACCL-17	Monterey Language Institute	Qian Gao
2006	NACCL-18	Western Washington University	Janet Xing
2007	NACCL- 19/IACL 15	Columbia University	Lening Liu
2008	NACCL-20	The Ohio State University	Marjorie K.M. Chan
2009	NACCL-21	Bryant University	Yun Xiao

Loanword Adaptation and Phonological Theory*

Yen-Hwei Lin
Michigan State University

This paper examines English-based loanwords in Standard Mandarin in light of various proposals on how loanwords are adapted and processed, and discusses the implications of the findings in loanword adaptation for phonological theory. There have been three major approaches to the adaptation and processing of sound-based loanwords: the Perception Approach, the Phonology Approach, and the Perception-Phonology Approach. By examining how Standard Mandarin adapts English consonants, vowels, and stress for loanwords, I show that the combined Perception-Phonology Approach better accounts for the data. The data and processes of loanword adaptation contribute to issues related to how the interaction of phonetics and phonology can be modeled. The degree to which and how features are perceived and modified in the adaptation process suggest relative saliency and/or asymmetrical relationship between features, and thus have interesting implications for feature theory in particular and phonological theory in general.

1. Introduction

There have been three major approaches to the adaptation and processing of sound-based loanwords. The Perception Approach (Peperkamp & Dupoux 2003, Peperkamp 2005) argues that adaptation results from misperception and is processed at the phonetic level. Peperkamp, Vendelin & Nakamura (2008) show that most loanword adaptations originate in *perceptual assimilation* that maps the non-native sounds and structures at the perceptual level onto the phonetically closest native ones. In their proposed speech-sound processing model for perception/encoding, as schematized in (1), perceptual assimilation (the source of loanword adaptations) occurs at the phonetic encoding phase. Under the Perception Approach, the changes of non-native sounds in loanwords are made purely at the perceptual level without involving phonology (Peperkamp & Dupoux 2003, Peperkamp 2005, Peperkamp, Vendelin & Nakamura 2008). The role of phonological grammar is hence indirect: loanword adaptations are *influenced* rather than computed by phonological grammar in the sense that phonology “determines which sounds and sound structures are available for the non-native ones to map onto” (Peperkamp, Vendelin & Nakamura 2008:131).

* I thank Professor Yun Xiao for inviting me to give a keynote speech at NACCL-21 and the participants of NACCL-21 for their comments and questions.

- (1) Perception/encoding in speech-sound processing
 (Peperkamp, Vendelin & Nakamura 2008:154)
- Phonetic surface form
 - Phonetic encoding
 (the process responsible for perceptual assimilation)
 - Phonological surface form
 - Underlying form

In contrast to the Perception Approach, under the Phonology Approach, the input to the adaptation process requires access to the source language's phonology, and loanword adaptation follows category preservation/proximity principles where segment matching is based on phonological categories (e.g. Paradis & LaCharité 1997, LaCharité & Paradis 2005, Paradis 2006, Rose & Demuth 2006, Uffmann 2006). The process of phonetic approximation is used only if the borrowers are not bilinguals (Paradis & LaCharité 2008). Under the Perception-Phonology Approach, the input to the adaptation process is based on how the borrowers perceive the acoustic signals of the source language, and then the perception-based input is modified/adapted by the borrowing language's phonological grammar (e.g. Silverman 1992, Yip 1993, 2002, 2006, Steriade 2001, Kang 2003, Kenstowicz 2003, Kenstowicz & Suchato 2006, Miao 2006). Other than these three major approaches, it has been shown in the literature that a variety of other factors, such as orthography, morphology, and semantics, can be involved in loanword adaptation (e.g. Adler 2006, Davis & Cho 2006, Miao 2006, Smith 2006ab, Vendelin & Peperkamp 2006); however, I will limit my discussion to the three competing approaches.

In this paper, I examine English-based loanwords in Standard Mandarin (SM) in light of the three models on how loanwords are adapted and processed and discuss the implications of the findings for phonological theory. The next section (§2) presents the data of English-based loanwords in SM, and §3 discusses which of the three models of loanword adaptation better accounts for the SM data. The concluding section (§4) offers remarks on the implications for phonological theory.

2. English-based loanwords in SM

In this section, we examine the patterns of syllable structure adjustments in loanword adaptation and the characteristics of adaptations of English consonants, vowels, and stress into SM.

2.1. Syllable structure adjustments

All loanwords conform to SM syllable structure, in which (i) the maximal syllable is CGVX, where C=consonant, G=glide, V=vowel/syllabic C, X=C or V (cf. Lin 1989, 2007b, Duanmu 2000), and (ii) the coda consonant can only be [n] and [ŋ], with the assumption that the *er* syllable [əɿ] consists of a rhotacized vowel (cf. Lee & Zee 2003, Zee 2003). Since

English syllable structure is more complex, syllable structure adjustments need to be made in loanword adaptation from English to SM (cf. Shih 2004, Miao 2006, Lin 2007b). In addition, Phonotactics and allophonic distributions are also strictly followed. Examples for epenthetic vowels/syllabic consonants to break up consonant clusters in English are given in (2a), and (2b) shows examples where some consonants in English are deleted so as to conform to SM syllable structure.

(2) a. Epenthesis			
	<u>Strauss</u>	<u>shǐ.tè.láo.sī</u>	[sɿ.t ^h ʎ.lau.sɿ]
	<u>Brook</u>	<u>bù.lǚ.kè</u>	[pu.lu.k ^h ʎ]
	<u>Richmond</u>	<u>lì.qí.méng.dé</u>	[li.tɕ ^h i.məŋ.tʎ]
b. Deletion			
	<u>Netherlands</u>	<u>ní.dé.lán</u>	[ni.tʎ.lan_]
	<u>Denmark</u>	<u>dān.mài</u>	[tan.mai_]
	<u>Richmond</u>	<u>lì.qí.méng</u>	[li.tɕ ^h i.məŋ_]

2.2. Consonant adaptation

When a consonant appears in both English and SM, the same consonant is used most of the time. When an English consonant is not part of the SM consonant system, a replacement that shares phonetic similarities with the English consonant is adopted, as the examples in (3) show.

(3) a.	<u>Victoria</u>	[v]	<u>wéi.duō.lì.yà</u>	[wei.two.li.ja]
	<u>Steve</u>	[v]	<u>shǐ,dì,fū</u>	[sɿ.ti.fu]
b.	<u>Arthur</u>	[θ]	<u>yǎ.gè</u>	[ja.sʎ]
	<u>Samantha</u>	[θ]	<u>shā.màn.shā</u>	[sa.man.sa]
	<u>Timothy</u>	[θ]	<u>tí.mo.xì</u>	[t ^h i.mwo.ɕi]

The examples in (4) show that phonotactics/allophonic distributions are followed; for example, in SM only an alveolo-palatal can appear before a high front vowel/glide, hence the change of an English palato-alveolar to an alveolo-palatal in SM, as in (4bd).

(4) a.	<u>Johnson</u>	[dʒ]	<u>zhān.sēn</u>	[tʂan.sən]
b.	<u>Jim</u>	[dʒ]	<u>jí.mǔ</u>	[tɕi.mu]
c.	<u>Shakespeare</u>	[ʃ]	<u>shā.shì.bǐ.yà</u>	[sa.ʂɿ.pi.ja]
d.	<u>Sheraton</u>	[ʃ]	<u>xǐ.lái.dēng</u>	[ɕi.lai.təŋ]

There are also contextual variation: for example, coda liquids in the rime delete after nonhigh back vowels in SM loanwords (Shih 2004), as in (5a). In general, as shown in (6), a limited range of context-free variation is commonly tolerated: for example, a nasal coda can be adapted as either an alveolar or velar nasal in SM (6de).

(5)	a.	<i>Barbara</i>	[ɹ]	<i>bā.bā.lā</i>	[pa_.pa.la]
		<i>Mark</i>	[ɹ]	<i>mǎ.kè</i>	[ma_.k ^h ɿ]
	b.	<i>Hilton</i>	[l]	<i>xī.ěr.dùn</i>	[çi.əɹ.tun]
		<i>Blair</i>	[ɹ]	<i>bù.léi.ěr</i>	[pu.lei.əɹ]
(6)	a.	<i>Simon</i>	[s]	<i>sài.méng</i>	[sai.məŋ]
		<i>Scott</i>	[s]	<i>shǐ.kǎo.tè</i>	[ʂɹ.k ^h au.t ^h ɿ]
				<i>sī.kǎo.tè</i>	[sɿ.k ^h au.t ^h ɿ]
	b.	<i>Peggy</i>	[p ^h]	<i>pèi.jī</i>	[p ^h ei.tçi]
		<i>Peter</i>	[p ^h]	<i>bǐ.dé</i>	[pi.tɿ]
	c.	<i>Scotland</i>	[k]	<i>sū.gé.lán</i>	[su.kɿ.lan]
		<i>Scott</i>	[k]	<i>shǐ.kǎo.tè</i>	[ʂɹ.k ^h au.t ^h ɿ]
	d.	<i>Harding</i>	[ŋ]	<i>hā.dìng</i>	[xa.tjəŋ]
		<i>Lansing</i>	[ŋ]	<i>lán.xīn</i>	[lan.çiŋ]
	e.	<i>Johnson</i>	[n]	<i>zhān.shēng</i>	[tʂan.ʂəŋ]
		<i>Johnson</i>	[n]	<i>zhān.sēn</i>	[tʂan.sən]

2.3. Vowel adaptation

There is a high degree of variation in adapting English vowels SM as it is common to match the same English vowel with several different vowels. English [eɪ] can be adapted to [ei] or the less faithful [i] and [ai], as shown in (7).

(7)	<i>Reagan</i>	[eɪ]	→	<i>lei.gen</i>	[lei.kən]
	<i>Reagan</i>	[eɪ]	→	<i>li.gen</i>	[li.kən]
	<i>Shoemaker</i>	[eɪ]	→	<i>xiu.mai.ke</i>	[çijou.mai.k ^h ɿ]

Deviation from faithful vowel adaptation can sometimes be attributed to individual users' or translators' preferences for particular characters based on semantic considerations or other factors (cf. Miao 2006). However, my recent studies have demonstrated that the seemingly chaotic variation in SM vowel adaptation has general patterns and restrictions (Lin 2007ab, 2008ab). The findings are that (i) vowel backness is more faithfully replicated than height and rounding, (ii) deviation in height is tolerated but minimal; e.g., a high-mid or mid-low match is acceptable but a high-low match is not, and (iii) central vowels behave as if they are unspecified for and/or ambiguous between front and back.

(8) Sample examples

a. Adaptations of English high vowels

<i>Grieg</i>	[i]	<i>gě.lì.gé</i>	[kɿ.li.kɿ]	front high
<i>Grieg</i>	[i]	<i>gě.léi.gé</i>	[kɿ.lei.kɿ]	front mid

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<i>Judy</i>	[u]	<i>zhū.dì</i>	[tʂu.ti]	back high
<i>Judy</i>	[u]	<i>qiū.dì</i>	[tʂ ^h ju.ti]	back mid
b. Adaptations of English mid front vowels				
<i>Reagan</i>	[ei]	<i>léi.gēn</i>	[lei.kən]	front mid
<i>Reagan</i>	[ei]	<i>lī.gēn</i>	[li.kən]	front high
<i>Shoemaker</i>	[ei]	<i>xiū.mài.kè</i>	[ʧjou.mai.k ^h ʃ]	front low
<i>Blair</i>	[ɛ]	<i>bù.léi.ěr</i>	[pu.lei.ɛ]	front mid
<i>Blair</i>	[ɛ]	<i>bù.lái.ěr</i>	[pu.lai.ɛ]	front low
<i>Clements</i>	[ɛ]	<i>kè.lǐ.mén</i>	[k ^h ʃ.li.mən]	front high
c. Adaptations of English mid back rounded vowels				
<i>Owen</i>	[ou]	<i>ōu.wén</i>	[ou.wən]	back mid
<i>Dole</i>	[ou]	<i>dù.ěr</i>	[tu.ɛ]	back high
<i>Gore</i>	[ɔ]	<i>guō.ěr</i>	[kwɔ.ɛ]	back mid
<i>Gore</i>	[ɔ]	<i>gāo.ěr</i>	[kau.ɛ]	back low
<i>Ohio</i>	[ou]	<i>é.hài.é</i>	[ʃ.xai.ʃ]	back mid unrounded
<i>Oregon</i>	[ɔ]	<i>é.lè.gāng</i>	[ʃ.lʃ.kɑŋ]	back mid unrounded
d. Adaptations of English low vowels				
<i>Gallup</i>	[æ]	<i>gài.luò.pǔ</i>	[kai.lwo.p ^h u]	front low
<i>Jackson</i>	[æ]	<i>jié.kè.sēn</i>	[tʧje.k ^h ʃ.sən]	front mid
<i>Harry</i>	[æ]	<i>hā.lì</i>	[xa _c .li]	central low
<i>Johnson</i>	[ɑ]	<i>qiáng.shēng</i>	[tʧ ^h jaŋ.ʂəŋ]	back low
<i>Carter</i>	[ɑ]	<i>kǎ.tè</i>	[k ^h a _c .t ^h ʃ]	central low
e. Adaptations of English mid central vowels				
<i>Kentucky</i>	[ə][ʌ]	<i>kěn.dé.jī</i>	[k ^h ən.tʃ.tʃi]	central/back mid
<i>Douglas</i>	[ʌ][ə]	<i>dào.gé.lǎ.sī</i>	[tau.kʃ.la _c .sɿ]	back/central low
<i>Ferdinand</i>	[ə]	<i>fěi.dí.nán</i>	[fei.ti.nan]	front mid
<i>Jeremy</i>	[ə]	<i>jié.lì.mǐ</i>	[tʧje.li.mi]	front high
<i>Hillary</i>	[ə]	<i>xī.lái.lì</i>	[ʧi.lai.li]	front low
<i>Bird</i>	[ə]	<i>bó.dé</i>	[pwo.tʃ]	back mid rounded
<i>Curt</i>	[ə]	<i>kè.tè</i>	[k ^h ʃ.t ^h ʃ]	back mid
<i>Curt</i>	[ə]	<i>kòu.tè</i>	[kou.t ^h ʃ]	back mid rounded
<i>Wordsworth</i>	[ə]	<i>wò.zī.huá.sī</i>	[wu.tsɿ.xwa _c .sɿ]	back high rounded/ central low

In Lin (2008b), the generalizations based on a large corpus from 1978 *Oxford Advanced English-English and English-Chinese Dictionary* are as follows:

- (9) Generalizations from the dictionary corpus
- a. In terms of the front-back dimension, English non-central high/mid vowels and diphthongs are mostly matched in backness in SM, whereas the SM matches for English central vowels and low vowels vary to a larger extent.
 - b. In terms of the height dimension, English high and low vowels have a strong tendency to be retained as high and low respectively in SM, whereas matches for English mid vowels mostly vary between mid and low in SM.
 - c. The match between mid and low vowels and that between mid and high vowels are tolerated to various degrees, but a match between high and low vowels rarely occurs, ranging from 0% for [æ] to 5% for [aʊ], although with a slightly higher 15% high-vowel match for [aɪ].
 - d. A rounding mismatch rarely occurs for English unrounded front and low vowels in the adaptation process, whereas mid back rounded vowels, mid central vowels, and back diphthongs can be matched with an unrounded counterpart in SM.

The dictionary data demonstrate that the more peripheral the English vowel is, the less deviation/variation there is in the SM matches: (i) Tense high/mid vowels show less backness variation in SM matches than the corresponding lax ones, and the high vowels show less such variation than mid vowels; e.g., [i] is mostly faithfully matched, [ɪ] is slightly less so, [eɪ] is more variable, and [ɛ] is even more variable; (ii) high and low vowels show much less deviation in height than mid vowels; (iii) mid central vowels have most variable matches in height, backness, and/or rounding. The fact that vowels with better perceptual contrasts and saliency (e.g. peripheral vowels, tense vowels) are adapted more faithfully while vowels with relatively poor perceptual contrasts and saliency (e.g. mid central vowels, mid vowels, lax vowels) have more variable matches seems to suggest that perceptual factors play a crucial role in the variation patterns of SM loanword vowel adaptation.

2.4. Stress-to-tone adaptation

Like vowel adaptation, there is much variation in stress-to-tone adaptation, and the main restriction is that only attested syllable-tone combinations can be used. In general, English stress is most frequently adapted as the high level tone in SM but can also be matched with the falling or rising tone (Wu, C. 2006). Wu, H. (2006) shows that stress in monosyllabic words in the English source are adapted with the falling tone, as in (10), and that the initially stressed syllable of English disyllabic words tends to be adapted with the

high level or rising tone, as in (11). Wu, H. (2006) also maintains that stressed syllables with sonorant onset consonants favor the rising tone for perceptual reasons, as in (11b).

(10)	<i>pound</i>	<i>bàng</i>	falling tone
	<i>pie</i>	<i>pài</i>	falling tone
	<i>ton</i>	<i>dùn</i>	falling tone
(11) a.	<i>sofa</i>	<i>shāfā</i>	high level tone
	<i>poker</i>	<i>pūkè</i>	high level tone
	<i>soda</i>	<i>sūdǎ</i>	high level tone
b.	<i>logic</i>	<i>luójí</i>	rising tone
	<i>modern</i>	<i>módeǎng</i>	rising tone
	<i>laser</i>	<i>léishè</i>	rising tone

Moreover, when the stress of the English source word does not occur initially, tone assignment on the stressed position resorts to acoustic similarity (Wu, H. 2006), as in (12). In general, the low tone in SM is least likely to be used for adapting English stress.

(12)	<i>baroque</i>	<i>bāluòkè</i>	falling tone
	<i>martini</i>	<i>mǎtīngní</i>	high level tone
	<i>romantic</i>	<i>luómàndìkè</i>	falling tone

Since high level, rising and falling tones all contain the high pitch, represented as HH (55), MH (35), HL(51) respectively, any tone that has the H feature can then be used to match English stress, which phonetically also tends to be higher in pitch. Therefore, acoustic and perceptual factors seem play a crucial role.

2.5. Summary

In sum, the major generalizations drawn from SM loanword adaptation are that (i) SM phonotactics and allophonic distributions are strictly followed in loanwords, (ii) only attested syllable-tone combinations can be used, (iii) the loanword matches for English sounds and stress share phonetic and/or phonological features, and (iv) there is a limited range of variation in consonant adaptation but the variation in vowel adaptation and stress-to-tone adaptation is more extensive and seems to be conditioned by acoustic/perceptual factors.

3. Which theoretical model for loanword adaptation?

With regard to the Phonology Approach, the extensive variability of vowel adaptation and stress-to-tone adaptation in SM loanwords casts doubt on the strict form of phonological category preservation/proximity principles (LaCharité & Paradis 2005). For example, since stress and tone differ in phonological representation and status, it is unclear how phonological category matching can be done (cf. Wu, H. 2006), and Wu, H. (2006) has

argued that acoustics and perception play an important role in stress-to-tone adaptation. In addition, the fact that an English mid vowel can vary between high, mid and low vowels in SM cannot be accounted for in terms of phonological category matching. Since the non-peripheral or less contrastively salient vowels, such as mid and central vowels, exhibit more variation in matches and/or ambiguity for categorization whereas peripheral vowels or more contrastively salient vowels are more faithfully replicated, the input to the adaptation process is likely to be based on auditory perception. Moreover, most of the SM transliterations are done by bilinguals, countering the claim made by Paradis & LaCharité (2008) that phonetic approximation is adopted only by monolinguals.

Both the Perception and Perception-Phonology Approaches maintain that the input to the adaptation process is mostly based on auditory perception but differ in whether or not the borrowing language's phonological grammar is directly involved in the adaptation process. The extensive variation in vowel and stress-to-tone adaptations and the prioritized matching in favor of some particular aspects of the foreign inputs seem to argue against a purely perceptual account since the same vowel or stress is not expected to be perceived variably under the Perception Approach. In addition, the inviolability of SM phonotactics, allophonic distributions, and syllable-tone combinations reflects the dominant phonological force and supports theories of loanword adaptation that incorporate the borrowing language's phonological grammar. Therefore, the Perception-Phonology Approach seems to provide the best account of the SM loanword data.

In an interesting study, Peperkamp, Vendelin & Nakamura (2008) show that the coda nasal in French is adapted into Japanese as a nasal plus an epenthetic vowel but the coda nasal in English is adapted simply as a nasal coda, and argue that phonetic differences, i.e. strong coda nasal release in French vs. weak or little coda nasal release in English, contribute to different adaptations. Note that the studies of SM vowel and stress-to-tone adaptations often examine matches between English and SM vowels and between English stress and SM tone without considering all the phonetic properties and contexts in either English or SM. To support the Perception Approach, one has to show that the extensive variation in SM vowel and stress-to-tone adaptations results from differences in the phonetic properties induced by the contexts (after excluding factors such as the lack of attested syllable types, suitable written characters, semantic consideration, etc.) For example, one may be able to show that the closest SM phonetic match for an English mid vowel in a certain context is a SM vowel in a particular context. Any such support for the Perception Approach will have to await further research.

4. Theoretical implications and conclusion

The first set of implications concern the input and variation in SM loanword adaptation. The SM loanword data seem to suggest that the input to loanword adaptation and processing is perceptual in nature (for consonants, see also Shih 2004, Miao 2006). The variation patterns, however, show that only some specific properties of the foreign inputs are used for adaptation matches and processing (cf. Yip 2002, 2006): (i) The fact that, for

example, [n] can be adapted as either [n] or [ŋ] indicates that input nasality is retained and processed but place features are not, (ii) the high pitch of stress can be adapted as HH, MH, or HL tone, indicating that input high pitch is retained and processed but rime duration may not (Wu, H. 2006), and (iii) vowel frontness and backness are preserved but vowel height and roundness are not as well preserved (Lin 2007ab, 2008ab). The fact that the speakers/listeners/adaptors tend to be better attuned to some particular set of features suggests that these features are salient in perception or primary in phonology. The formal phonological analysis of SM vowel adaptation in Lin (2008a) proposes that the input is underspecified. For example, the highly variable mid central vowel is specified with only [-high] and hence can be matched with front or back and mid or low vowels. If this thinking is on the right track, then one source of variation can come from underspecified input. The variation patterns in SM loanword adaptation then have theoretical implications for issues of underspecification and how variation is modeled.

The larger theoretical questions are then: (i) How to construct a model to predict the degree of underspecification (or selective perception/representation) and which features to be underspecified/selected? (ii) What are the possible sources of variation in loanword adaptation in particular and in linguistic variation in general (cf. Coetzee 2006)? (iii) How should variation be modeled in theoretical linguistics and psycholinguistics? Empirically and experimentally, we may ask: (i) What types of data can provide the evidence for these theoretical questions? (ii) What phonetic and/or psycholinguistic experiments can be conducted to tease apart phonetic versus phonological factors, predict the degree of underspecification and which features to be underspecified, and show how and when variation occurs?

The SM loanword adaptation data also have implications for feature theory. That some features are better retained than others in the adaptation process and minimal deviation in some other features is tolerated suggests that not all features are equally salient perceptually or of the same weight phonologically. It is also interesting to note that for consonants, manner features are more faithfully retained than place and voicing features (Steriade 2001, 2002, Miao 2006), and yet for vowels, backness features (vowel place features) are more faithfully retained than other vowel features. For prosodic features, pitch height appears to be more salient. The larger theoretical questions then are: (i) Why is there asymmetrical behavior of different features? (ii) What phonetic and/or phonological factors influence the asymmetrical behavior? (iii) How can a feature theory capture the unequal relationships between features? Empirically and experimentally, the questions are: (i) What types of data can help construct such a feature theory? (ii) What phonetic and/or psycholinguistic experiments can be conducted to gain a better understanding of the underlying causes of the asymmetrical relationship/behavior among different features?

In conclusion, the data and processes of loanword adaptation showcase the interplay between phonetics and phonology and contribute to issues related to how the interaction of phonetics and phonology can be modeled. The degree to which and how features are perceived and modified in the adaptation process and the prevalence of variable adaptation

suggest relative saliency and/or asymmetrical relationship between features, and thus have interesting implications for feature theory in particular and phonological theory in general.

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Core Vocabulary in Spoken Mandarin and the Integration of Corpus-Based Findings into Language Pedagogy*

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A key issue in language acquisition is to improve native-like proficiency in vocabulary use. One solution to this is to identify word frequencies (especially in conjunction with core vocabulary) and collocation patterns based on native speakers discourse. In this paper, I first discuss some of the puzzles presented in some long-standing and recent quantitative observations of the Mandarin lexicon. I then discuss high frequency clusters in terms of their unique forms and functions as a way of solving some of the puzzles. Finally I discuss the implications of these findings for language teaching, especially vocabulary teaching.

0. Introduction

One of the most commonly encountered issues in language acquisition is to improve native-like proficiency in vocabulary use, whereby not only individual words are used appropriately, but word combinations are used in ways that are close to how native speakers deploy them in actual communicative contexts. This kind of research has been conducted along the lines of collocation, phraseology, idiom, fixedness, formulaic language, the Idiom Principle, and Lexical Priming, to name just a few (Pawley and Syder 1983, Sinclair 1991, Nattinger and DeCarrico 1992, Lewis 1993, Howarth 1998, McCarthy 1998, Erman and Warren 2000, Wray 2002, Hoey 2004). A key solution to this issue is to identify word frequencies (in conjunction with core vocabulary) and collocation patterns based on native speaker discourse. Fortunately, with the availability of electronic corpora and corpus analysis tools, such tasks have become increasingly manageable (Sinclair 1991, O'Keeffe, McCarthy, and Carter 2007).

Previous research on statistical properties of Chinese has tended to focus on the frequency of use, as well as the standards, of Chinese characters, due understandably to the prominence of characters in the Chinese writing system (GJYW 1988, Chen 1989, 1993, GJHB 1992). More recent work has begun to examine distributional properties of the language itself. Thus the well-known Frequency Dictionary of Modern Chinese compiled by the Beijing Language University (YYXY 1986) provides useful frequency information about various types of lexical items in different genres, as do the recently published Xiao et al. (2009): *A Frequency Dictionary of Mandarin Chinese: Core Vocabulary for Learners* as well as the frequency dictionary in Liu et al. (1990). However,

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a major drawback with such studies is the lack of natural conversation data, limiting the scope mainly to written texts and spoken prose (Abercrombie 1963). Furthermore, very few quantitative studies have attempted to provide in-depth analyses of patterns of language use beyond simple character/word lists.

Looking beyond the Chinese linguistics realm, we can find that, in the area of word frequency distribution, as early as in the 1930s George Zipf (1935) had made influential proposals about statistical distributional properties of the lexicon, widely known as Zipf's Law. Interestingly, his work also involved data from Beijing Chinese. Among the phenomena discussed by Zipf, the relation of Beijing syllables to the shape of its words is described as high frequency words tending to have fewer syllables ("shorter") while low frequency words tending to have more syllables ("longer"). He pointed out that overall the variety of high frequency words is smaller than that of the low frequency words. These patterns of course fit well with what Zipf observed of vocabulary in general: 1) a small number of lexical items have very high frequencies in natural texts; and 2) in general the magnitude of words tends to stand in an inverse relationship to the number of occurrences. A recent study in Wang (2009) also shows that Zipf's Law applies to the variety of word senses: the more senses a word has, the shorter (and more frequent) it tends to be. While mathematicians have found Zipf's Law to apply to a wide range of physical and social phenomena (e.g. populations of cities), few linguists have attempted to understand the underlying reasons for the observed tendencies other than reiterating Zipf's (1935, 1949) "least effort" principle (Wang 2009). This paper is an attempt at elucidating some of the properties of lexical use, with a goal to demonstrate their relevance to Chinese language pedagogy.

In what follows I will first describe the database of this study. Then general findings from the data will be presented and explanations will be offered. At the end of the paper implications of the findings for Chinese language education will be discussed.

1. Data

My data come from 54 face-to-face conversations, recorded between the 1980s and 2005. The conversations are between native speakers of Mandarin who are generally familiar with each other in various locations in mainland China, Hong Kong, and overseas.

The data were word-segmented and tagged for parts-of-speech (POS) information by the software program ICTCLAS (Zhang, Liu, Zhang, and Cheng 2002, Xiao, Rayson, and McEney 2009: 3-4), which uses algorithms based on statistical models. A total of 344,141 words were identified by the program.

2. General Patterns

A search of the data shows that there is a general dominance of a small number of lexical types in the corpus. Here, a type is taken to be a unique word as identified by the ICTCLAS program, while a token is any occurrence of the type in the corpus. From this point of view, the data show that the top 100 types account for near 80% of the running words.

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	Type	Token	Proportion of tokens in corpus
High frequency	top 100	268,979	78%
Low Frequency	below top 100= 16,940	75,162	22%
Total	17,040	344,141	100%

Table 1: Type-token distribution: top 100 vs. the rest

This finding is clearly in line with Zipf’s observation of Beijing Mandarin and other languages. Figure 1 provides another perspective. It gives a breakdown of the top 300 words and their proportions in the corpus: there are 3 words with a frequency of 10,000, 6 with a frequency of 5000, 51 with a frequency of 1000, and so forth. Together they make up a large majority of the corpus. On the other hand, there are over 14,000 words that occur just once in the corpus.

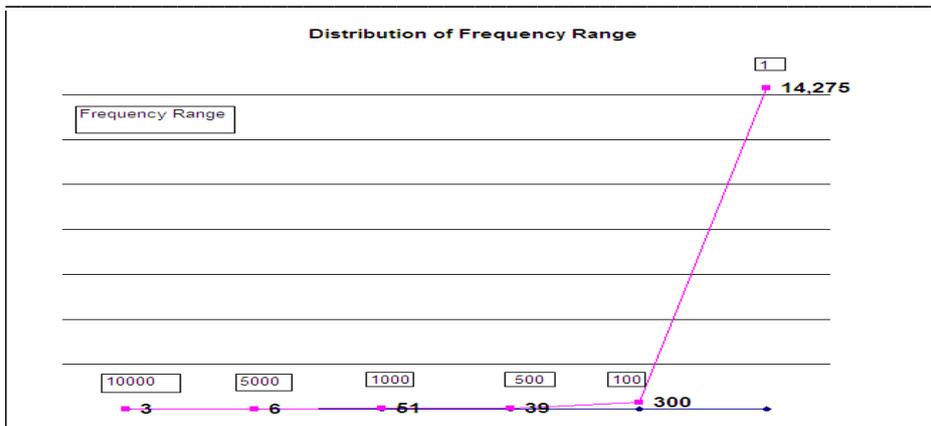


Figure 1: Major bands of words and their proportions in the corpus

In other words, a small number of high frequency words dominate over a large variety of low frequency words.

Given the high concentration of a few high frequency words in spoken discourse, it is natural for us to ponder: What are these words? What categories they may belong to? McCarthy (1999) and McCarthy and Carter (2003) show that in spoken (British) English, the following major categories are common in their data: 1) modal items, e.g. *can, could, should, will, look, seem, sound*, etc.; 2) delexical verbs, i.e. verbs that have low semantic content, e.g. *do, make, take, get*, etc.; 3) interactive markers which are central to spoken communication: *just, whatever, really, things*; 4) discourse markers which organize and monitor the talk, e.g. *I mean, right, so, good, you know*; 5) deictic words which refer to spatial and temporal points, e.g. *this, that, now, ago, away*; 6) basic nouns, e.g. *person, problem, situation, door, water, house, car*, etc. 7) basic adjective, e.g. *good, bad, different, lovely, terrible*; 8) basic adverbs, e.g., *today, yesterday, eventually, finally, usually, normally, quickly, slowly*, etc.; 9) basic verbs, e.g. *sit, give, say, leave, stop, help, feel, put*, etc.

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For Mandarin, Tseng (2001:168, 2006:104) identifies 36 high frequency words as the core vocabulary on the basis of a small sample (less than ten thousand words) of spoken Chinese. Her classification is as follows:

7 verbs: 在 zai 'be in/at', 是 shi 'copula', 就是 jiushi 'that is', 说 shuo 'say', 去 qu 'go', 要 yao 'want', 有 you 'have';

6 discourse particles: 哦 o, 嗯 en, 哎 ai, 啦 la, 啊 a, 嘛 ma;

5 adverbs: 也 ye 'also', 就 jiu 'then', 都 dou 'all', 很 hen 'very', 对 dui 'right';

4 grammatical particles: 呢 ne; 吗 ma; 了 le; 的 de;

4 nouns: 话 hua (words), 时候 shihou 'time point', 人 ren 'person', 小孩子 xiaohaizi 'kids';

3 na and zhe words: 这样 zheyang 'this way', 那个 nage 'that one', 那 na 'that';

3 pronouns 他 ta 'he', 我 wo 'I', 你 ni 'you';

2 negation: 不 bu 'not', 没有 meiyou 'have not';

1 adjective 好 hao 'good';

1 connective 所以 suoyi 'so'.

For my data, the top 50 plus items are listed under Table 2. As can be seen from the raw frequencies, a few major groups emerge, with some overlapping with those on Tseng's list while others not. An initial taxonomy of the core vocabulary can be established as follows.

- 1) Pronouns: 我 wo 'I', 你 ni 'you', 他 ta 'he'
- 2) Low content verbs: 是 shi 'be', 有 you 'have'
- 3) Speech act verbs: 说 shuo 'say'
- 4) Cognitive verbs: 觉得 juede 'feel', 知道 zhidao 'know', 看 kan 'see, think'
- 5) Motion verbs: 去 qu 'go', 到 dao 'go to', 上 shang 'get'
- 6) Adverbs: 就 jiu 'then', 就是 jiushi 'then', 都 dou 'all', 也 ye 'also', 很 hen 'very', 还 hai 'also'
- 7) Numeral/Classifiers: 一 yi 'one', 一个 yige 'one'
- 8) Modal expressions: 要 yao 'would, will, should'
- 9) Negation: 不 bu 'not', 没有 meiyou 'not have'
- 10) Deixes: 这 zhe 'this', 这个 zhege 'this one', 那 na 'that', 那个 nage 'that one'
- 11) Temporal deictic: 然后 ranhou 'then', 现在 xianzai 'now'
- 12) Reactive tokens: 哦 o, 嗯 en, 啊 a, 对 dui
- 13) Particles: 吧 ba, 呢 ne, 嘛 ma, 啊 a
- 14) Interrogatives: 什么 shenme 'what'
- 15) Conjunctions: 所以 suoyi 'so', 而且 erqie 'and', 但是 danshi 'but'
- 16) General nouns: 人 ren 'person'
- 17) Basic adjectives: 好 hao 'good'

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1) 的.....13245	19) 那个.....3154	37) 到.....1666
2) 是.....12047	20) 然后.....3076	38) 她.....1606
3) 我.....10052	21) 在.....3067	39) 没.....1590
4) 就.....7782	22) 什么.....3064	40) 吧.....1539
5) 不.....7743	23) 这.....3027	41) 多.....1490
6) 你.....7658	24) 这个.....2772	42) 它.....1474
7) 了.....7484	25) 很.....2373	43) 没有.....1438
8) 那.....6846	26) 哦.....2245	44) 得.....1412
9) 啊.....5792	27) 看.....2197	45) 呢.....1384
10) 个.....4696	28) 人.....2100	46) 跟.....1336
11) 他.....4385	29) 还.....2093	47) 他们.....1335
12) 对.....4285	30) 嗯.....1953	48) 儿.....1326
13) 就是.....3920	31) 好.....1939	49) 上.....1235
14) 有.....3816	32) 要.....1871	50) 吗.....1200
15) 都.....3760	33) 我们.....1847	51) 现在.....1176
16) 说.....3677	34) 去.....1824	52) 知道.....1135
17) 一.....3497	35) 一个.....1814	53) 嘛.....1112
18) 也.....3186	36) 觉得.....1694	54) 但是.....1082

Table 2: Top 50 plus high frequency words in the corpus

3 Understanding core vocabulary in spoken Chinese

3.1. General questions

If, as the results shown above indicate, a limited number of words are doing most of the work in spoken communication, how is this possible? Especially intriguing are the following properties that can be detected from the data:

-That many of the core vocabulary items are not real lexical or high content words.

This is illustrated by words such as copula verbs, negation markers, and general nouns.

-That most of them can not stand alone. This is illustrated by words such as conjunctions, particles, and adverbs. One cannot typically make up an utterance with these words alone, as they rely heavily on the context provided by other words and expressions.

Given the above, why, then, would these lexical items be so frequent and be able to make up much of the talk/text?

Clearly, some of the usage patterns are transparent given the nature of conversation. For example, utterance-final particles are probably not too surprising given that one can practically not produce a spontaneous utterance in Chinese without attaching a final particle to indicate its pragmatic nuance. We can also safely anticipate the use of

person pronouns, which typically indicate speaker roles, and the use of reactive tokens, which regulate speaker interaction (Clancy et al. 1996). Yet, many on the top list demand an explanation. For example,

- Why would there be so many copulas?
- Why cognitive verbs?
- Why so many conjunctions if spoken language is supposed to be fragmented, short, and simple?
- Why so many negatives?
- Why do distal demonstratives outnumber proximal ones if conversation is supposed to be about “here and now”?

While there are no quick answers to any of the above questions, and a full-fledged study is certainly beyond the scope of the present paper, we can at least explore some possibilities with a few selected items here.

3.2. A proposal

In contrast with the dominant approach to meaning and vocabulary that emphasizes the single lexical words as a unit of meaning (Chao 1968), I propose that the key to a proper understanding of the puzzles presented in the quantitative data is to look beyond the single words and take multi-word units as a valid unit of meaning (Sinclair 1991, 1996, McCarthy 2002). That is, in addition to the meanings and grammatical patterns typically found in dictionary definitions and grammatical descriptions of individual words, most of these lexical items have special collocation patterns, constituting fixed or semi-fixed expressions; often they combine with one another and function as expanded phrasal units. These units tend to have specialized pragmatic meanings and functions and often play multiple roles in spoken discourse, resulting in mismatches between lexical forms and functions.

In other words, the individual frequency when used separately, the frequency of combinations involving these lexical items, as well as the extended meanings and functions beyond the lexical meanings, give rise to the statistical and functional prominence of these lexical items in spoken discourse.

3.3. A case study of cognitive verbs: 知道 *zhidao* ‘to know’

In this section, I take on the case of one cognitive verb and demonstrate how individual items and the associated combinations work to create high frequency expressions.

Cognitive verbs such as *zhidao* ‘to know’ are typically taken to indicate mental states, cognitive abilities, and so forth. They are considered syntactically interesting as they can take a variety of objects, including complements (Meng et al. 1999). E.g.,

(1) 我也不是学西医，知道一点而已。

‘I’m not a specialist in Western medicine, so I know just this much.’

(2) 其中有一个问题就是问他们打 - 有没有打流感预防针，然后说知不知道要多久

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打一次第 - 流感预防针,

‘One of the questions they asked them was whether or not they had had the flu shot. Then they asked whether they knew how often flu shots were given.’

In the first example, the object is a simple nominal, while in the second a complement clause. In both cases, the verb *zhidao* denotes a cognitive meaning, i.e. the possession of knowledge or lack thereof.

However, discourse data show that the attested patterns are quite different from the expected syntactic behaviors. In a previous study, Tao (2003) shows that half of the *zhidao* cases in the conversation corpus do not take any objects.

With Objects	55	47%
Without Objects	58	50%
Other	4	3%
Total	117	100%

Table 3. The syntax of *zhidao* in conversation

Furthermore, there are numerous combinations which function as special constructions with special meanings beyond the typical lexical semantics of the verb. One common collocation is 不知道 *bu zhidao* ‘don’t know’. Many of these combinations indicate an epistemic meaning, where the speaker is taking a stance to show a lack of commitment as to the source or truthfulness of the statement. E.g.,

(3)男: 那个梅, 梅市长我不知道为什么那个..升的真快, 他..

‘The mayor, Mayor Mei, I don’t know why he was promoted to fast, he must be..’.

In this segment, taken from a reporter’s conversation with a colleague after they both interviewed a mayor, shows an apparent lack of knowledge. However, upon further examination of the conversation, one can see that the same speaker continued the conversation with an explanation of the mayor’s rise to prominence. This shows that the lack of commitment is not due to cognitive deficiencies such as memory lapses, as the speaker did provide a full account of the mayor’s professional history, but rather is a lack of epistemic commitment. The likely motivation here is that the speaker was trying to avoid creating an impression that he was in possession of knowledge that was lacked by his fellow reporter. As the concordance lines show, a combination of 我也不知道 *wo ye bu zhidao* ‘I just don’t know’, though not all being an epistemic phrase, contributes to the high frequency of four of the top items on the frequency list: *wo*, a person pronoun; *ye*, an adverb; *bu*, a negator; and *zhidao*, a cognitive verb.

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一个那个发条城] F: 都不行, M: 我也 不 知道 那个是啥, F: 啊, M: 我原来以为是个恐怖
 转学的话就面临着更大的经济压力, 我也不 知道 为什么反正她这么说可能周转 - M: 不转学活不下去,
 我们精力都花在什么上面了? M: ...我也不 知道 都干吗去了, XXX 考 GRE 上, F: 我时间全花在
 。 F1: .. 它也太艺术夸张了。.. 我也不 知道 真的李昕当他们的教练有些什么事儿, F2: 唉是啊
 可能 - 他不是说李昕一下 - 一气之下辞职 也不 知道 是为什么辞职。 F2: [m=] F3: [uh,
 onica Mountain 在哪儿啊? F3: 我 [也不 知道。] F2: [我也不知]道, F3:
 就想你在暗示我这个, 他说我 - ^也 = 不 知道 这个男的怎么想的, 然后就去 - 就去跟那个 Michelle P
 怀孕了的一个女的, 但是我具体是谁还是我也不 知道。就是我只 - 电影 - 内容 - M: 你看了多少啊,
 八景儿的电影哪个值得保 - 保存? F: 我也不 知道。 ((24:58)) M: 那个怪片子。在 = Barn
 [3 我我不知道 3] 为什么 - 我可能是 - 我也不 知道 是为什么, 4] M: [4 乱世佳人我看 4] 过多少
 没出过。 1] 就 - 不出。也不 知道 为啥。 F: Scott 有那个 V- M: [2
 那沙发。 @> F: .. 哦, 我也 - 我也不 知道, huh 不是。 M: 你那沙发放哪儿了, F:
 结果真得了不得, 哪时候小孩也 [1 不 知道 1] 要保持一下迷糊, [2 就哪样儿啦
 摇篮是床高还是啥, 我也不 知道 为啥, 反正我就是 - <X 硬往 X> 床上面尿, M
 就不愿意叫阿姨不愿意下床哪个样子, X- 也不 知道 是被子冷还啥, 我也 - 我自己也 - [现在] 具体怎么
 哦, M: 她就打我。 F: 哪我也不 知道, 我小时候 - M: 我就 - 我 - 从小儿就是强。 [1
 然后, 我还可能是有点吃醋吧, 我也不 知道, 我现在想不太起来了, (H) 然后有一次骑自行车他俩
 它就是相当于国内的哪种什么 - @@@ 我也不 知道 哪个名字, 足球哪种什么 - (H) ..uh- 我 - 我一个
 这是他的助手。啊, 不知道怎么弄。然后他也不 知道 该怎么选择, 他的助手就告诉他是 | I^平

Figure 2: Concordance lines of (*wo*) *bu zhidao*.

Another common collocation involving *zhidao* is the phrasal unit 你知道 *ni zhidao* ‘you know’. This expression functions in similar ways as the English discourse marker ‘you know’ (Schiffrin 1988) in that they both function as an involvement device to draw the addresser’s attention. However, what is interesting in Mandarin Chinese is that there is usually an interrogative particle 吗 *ma* or 吧 *ba* attached to the subject-verb structure, making it apparently an interrogative form. However, in actual use it is not always a genuine question – and in fact it is usually not. Here is an example of *ni zhidao*.

(4) M: 那那是夹竹桃吧,
 F: 不是, 是桃花啊, 你知道吗?
 M: 夹竹桃吧,

‘M: That looks like oleander. F: No, it’s peach blossom, you know? M: It seems more like oleander.’

In this example, since the first speaker begins by asking for confirmation, the second speaker’s use of the apparent question with *zhidao* can only be interpreted as a confirmation token rather than a genuine question.

If we analyze the composition of examples such as (4), we can see that three common items on the high frequency list can be accounted for: *ni*, a second person pronoun; *zhidao*, a cognitive verb; and *ma*, a final particle. Again a phrasal unit with a special construction status and with special pragmatic meanings account for the high frequency of multiple lexical items. Of course this is not to suggest that such environments are the only ones in which the three items are used, but this does point to at

least one common place that contributes to the high frequency of the component elements in Mandarin conversation.

One way to show the fixedness of these phrasal units, *wo bu zhidao* and *ni zhidao* (*ba/ma*), etc., is to look at the flexible positions they take in the stream of speech. That is, rather than taking a complement or any objects at all, they often appear at the end of a completed clause, rendering them a parenthetical status. Here is an example of *wo bu zhidao*:

(5)他这最多可以写多少字我也不知道，但是我反正曾经写过三十个字。

‘How many characters he can write this way, I am not really sure about, but I used to write about 30.’

In this case the whole *wo bu zhidao* construction appears right after a complex clause. In the following example, *ni zhidao* is placed in the middle of a longer utterance:

(6) B: 而且我们这儿你知道不知道人家线路怎么走，看车辆牌子全一样。

A:对（笑）。

‘B: In here we, as you know, we don’t know how the locals get around; all those bus stop signs look the same. A: Exactly.’

那那是 ya- 竹桃吧, F: 不是, 是桃花啊, [你 **知道** 吗?] M: [夹竹桃吧,] F: 桃花也有啊,
 [2@@@2] F2: [1问问, 对啊=, 1] [2你 **知道** 吗?真的很2]残忍, 在我们那边发生了^好多起=,
 从国内到美国来,这感觉这不一样啊, 你 **知道** 我说什么,这肯定是不一样的, 我要是就是
 - 非常-难受的地方。 M1: 可是他有人^喜欢你 **知道** 吗, M2: 真的吗? M1: 对啊, M2:
 M: @@@ F: 那时候根本不能喝水你 **知道** 为啥?不能喝水?因为根本没办法上厕所,蹲不下去,
 [干的?] F: 非常好吃, F: 嗯,你 **知道**, M: 干的辣椒面儿还调制啊? F: 你知道我
 有 -a^ccounting 有个 <XgoodwillX>嘛, 你 **知道**, 还有 -um...还有就说=..还有股票,一些股票啊=,
 怎么一个原因, M1: 你说 - F: 因为你 **知道** 他们高中生你平时就要做好多好多的实验, 什么=
 F: 真的是很孤单很孤单,而且那个,因为你 **知道** 那不是最后落脚的地方,那些人也不把你当成-
 M2: 你-你不知道^打哪儿^块=你 **知道** 吗, @@@@你不知道怎么,然后我就-^把他^全
 - 因为我可不习惯女孩儿之间这一套你 **知道** 吗, M: uh= F: 因为我们X家的女孩儿
 M2: 没有,外国女人没有女人味你 **知道** 吗, 个个像男人一样。 M1: ..没有, F:
 [它这个收音.] F: 小时候 你 **知道** 那报纸上什么什么什么少年什么那一类的报纸
 F3: 小卫生间,后来那个味道-就是那-就你 **知道** 那个气, F2: 对, F3: 觉得不对头, F
 买2]辆新车它不会开到这车-...就^一直开你 **知道** 吗, M2: 对, M1: 他-开几年他就
 M: 习惯了。 F: 你不用^想= 你 **知道** 吗,看那种东西你就是更更更就看电视一样就
 就要蹦出一个英语单词来那<@一种感觉你 **知道** 吗?@> huh特别-特别难受看了那一台那个
 我接-接受吃肉,但是我-你 **知道** 我吃得太多我不行=, uh uh,(H) F3: 我-
 -在医学上叫做^异体排斥嘛, 异体排斥你 **知道** 吗? 就是说, eh,tsk((orlighter'ssoun
 哪天比赛你没见着, ...明星。明星教练你 **知道** 吧,") F2: qi-(Hx),他把别人当白痴 I[≠]

Figure 3: Concordance lines involving *ni zhidao*.

For a full account of the syntactic, semantic, discourse, and phonological properties

associated with *zhidao* constructions, the reader is referred to Tao (2003). Suffice it to say here that this cognitive verb is by no means a rarity, and that there are multiple combinations involving a large number of common words found in the high frequency list, all having constructional meanings different from their individual parts. For example, a quick review of the literature in Chinese discourse studies suggests that similar behaviors have been observed of many other cognitive verbs (e.g. *juede*, Lim (this volume), Chiang 2004), copula expressions involving *shi* and *jiushi* (Biq 2001), low content verbs *you/meiyou* (Dong 2004), as well as the speech act verb *shuo* (Liu 1986, Meng 1982, Dong 2004). When we take into account both the lexical use and the multi-word constructional use it is possible to understand why all of the items in question have such high frequencies, yet individually they have little grounds to stand alone or be independent in constructing utterances.

4. Summary

I have shown with a case study of a cognitive verb that although the variety of the core lexicon may be small, their capacity to generate new lexical forms is high. The mechanisms are collocation and colligation: words combine with one another. Through combinations, new semiotic resource are created and serve to indicate subtle meanings in the conduct of social interaction. As a result, the frequencies of individual items in question also increase. This can be viewed as complementing the “least effort” principle as argued by Zipf (1935, 1949).

That words cluster is hardly a surprising finding. As research from corpus linguistics has repeatedly shown, a proper understanding of language must evoke some degree of fixedness or idiomaticity, as it is not possible for all language use to be computed on the fly and formulas and prefabs facilitate both speech production and comprehension. Researchers have reported that about 60-80% of spoken texts fall into some sort of formulaic sequences (Altenberg 1998, Erman and Warren 2000, Schmitt and Carter 2004). Research in this area has touched upon the issue of unit of meaning beyond single words (Sinclair 1991, 1996, McCarthy 2002), chunking (Bybee 2006, 2007), and formulaicity/idiomaticity (Wray 2002, Wulff 2008, Corrigan et al. 2009). Concerning formulaicity, Wray (2002:280) points out that “formulaicity bridges the gap between novelty and routine, and makes it possible for us to protect our own interests by producing language that is fluent and easily understood”. Bybee (2006, 2007, 2009) points out that “‘chunking’ results when sequences of units that are used together cohere to form more complex units” and create frequency effects that facilitate production and comprehension. All this calls into question long-standing views of the nature of lexical and grammatical units, where individual words are seen as independent meaningful units, and provides an advantageous perspective for understanding the highly skewed distribution patterns that are widely observed in natural discourse.

5. Implications for Chinese language education

Turning now to the issue of integrating corpus-based findings into language pedagogy, an obvious application would be identify and focus on multiword sequences in pedagogy, as frequency effects of prefabs have also been shown to facilitate production

and comprehension in the L2 context (Wood 2002). However, even a cursory survey of the most commonly used Chinese teaching materials will show that Chinese language pedagogy has an overwhelming tendency to focus on individual characters and isolated words. Although sometimes correlated expressions such as paired conjunctions (e.g. 因为 yinwei ‘because’...所以 suoyi ‘therefore’, 不但 budan ‘not only’...而且 erqie ‘but also’, etc.) may be singled out, the discussion rarely goes beyond this. Thus in a lesson on eating out at restaurants found in a textbook series recently published in mainland China, which is also widely distributed internationally, the following text is found:

上餐馆

爸爸开车带我到了中餐馆，妈妈已经坐在里面等我们了。星期天，中餐馆里人很多，空位子很少。中餐馆里的菜可多了，有鱼，有肉，还有各种海鲜和青菜。中国菜颜色美，味道香，又好看又好吃。我们坐下来，要了茶，接着点了三菜一汤，还点了鸡蛋炒饭。饭菜的味道好极了，我们都吃得很饱。这顿饭才花了二十多美元。爸爸付了钱，我们高高兴兴地离开了餐馆。

What follows, as are typical of Chinese textbooks, are lists of single characters, single words, along with a couple of key sentences:

生字

馆空菜肉鲜青味茶汤鸡炒极饱顿

词语

餐馆好吃接着鸡蛋味道

句子

我们吃得很饱。
这顿饭才花了二十多美元。

Even though this lesson consists of a made-up text rather than authentic material, we can still identify a number of common multi-word expressions:

上餐馆	中餐馆	颜色美	味道香	(又)好看(又)好吃
要了茶	点了菜	三菜一汤	鸡蛋炒饭	味道好 这顿饭

All of these are attested phrasal expressions from written language corpora (e.g.

<http://corpus.leeds.ac.uk/internet.html#>). As with common multi-word expressions (Wray 2002), many of them contain core elements plus variable components. For example, 中餐馆 zhong canguan ‘Chinese restaurant’ could be substituted and become 西餐馆 xi canguan ‘Western restaurant’, 三菜一汤 san cai yi tang ‘a set of three dishes and one soup’ could be 四菜一汤 ‘a set of four dishes and one soup’, and 鸡蛋炒饭 jidan chao fan ‘fried rice with eggs’ could be 虾仁炒饭 xiaren chao fan ‘fried rice with shrimps’ or 鸡蛋炒青椒 jidan chao qingjiao ‘fried eggs with green peppers’ etc. Yet the commonality of these expressions are undeniable. If these chunks are made aware of to the learner, there is no doubt that it would be much easier for learners to grasp similar expressions when they next encounter them. Of course this is by no means to suggest that all of these items must be prioritized in instruction, and researchers are still debating the pros and cons of formulaic language instruction (see Wray 2002, Part IV). However, the benefits of focusing on not just individual words/characters but also fixed chunks are beyond question (Nattinger and DeCarrico 1992, Howarth 1998, McCarthy 2002, Wood 2002). Perhaps what is ironic is that expressions such as 颜色美 yanse mei ‘pretty colors’ and 味道香 weidao xiang ‘delicious tastes’ are probably designed to be learned as fixed expressions given their adjacent and parallel features, yet they are nowhere to be seen in the vocabulary list, and nor are they ever integrated in pattern drills or any other types of pedagogical practices.

By way of conclusion, the findings reported in this paper, many of which have been discussed extensively in the literature, point to the following:

- 1) Rather than learning ever lengthening lists of new rare words, students may become more effective communicators by being exposed to combinations of words already internalized in new and useful ways;
- 2) Teachers should use every opportunity to raise the learner’s awareness about existing and novel combinations and the mechanisms of such combinations;
- 3) When analyzing fixed formulas, emphasis should be placed on both key components and flexible substitutes. It is also important to contrast individual meanings with meanings of the whole chunk.

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The Phonology of *ABB* Reduplication in Taiwanese

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This paper investigates the tonal patterns of *ABB* reduplication, a frequent indicator of onomatopoeia and ideophones in Taiwanese. The data show that the tonal pattern of the suffix *BB* that occurs most frequently is 53-21. In this pattern, the high falling tone, 53, is the result of tone sandhi, with the underlying tonal pattern 21-21. Unlike Mok's (2001) findings that Mandarin, Cantonese, and Hakka have a preference for the high level tone for a similar type of reduplication, Taiwanese onomatopoeia and ideophones favor the low falling tone 21. It was also found that some *BB* suffixes can surface with a separate, distinct tonal pattern, raising the question of which tones are underlying and which derived. Moreover, there do not seem to be regular rules specifying the phonological environment in which each tonal pattern of the *BB* suffix surfaces. Further research on the tonal derivation of onomatopoeia and ideophones should be carried out to provide solutions to these unanswered questions.

1. Introduction

Taiwanese has a large number of non-prosaic words, including many that are onomatopoeia and ideophones. According to Pharies (1979), onomatopoeia is a mimetic expression with inherent acoustic properties similar to the sound it refers to. Ideophones, coined by Doke (1935), categorize a class of words that describe action, state, intensity, color, sound, smell, manner, and emotion. Linguists working on onomatopoeia and ideophones have found that they often have different phonological characteristics than prosaic words. In terms of phonological abnormalities of tone, onomatopoeia and ideophones can demonstrate unfamiliar tonal patterns and decrease in contrasts of tones (Mok, 2001). For example, in Kongo, two adjacent high tones or low tones at the end of an utterance occur exclusively in ideophones (Daelman, 1966, cited in Samarin, 1971). In Lao, a six-toned language, only the mid-high level tone and the high-falling tone are used in onomatopoeia (Crisfield, 1978). However, Taiwanese onomatopoeia and ideophones' tonal characteristics have not yet been investigated in the literature. Thus, this paper seeks to examine the tonal patterns of a particular type of onomatopoeia and ideophones in Taiwanese, known as *ABB* reduplication (Chiang, 1992; So & Harrison, 1996).

ABB reduplication is composed of a root and a double reduplicated suffix. In this article, *A* in *ABB* reduplication stands for the root, and *BB* for the double reduplicated

suffix. The root *A* is usually an adjective, a verb, or a noun, and the suffix *BB* can be either onomatopoeia as in (1), or an ideophonic expression as in (2).

(1) The *BB* suffix as onomatopoeia:
 /tsio hai hai/ ‘laugh’
 laugh laughing sound

(2) The *BB* suffix as an ideophone:
 /pHui ki ki/ ‘fat’
 fat O O

The function of the *BB* suffix is to add more descriptive weight to the root or to modify the degree of intensity (Chiang, 1992). Previous research on Taiwanese *ABB* reduplication focuses on its morphological derivation (Chiang, 1992) or its semantic differences compared with the root alone or with other similar phrases (Liu, 2003). Mok’s (2001) study of Chinese sound symbolism is a thorough examination of onomatopoeia and ideophones, but the languages under investigation in her research were Mandarin, Cantonese, and Hakka. The study seeks to remedy the lack of phonological investigation of Taiwanese onomatopoeia and ideophones in the literature by presenting the tonal patterns of *ABB* reduplication in Taiwanese.

The organization of this paper is as follows. Section 2 reviews Mok’s (2001) analysis of *ABB* reduplication. In Section 3, Taiwanese tones and tone sandhi are presented as the background of the analysis. In Section 4, the tonal patterns of *ABB* reduplication in Taiwanese are presented. Section 5 discusses the analysis and remaining unresolved puzzles of *ABB* reduplication. Section 6 concludes the paper with directions for future research.

2. Mok (2001)

The data in Mok’s study were analyzed within the framework of Lexical Phonology (Kiparsky, 1982; Halle and Mohanan, 1985) and Steriade’s (1988) theory of reduplication. The assumption is that reduplication is a left-to-right affixational process, involving copying the segmental and suprasegmental features of a base. Phonological rules apply lexically or postlexically, and the input and output are governed by prosodic constraints. In the case of *ABB* reduplication, one Cantonese example with tone subscripted is given in (3).

(3) Suffixal base: B₂₁
 Reduplication: B₂₁-B₂₁
 Affixation to root: A₅₅- B₂₁-B₂₁
 Tone change: A₅₅-B₃₅-B₂₁

In (3), a monosyllabic suffixal base *B* is reduplicated and affixed to a word root *A*, forming an *ABB* pattern. A tone change rule is then applied on the middle syllable to derive the correct surface tonal pattern.

Mok's study concludes that the high level tone is the most common tone in onomatopoeia and ideophones. In Mandarin, onomatopoeia and ideophones with the high level tone account for 97.6% of the corpus. In Cantonese, 43% of these are realized with the high level tone and 44% with the low falling tone. Hakka onomatopoeia and ideophones also favor the high level tone, which accounts for approximately 50% of the data. Mok attributes the speakers' preference for the high level tone to acquisition—the high level tone is usually acquired the earliest in L1 and L2 acquisition (Li & Thompson, 1977; Tse, 1978). The unmarked and prominent properties of the high level tone may help explain why speakers of the three languages frequently use the high level tone in onomatopoeia and ideophones.

3. Taiwanese tones and tone sandhi

3.1 Tones

Every single syllable in Taiwanese has two different phonetic tones depending on the environments where it occurs (Du, 1988). When the syllable appears alone or is placed in a phrase-final position, it carries the citation tone. The tonal value varies to the sandhi tone if the syllable occurs in a non-final position of a phrase. According to Cheng (1968), the citation tone is the underlying tone and the sandhi tone is derived. Each citation tone has a sandhi counterpart.

Most linguists agree that there are seven distinct underlying tones in Taiwanese (Chen, 2000, Cheng, 1979, Chung, 1996). The seven tones are divided into two categories, entering tones and non-entering tones, based on the duration of the syllable. Entering tones occur in checked syllables ending in /p, t, k, ?/ while non-checked syllables with non-entering tones end in vowels or sonorant codas. Non-entering tones are also usually longer in duration than entering tones.

The tonal value is usually represented with a 5-level system, proposed by Chao (1968) to transcribe Mandarin tones. In this system, 1 refers to the lowest pitch and 5 to the highest pitch. Different linguists may transcribe each tone with different tonal values. For instance, the tone systems created by Cheng (1979), Chung (1996), and Chen (2000) are slightly different from one another, as shown in (4).

(4) Taiwanese tones transcribed by Cheng (1979), Chung (1996), and Chen (2000)

	Cheng (1979)		Chung (1996)		Chen (2000)	
	Citation tones	Sandhi tones	Citation tones	Sandhi tones	Citation tones	Sandhi tones
Non-entering tones	55	33	55	33	44	22
	53	55	53	55	53	44
	33	21	33	31	22	21
	21	53	31	53	21	53
	13	33	13	33	24	22
Entering tones	53	21	55	31	4	21
	21	53	31	55	32	4 or 53

Given the fact that the three tone systems in (4) do not differ much in tonal values, I have adopted Cheng's transcription of tones in this study.

3.2 Tone sandhi

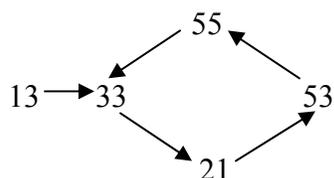
Taiwanese tone sandhi is conditioned by syntactic structures. As long as a syllable does not occur in a phrase-final position, the citation tone is subject to the sandhi tone. Examples showing the variation between citation and sandhi tones are given in (5). Citation tones are parenthesizedized.

- (5) a. /pe tsHia/ 'white car'
 white car
 21(33) 55
- b. /tsHia lian/ 'car wheel'
 car wheel
 33 (55) 53

In (5a), when the word /tsHia/ occurs alone or is placed in the phrase-final position, it carries the citation tone 55. However, the underlying tone 55 is altered to sandhi tone 33 when /tsHia/ occurs in a non-final position of a phrase as in (5b).

It has been observed that the non-entering tones in Taiwanese follow a tone circle in (6) with respect to changing to sandhi tones (Chen, 1987). This circle is like a pushing chain, by which a citation tone is looking for another citation tone to serve as its sandhi tone to surface. For example, a syllable with the citation tone 21 would undergo this tone circle to derive its sandhi tone 53.

(6) Taiwanese tone sandhi circle



In terms of tone sandhi in the entering tones, in Cheng’s (1979) and Chung’s (1996) transcription, the two entering tones interchange, but Chen’s (2000) system is different. According to Chen, the underlying entering tone 4 is subject to the sandhi tone 21, but the tone 32 has two sandhi tone variants. If the last consonant of a syllable is /p/, /t/, or /k/, the entering tone 32 becomes tone 4; otherwise it carries the sandhi tone 53.

4. The present study

The data on which this study is comprised of two kinds: dictionary data and interview data. First, all of the *ABB* reduplication phrases listed in a Taiwanese dictionary (Yang, 2004) were extracted. Then, to ensure that the extracted phrases were frequently used in daily conversation, two Taiwanese speakers (age 57 and 53) were consulted. If they failed to recognize a phrase, it was eliminated from the corpus. During the interview, they were asked to pronounce the *ABB* reduplication phrases from the dictionary for tone transcription and to provide more phrases they would use in daily life. In total, 108 *ABB* reduplication phrases¹ were collected and transcribed based on Cheng’s (1979) transcription system (See the appendix for the complete list of phrases).

The data of this study show that all of the seven tones in Taiwanese are utilized in *ABB* reduplication phrases. Since in Taiwanese, a syllable being checked or non-checked carries different tones and has different tone sandhi rules, the tonal patterns reported in this paper are presented based on the syllable structures of the root *A* and the *BB* suffix respectively. Table (7) shows the identified tonal patterns of the root *A* and the *BB* suffix both with non-checked syllables.

(7)	Non-checked syllables	Non-checked syllables		
	Citation tone on <i>A</i> -> Sandhi tone	<i>BB</i>	Surface tonal patterns	Total
	21 -> 53	33-55	53-33-55	9
		53-21	53-53-21	2
	33 -> 21	33-55	21-33-55	6
		53-21	21-53-21	7
	13 ->33	33-55	33-33-55	4
		53-21	33-53-21	13
		33-13	33-33-13	1

¹ Note that quasi-ideophonic phrases were not included in the corpus. In a quasi-ideophonic phrase, the suffix does not contain any sound-symbolic elements and it can stand alone without the root base (Mok, 2001). Some examples in Taiwanese are given below.

- a. /lai kian kian/ ‘sharp’
sharp sword sword
- b. /p^hong sai sai/ ‘inflated’
inflate lion lion

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55 ->33	33-55	33-33-55	2
	53-21	33-53-21	14
	33-13	33-33-13	1
53 ->55	33-55	55-33-55	7
	53-21	55-53-21	11
	33-13	55-33-13	3
Total			80

As seen in Table (7), the root *A*, not appearing phrase-finally, undergoes tone sandhi and surfaces with the sandhi tone. With respect to the tonal patterns of the *BB* suffix, the most common pattern is 53-21 (47 phrases). The tonal pattern 33-55 is also used frequently (28 phrases). The tonal pattern 33-13 is only found in five phrases.

The table in (8) summarizes the tonal patterns when the root *A* is a non-checked syllable whereas the *BB* suffix is a checked syllable.

(8)	Non-checked syllables	Checked syllables		
	Citation tone on <i>A</i> -> Sandhi tone	<i>BB</i>	Surface tonal patterns	Total
	21 -> 53	53-21	53-53-21	5
	33 -> 21	53-21	21-53-21	7
	13 ->33	53-21	33-53-21	5
	55 ->33	53-21	33-53-21	5
	53 ->55	53-21	55-53-21	4
	Total			26

In (8), when the *BB* suffix is a checked syllable, it carries the entering tones, 53 and 21. No other tones are applied when the suffix is a checked syllable.

Among the 108 *ABB* reduplication phrases, only 2 phrases are found with the root *A* being a checked syllable perhaps because in Taiwanese, words with checked syllables are comparatively much fewer than those with non-checked syllables. The two phrases are followed by *BB* suffixes with non-checked syllables. Table (9) shows the tonal pattern where the root *A* is a checked syllable and the *BB* suffix is not.

(9)	Checked syllables	Non-checked syllables		
	Citation tone on <i>A</i> - > Sandhi tone	<i>BB</i>	Surface tonal patterns	Total
	53 -> 21	53-21	21-53-21	2

As shown in (9), the *BB* suffix following a checked syllable has the tonal pattern, 53-21.

Based on the data of this study, a total of three suffixal tonal patterns have been identified: 53-21, 33-55, and 33-13. The most productive tonal pattern is 53-21, which

accounts for about 69% of the database (75 phrases out of 108). 33-55 is the second most frequently used pattern, with 26% of the *ABB* phrases carrying this tonal pattern (28 phrases). The least frequent pattern is 33-13, with only 5% of the phrases (5 phrases) realized with these tones.

5. Discussion

5.1 Tone sandhi on *ABB* reduplication

Because of Taiwanese tone sandhi, the citation tone of a word is changed into its sandhi form if it is not placed in the phrase-final position. In the case of AB_1B_2 reduplication, only B_2 carries the citation tone whereas A and B_1 carry their respective sandhi tones. Following Mok's (2001) analysis of reduplication, *ABB* reduplication is a left-to-right affixational process with B_2 serving as the base for reduplication. (10) schemes the derivational process of tonal patterns of *ABB* reduplication. The phrase, /pui ki ki/ meaning 'fat,' is used as an example.

(10) Suffixal base:	ki_{21}
Reduplication:	ki_{21} - ki_{21}
Affixation to root:	pui_{13} - ki_{21} - ki_{21}
Tone Sandhi:	pui_{33} - ki_{53} - ki_{21}

As shown in (10), the suffixal base ki_{21} is reduplicated and then affixed to a word root. However, due to the constraint of Taiwanese tone sandhi, A and B_1 , placed in the non-phrase-final position, appear with sandhi tones. The citation tone 21 on B_1 changes to its sandhi tone counterpart 53, and the underlying tone 13 on the root A to the sandhi tone 33.

5.2 Preferred tone and tonal patterns

Taiwanese has five contrastive tones for non-checked syllables. If the *BB* suffix is non-checked, it would be expected to have five tonal patterns after tone sandhi is applied: 33-13, 21-33, 53-21, 55-53, and 33-55. However, only three patterns have been identified. Among them, the tonal pattern 53-21 occurs most frequently. Note that the tone 53 in the pattern 53-21 is a sandhi tone. Before tone sandhi is applied, the underlying pattern is 21-21. Unlike what Mok (2001) has found in Mandarin, Cantonese, and Hakka onomatopoeia and ideophones, in Taiwanese *ABB* reduplication, the preferred tone is the low falling tone 21, instead of the high level tone 55.

With regard to tones on checked syllables, based on the corpus of this paper, the preferred tone for *BB* suffixes with checked syllables is exclusively 21. A possible reason the other likely tone for a checked syllable, 53, is not used can be attributed to markedness when the two tonal patterns 53-21 and 21-53 are compared. The tonal pattern 21-53, which is a combination of rising and falling, is much more marked than the other falling tone counterpart 53-21. Because falling tones minimize articulatory effort, they are less marked than rising tones (Yip, 2002).

5.3 Some puzzles

It was found that some *BB* suffixes are very productive in use. However, those suffixes do not always have the same surface tonal patterns. For example, the suffix /ki ki/ has two tonal patterns: 33-55 and 53-21, as shown in (11) and (12). The citation tones are parenthesized.

- (11) /ki ki/: 33-55
 a. /liŋ ki ki/ ‘cold’
 55(53) 33 55
 b. /bai ki ki/ ‘ugly’
 55(53) 33 55

- (12) /ki ki/: 53-21
 a. /aN ki ki/ ‘red’
 33(13) 53 21
 b. /hiao ki ki/ ‘whore’
 33(13) 53 21
 c. /pui ki ki/ ‘fat’
 33₍₁₃₎ 53 21

Based on (11) and (12), it seems plausible to postulate that the tone on the root *A* favors a certain type of tonal pattern following it. For instance, word roots with the citation tone 53 tend to be followed by *BB* suffixes with the tonal pattern 33-55. The root carrying the underlying tone 13 prefers the suffixal tonal pattern 53-21. However, the examples in (13) undercut this postulation.

- (13) /pi pi/: 33-55 or 53-21
 a. /əN pi pi/ ‘yellow’
 33(13) 33 55
 b. /we pi pi/ ‘small (used to describe space)’
 55(53) 53 21

In (13a), the root *A* with the citation tone 13, instead of being followed by the predicted tonal pattern 53-21, has 33-55 as its suffixal tones. The example in (13b) also shows that the root *A* with the underlying tone 53 does not restrict itself to the pattern 53-33-55. In Mok’s Cantonese data, some *BB* suffixes have more than one tonal pattern as well. For instance, the suffix /l□p l□p/ can surface with the pattern 22-22 or 55-55 regardless of what tone the root carries, as in (14).

(14) Cantonese *BB* suffix /lɔ̃p lɔ̃p/: 22-22 or 55-55

- | | | | |
|----------|------|-------|----------|
| a. /hau | lɔ̃p | lɔ̃p/ | ‘thick’ |
| | 13 | 22 22 | |
| b. /nyn | lɔ̃p | lɔ̃p/ | ‘warm’ |
| | 13 | 55 55 | |
| c. /jɔ̃u | lɔ̃p | lɔ̃p/ | ‘greasy’ |
| | 21 | 22 22 | |

As shown in (11-14), some onomatopoeic and ideophonic suffixes are not consistent in terms of their tonal patterns, which raises a few questions worth investigating. First, since a suffix may appear with two different tones, which is underlying and which is derived? Previous studies assume that each onomatopoeic and ideophonic expression comes with an underlying tone. With this assumption, does this mean that the Cantonese suffix /lɔ̃p lɔ̃p/, for instance, has two underlying tones? To resolve the problem of the underlying tone, we should investigate how each onomatopoeic and ideophonic expression derives its tone, instead of assuming that the tone has been specified at the underlying level. In addition, based on the data of this study, it can only be concluded that the preferred tonal pattern for the onomatopoeic and ideophonic suffix is 53-21. There do not seem to be rules governing the environment where the other tonal patterns of the suffix appears.

6. Conclusion

In this paper I have presented the tonal patterns of *ABB* reduplication in Taiwanese. Among the five likely tonal patterns for the *BB* suffix when it carries a non-checked syllable, only three patterns, 53-21, 33-55, and 33-13, have been identified, with the tonal pattern 53-21 the most frequently used in *ABB* reduplication phrases. When the *BB* suffix carries a checked syllable, 53-21 is the only tonal pattern. Before tone sandhi is applied, the underlying tonal pattern for 53-21 is 21-21, which shows that the low-falling tone 21 is the preferred tone in Taiwanese *ABB* reduplication. In addition to this finding, some of the onomatopoeic and ideophonic suffixes were found to be able to surface with more than one tonal pattern. If each onomatopoeic and ideophonic expression is created with an underlying tone but surfaces with another, there are likely rules governing the environment in which each tonal pattern occurs. To resolve the questions concerning the underlying tone of suffixes with two tonal patterns, further research on the tonal derivation of the suffix should be carried out to shed more light on the phonology of onomatopoeia and ideophones.

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Appendix: *ABB* reduplication phrases

1. Citation tone of the word root A: 21

Surface tonal patterns	ABB phrases	
53-33-55	1. /am mo mo/	‘dark’
	2. /am so so/	‘dark’
	3. /kui sam sam/	‘expensive’
	4. /soN wai wai/	‘feel very happy’
	5. /tiam wai wai/	‘tired’
	6. /tsao mo mo/	‘smelly’
	7. /tsio hai hai/	‘laugh’
	8. /tsio hi hi/	‘laugh’
	9. /yu mi mi/	‘soft’
53-53-21	10. /sio m ^w i m ^w i/	‘cheap’
	11. /tian tiu tiu/	‘hurt’
	12. /jium lap lap/	‘wet’
	13. /jium lok lok/	‘wet’
	14. /sie ko? ko?/	‘mature’
	15. /ki pu? pu?/	‘angry’
	16. /yiu sap sap/	‘thin-cut’

2. Citation tone of the word root A: 33

Surface tonal patterns	ABB phrases	
21-33-55	1. /bun tΣa tΣa/	‘stupid; clumsy’
	2. /həN liu liu/	‘far’
	3. /dZiN tΣao tΣao/	‘quiet’
	4. /pe pao pao/	‘white’
	5. /pe tsaN tsaN/	‘white’
	6. /dZiu tΣa tΣa/	‘itchy’
21-53-21	7. /bu sa sa/	‘confused ; blurry’
	8. /dZam m ^w i m ^w i/	‘sharp’
	9. /koN ma ma/	‘silly’

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	10. /koN tu tu/	‘stupid’
	11. /sian tao tao/	‘feel sick’
	12. /sian tiu tiu/	‘feel sick’
	13. /sian tu tu/	‘feel sick’
	14. /kao tu? tu?/	‘thick’
	15. /lao ko? ko?/	‘old’
	16. /lie pu? pu?/	‘very enthusiastic’
	17. /lua hu? hu?/	‘hot’
	18. /Ni ko? ko?/	‘hard’
	19. /pe Σa? Σa?/	‘white’
	20. /tN ko? ko?/	‘hard’

3. Citation tone of the word root A: 13

Surface tonal patterns	ABB phrases	
33-33-55	1. /ban tun tun/	‘slow’
	2. /liam ti ti/	‘sticky’
	3. /lo ti ti/	‘muddy’
	4. /əN pi pi/	‘yellow’
33-53-21	5. /lu tsaN tsaN/	‘messy’
	6. /aN ki ki/	‘red’
	7. /aN koN koN/	‘red’
	8. /aN pa pa/	‘red’
	9. /hiao ki ki/	‘whore’
	10. /hiao te te/	‘whore’
	11. /ko te te/	‘stingy’
	12. /hioN kai kai/	‘cruel’
	13. /lu pe pe/	‘like to argue’
	14. /pui ki ki/	‘fat’
	15. /ΣiuN le le/	‘wet’
	16. /tam ti ti/	‘wet’
	17. /yiu təN təN/	‘greasy’
	18. /an tu? tu?/	‘tight’
	19. /kiam to? to?/	‘salty’
	20. /lo kia? kia?/	‘muddy’
	21. /lu sap sap/	‘messy’
	22. /yiu lu? lu?/	‘greasy’
33-33-13	23. /tam ko ko/	‘wet’

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4. Citation tone of the word root A: 55

Surface tonal patterns	ABB phrases
33-33-55	1. /kim tan tan/ ‘shiny’
	2. /o lu lu/ ‘black’
33-53-21	3. /hiam tsN̄ tsN̄ / ‘spicy’
	4. /hun boN̄ boN̄/ ‘smoky’
	5. /kim si si/ ‘shiny’
	6. /kN̄ yiaN̄ yiaN̄/ ‘shiny’
	7. /o ma ma/ ‘black; dirty’
	8. /o sim sim/ ‘black’
	9. /paN̄ koN̄ koN̄/ ‘aromatic’
	10. /sN̄ liu liu/ ‘sour’
	11. /tsim loN̄ loN̄/ ‘deep’
	12. /tsi) lin lin/ ‘green’
	13. /yiao sa sa/ ‘hungry’
	14. /tsi) sun sun/ ‘green’
	15. /tso pe pe/ ‘coarse’
	16. /tsiN̄ ho ho/ ‘call someone as if you were very familiar with him’
	17. /hue lok lok/ ‘flowery’
	18. /kN̄ lu? lu?/ ‘nothing left’
	19. /sin tsa? tsa?/ ‘new’
	20. /ta kok kok/ ‘dry’
	21. /ti) b ^w u? b ^w u?/ ‘sweet’
	33-33-24

5. Citation tone of the word root A: 53

Surface tonal patterns	ABB phrases
55-33-55	1. /ho liu liu/ ‘well’
	2. /kiao lian lian/ ‘smart’
	3. /kiao te te/ ‘smart’
	4. /lin ki ki/ ‘cold’
	5. /bai ki ki/ ‘ugly’
	6. /sui tan tan/ ‘beautiful’
	7. /am toN̄ toN̄/ ‘not condensed (used to describe liquid)’

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55-53-21	8. /dZan pu pu/	‘light ; not salty enough’	
	9. /kuan tsu tsu/	‘hurry’	
	10. /kuan si si/	‘hurry’	
	11. /kuan tΣi tΣi/	‘hurry’	
	12. /nN̄ gao gao/	‘tired’	
	13. /nN̄ sun sun/	‘soft’	
	14. /pa tu tu/	‘full’	
	15. /pa yN̄ yN̄ /	‘full’	
	16. /pai tsiN̄ tsiN̄/	‘mean’	
	17. /we pi pi/	‘small (in terms of space)’	
	18. /we tun tun/	‘small (in terms of space)’	
	19. /ko yap yap/	‘bitter’	
	20. /we ta? ta?/	‘small (in terms of space)’	
	21. /wN̄ ta? ta?/	‘sure’	
	22. /yoN̄ kia? kia?/	‘strong’	
	55-33-13	23. /nN̄ go go/	‘soft’
		24. /nN̄ so so/	‘soft’
		25. /nN̄ yo yo/	‘soft’

6. Citation tone of the word root A: 53 (entering tone)

Surface tonal patterns	ABB phrases	
21-53-21	1. /bat su su/	‘dense’
	2. /zat toN̄ toN̄/	‘smart’

Tonal adaptation of English loanwords in Cantonese

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This study examines the tonal adaptation of English loanwords in Cantonese spoken in Hong Kong. We adopted the analyses of previous research (Kiu, 1977; Silverman, 1992) and incorporated seeming exceptions. The major rules are: 1) The stressed syllable in English usually bears the high tone in Cantonese, and it includes both primary and secondary stress. 2) If the English word is (historically) viewed as the compounding of two free morphemes, both syllables receive the high tone. 3) Pre-tonic unstressed syllable receives a mid tone, while post-tonic unstressed syllable receives a low tone. 4) When the English word contains a consonant cluster, a vowel is inserted to break the cluster and the created syllable usually carries the low tone. 5) A high-tone morpheme that indicates colloquial style is attached to the end of most loanwords. This morpheme changes the final low tone to a rising tone. However, not all the loanwords conform to these patterns. For example, the borrowing of verbs usually has different tonal assignment. The consonant type of the English word also plays a role. If the English syllable ends in a stop, it carries an entering tone and the morphemic high tone cannot be attached. In addition, palato-alveolar codas in English, such as /ʃ/ and /tʃ/, seem to block high-tone morpheme attachment as well. This study shows that the tonal adaptation of English loanwords in Cantonese is not just a stress-to-tone mapping. The tonal assignment is also determined by the consonant types in English, word class, position of the syllables, and so on.

1. Introduction

The study of loanwords has become prevalent during the past decade. For example, a recent issue of *Lingua* in 2006 was devoted to loanwords, while a special issue of the *Journal of East Asian Linguistics* (2008, issue 4) concentrated on the discussion of loanword phonology in East Asian languages. Most recent studies on loanwords have focused on how the segments of the source languages are incorporated into the recipient languages (e.g. Ito et al., 2006; Kang, 2003; Paradis, 2006; Uffmann, 2004), but only a few studies have explored the interaction of two prosodic systems. Especially interesting are cases of borrowing when the two languages make different linguistic use of pitch. For instance, the source language may use stress while the recipient language adopts a pitch-accent system (see Kubozono, 2006 for English into Japanese; Kubozono, 2007 and Lee, 2005 for English into South Kyungsang Korean; Kim, 2005 for English into North Kyungsang Korean), or the source language makes use of stress and the host language uses lexical tones (Kenstowicz & Suchanto, 2006 for English into Thai; Kiu, 1977 for English into Cantonese; Wu, 2006 for English into Mandarin Chinese; Hsieh &

Kenstowicz, 2008 for English into Tibetan), or the source language with pitch-accent may be adapted into a tone language (Davis & Tu, 2007 for Japanese into Taiwanese). The analyses showed that the host language may assign the prosodic patterns of the loanwords according to the original pitch contour in the source language (the cases of English into Cantonese and Mandarin). Or the loanwords may display prosodic patterns predictable from the syllable structure but independent from the source language (the cases of English into Japanese, North Kyungsang Korean, South Kyungsang Korean, and of Japanese into Taiwanese). The present study aims to give an overview of the tonal adaptations of English loanwords in Hong Kong Cantonese, and explore how the prosody of the loanwords is determined.

Hong Kong Cantonese has a rich amount of loanwords from British English, because of the period of Britain colonization lasting over 150 years. Consequently many loanwords are frequently used in their daily conversation. Kiu (1977) established some tonal rules for the English loanwords. In his analysis, the stressed syllable in English always receives a high tone in Cantonese. An unstressed syllable in word-final position following the stressed syllable always carries the rising tone. A low tone occurs on syllables in other positions, such as an unstressed syllable before the stressed one. The rules he proposed seemed very simple. But there are several exceptions to the rules that were not mentioned in the analyses. One instance is the loanword for ‘doughnut’: [dɔ̃n HH nɔ̃t H]¹, for which both stressed and unstressed syllables receive the high tone. Another word is ‘microphone’: [maj HH kɔ̃: HH fɔ̃ŋ HH], where not only the syllables with primary and secondary stress bear a high tone, but also the unstressed syllable in between. Hence some modifications to his analyses may be required.

Silverman (1992) examined the tonal patterns of English loanwords in Cantonese as well. He proposed that English words were borrowed into Cantonese through both Cantonese speakers’ perception of the original forms and the operation of Cantonese phonology to modulate the perceived forms to be more native-like. Hence some adaptation rules apply at the Perceptual level and others at the Operative level. For example, the compound like ‘dockyard’ was perceived as the combination of two distinct morphemes at the Perceptual level. Therefore each free morpheme was assigned a high tone, which surfaces as the output [dɔ̃k H ya: HH]. Hence it seemingly violates the rule that only the stressed syllable receives the high tone. But it is actually because the perceived stress pattern by the Cantonese speakers is different from that in contemporary English. Another example is the word ‘sociology’, which is borrowed as [sow MM si: MM]. He proposed that the truncation probably occurred in the Operative level since the tonal assignment of these two syllables matches the prosody in the original form. Thus this word should be fully perceived at the Perceptual level and assigned the mid tone to the unstressed syllables and high tone to the stressed syllable. Then due to the preference of disyllabic words in Cantonese phonology, only the first two syllables were preserved at the Operative level and surfaced with the mid tone. These two examples show that the form of the loanwords is determined by both Perceptual and Operative parameters.

¹ The letters in the lowercase are the transcription of the segments, while the capital letters transcribe the lexical tones. H stands for the high tone, M for the mid tone, and L for the low tone. Every mora carries a tone (Yip, 2002b). Hence bi-moraic syllables carry full tones such as HH or LH, while mono-moraic syllables carry entering tones like H, M, or L. All the loanword examples in this study are transcribed in this manner.

Besides proposing the multiple scansion in loanword adaptation, Silverman (1992) suggested one more rule to explain the rising tone in word-final position commonly found in loanwords. Unlike Kiu (1977), which postulated that the unstressed syllable following the stressed one received a rising tone, Silverman hypothesized that a high-tone morpheme which indicates colloquial style is always attached to the end of the loanwords. This hypothesis comes from the phenomenon that the high-tone morpheme attachment is also observed in the formation of hypocoristics in Cantonese. Hence it is possible that the native phonological rule applies to the formation of loanwords. The analyses by Silverman (1992) could account for most loanwords. Yet the loanwords that end in a low tone probably need some explanation. In addition, given the active operation of the disyllabic word-form preference in his data, the words that are disyllabic in English but become tri-syllabic in Cantonese are obvious exceptions, such as ‘spanner’ [si: LL ba: HH la: LH].

The current study will present the loanword data according to the number of syllables and the stress patterns of the English words and the number of syllables and the tonal patterns of the Cantonese words. I will adopt rules from the previous literature, and propose additional rules to account for more data. I will also discuss the exceptions and propose possible explanations.

1.1. Corpus

Many loanwords in my analysis came from the website that lists the English loanwords in Cantonese (<http://ihome.ust.hk/~lbsun/hkloan.html>). A native speaker of Cantonese read all the words he was familiar with from the website. He also provided additional loanwords that he knew. His recording was later transcribed by the author. Examples were also collected from the published literature, such as Bauer and Benedict (1997), Cheung (1986), Silverman (1992), and Yip (1993, 2002a).

1.2. Cantonese consonants, vowels, and tones

The phonetic transcription of consonants and vowels in this study mainly follows Bauer and Benedict (1997) and Cheung (1972). The consonant and vowel inventory is shown below. Cantonese only allows certain consonants to appear in coda position, such as nasals /m, n, ŋ/, unreleased stops /p, t, k/, and glides /w, j/. The palato-alveolar consonants [tʃ, tʃ̚, tʃ̚w] are allophones of the alveolar consonants /s, ts, ts̚/ when preceding front vowels. As for the vowels, [i] is the allophone of /i/, [e] is the allophone of /e/, [ɐ] is the allophone of /u/, and [o] is the allophone of /o/. These four non-contrastive allophones, plus /ɔ/, can only occur in closed syllables. The vowels that appear in open syllables are the longest, those in syllables closed by stops are the shortest, while those that occur in syllables closed by nasals and glides are in between.

<i>Cantonese consonants</i>				<i>Cantonese vowels</i>			
p	t	k	kw	i	y	u	
p ^h	t ^h	k ^h	k ^h w	* ^h		* ^h	
m	n	ŋ		*e	ɛ	*o	
f	s	* ²	h	æ			
	ts	*t		a			
	ts ^h	*t ^h					
w	l	j					

As for the tones, there are six full tones and three entering tones in Cantonese. The six full tones occur with open syllables or syllables closed by sonorants. The entering tones go with the syllables ending in stops (p, t, k) and are shorter than other syllables. The tones are represented by numerical values in Bauer and Benedict (1997), with 5 signifying the highest pitch and 1 the lowest pitch. For the purpose of the present analysis, I will use the letter H, M, and L to signify the pitch height. H represents the values 5 and 4, M represents 3, and L represents 2 and 1. The Cantonese nine tones in both Bauer & Benedict’s notation and this study’s are listed below.

	High level	High rising	Mid level	Low falling	Low rising	Low level	High entering	Mid entering	Low entering
B & B	55	25	33	21	23	22	5	3	2
This study	HH	LH	MM	LL	LM	LL	H	M	L

Note that the low-rising tone is never used in loanwords. And under this notation, two distinct tones, low-falling and low-level, become undistinguishable. This does not seem to cause a problem since these two tones are mostly used under the same conditions in the data collected. Hence both of them should be considered a low full-length tone LL.

2. Analysis

In the analysis, the loanwords are first categorized according to the number of syllables in English, i.e. monosyllabic, disyllabic, and tri-syllabic. For the words that have the same number of syllables in English, they are then ordered by the number of syllables in Cantonese.

2.1. Monosyllabic

2.1.1. English words

The monosyllabic words are always stressed in English. They are adapted into Cantonese as either monosyllabic or disyllabic.

² The consonants with asterisk are non-contrastive allophones.

2.1.2. Monosyllabic Cantonese words

The monosyllabic Cantonese loanwords almost always carry the high tone. Whether it is a full-length high tone HH or an entering high tone H depends on the syllable structure of the English form. Some examples are provided in (1).

(1) <i>English</i>	<i>Cantonese</i>
beat	[pit H]
card	[k ^h at H]
lift	[lip H]
tie	[t ^h aj HH]
fund	[f ^h n HH]

If the English word ends in a stop, it carries the entering tone H, as in ‘beat’ and ‘card’. Notice that the voicing distinction in the coda position in English (/t/ vs. /d/) is neutralized into a voiceless unreleased stop (/t^h/), since only voiceless stops are allowed in the coda position in Cantonese. In addition, the post-vocalic /^h/ as in ‘card’ is dropped because it is normally not pronounced in British English. It could also be due to the fact that post-vocalic /^h-deletion is a common phenomenon in loanword adaptation (e.g. Kenstowicz, 2001; 2006). An interesting case is the word ‘lift’. It ends with a consonant cluster (CC). In most of the Cantonese loanwords we examined, when there is CC in the coda position, the second consonant is omitted while the first one is preserved. But since the fricative /f/ is not a legitimate coda in Cantonese, it is assimilated to the closest coda possible, which is /p/. And this word carries the entering H tone. When the English monosyllabic word comprises a simple open syllable or ends in a nasal coda, it carries a full-length high tone, as in ‘tie’ and ‘fund’.

2.2. Disyllabic

We can divide the English monosyllabic words that are borrowed as disyllabic Cantonese words into several types. The first category is when the English words have consonant cluster in the onset. Some examples are given in (2).

(2) <i>English</i>	<i>Cantonese</i>
spare	[si: LL p ^h : HH]
stick	[si: LL t ^h k H]
fluke	[fu: LL l ^h k H]
cream	[kej LL lim HH]
plum	[pow LL l ^h m HH]
brake	[p ^h k L l ^h k H]

Cantonese does not allow consonant cluster in the onset position. Thus a vowel is inserted between the CC. The syllable composed of the first consonant and the epenthesized vowel receives a low tone, while the syllable consisting of the second consonant and the original vowel bears a high tone. In this pattern the stressed syllable in

English is assigned a high tone in Cantonese, and the created syllable, which should not be stressed in English, carries a low tone. Usually a long vowel or diphthong is inserted. But there is one instance that the vowel is short and followed by a stop coda: ‘brake’ [p□k L l□k H]. The CC onset of this word is a voiced stop followed by a liquid, while others are voiceless stop followed by a liquid. Note that both the voiceless and voiced stops are adapted as the voiceless unaspirated stops in Cantonese. Hence the voicing distinction may be preserved in the length of the inserted vowel. For voiceless stops, a long vowel is inserted. For voiced stops, a short vowel followed by a stop coda is inserted.

The second category, which is a common pattern in Cantonese loanwords, consists of English monosyllabic words that end in fricatives and liquids. It also includes words that end in CC in which the first consonant is a sibilant or /l/. Some of these words are listed in (3).

(3) <i>English</i>	<i>Cantonese</i>
size	[saj HH si: LH]
file	[faj HH low LH]
pear	[p□: HH lej LH]
toast	[t□: HH si: LH]
film	[fej HH l□m LH]

When these words are borrowed, a vowel is inserted after the coda (as in ‘size’, ‘file’, and ‘pear’), or after the first consonant if the coda is a CC. The second consonant is omitted if it is a stop (as in ‘toast’), but retained if it is a nasal (‘film’). The stressed syllable bears a high tone, while the second syllable bears a rising tone LH. The reason that the created/unstressed syllable does not carry a low tone but a rising tone has been proposed by Silverman (1992). He suggested that all the loanwords are attached by a high-tone morpheme in the end, which indicates colloquial style. This morpheme attachment applies vacuously to the loanwords that end in a high tone. But for those words under this category, in which the final unstressed syllable receives a low tone, this attachment results in a rising tone LH. This explanation is plausible given that most of the loanwords end in a high tone or rising tone.

The third category contains words that either break the rule that the stressed syllable receives a high tone, or do not show high-tone morpheme attachment. There are not many such words and they are listed in (4).

(4) <i>English</i>	<i>Cantonese</i>
fail	[fej LL low LH]
mince	[min LH t□i: LL]
kiss	[k□i: HH si: LL]
cash	[k□□: HH □y: LL]
punch	[p□n HH t□i: LL]

For the word ‘fail’, the stressed syllable carries a low tone instead of a high tone. For ‘mince’, the stressed syllable receives a rising tone, and the final syllable bears a low

tone rather than a rising tone. ‘Kiss’ has high tone on the stressed syllable, while the final epenthesized syllable carries the low tone instead of the rising tone. A possible explanation for the unexpected tonal patterns of these words is that they belong to categories other than nouns. ‘Fail’ is most often used as a verb, ‘mince’ as an adjective, while ‘kiss’ can be both a verb and a noun. Therefore these words may exhibit adaptation patterns different from nouns. The other two examples in (4) seem to block high-tone morpheme attachment and thus end in a low tone, such as ‘cash’ and ‘punch’ as in fruit punch. It could be the palato-alveolar coda in these English words that causes the blocking. Yet we cannot make any certain claim out of two examples.

2.2.1. Disyllabic English words

Most disyllabic English words are borrowed into Cantonese also as disyllabic. While the English words may have stress on the first or second syllable, mostly the stressed syllable bears a high tone in Cantonese. We will also look at disyllabic English words that become tri-syllabic in Cantonese.

2.2.2. Disyllabic Cantonese words

For the disyllabic English words that are adapted into Cantonese disyllabic words, the tonal patterns are determined by whether the English form has initial or final stress. Even for the English words that are stressed on the first syllable, they receive different tone assignment if the words end in a single stop coda (not CC), or if the words can be viewed as a compound. We will first look at English words that have stress on the first syllable in general. The most common tonal pattern for such words is a high tone on the stressed syllable and a rising tone on the unstressed/final syllable. We present some examples in (5).

(5) <i>English</i>	<i>Cantonese</i>
number	[n [□] m HH pa: LH]
movie	[mu: HH fi: LH]
sergeant	[sa: HH t [□] in LH]
brother	[pa: HH ta: LH]
broker	[p [□] k H k [□] a: LH]

This pattern is very productive in Cantonese loanwords, and the tonal melody is the same as the English monosyllabic words ending in sibilants and /l/ (example (3)). The second syllable, being unstressed, receives a rising tone rather than a low tone because of the high-tone morpheme attachment, as proposed by Silverman (1992). There are two segmental issues relevant to the tonal patterns in these examples. First, in the word ‘sergeant’, the stop coda of the second syllable is dropped because it is the second consonant of the CC. Thus this syllable carries a full-length tone LH instead of an entering tone. Second, the CC onset in the words ‘brother’ and ‘broker’ is simplified by deleting the liquid rather than inserting a vowel between the stop and the liquid. As a result, these words remain disyllabic in Cantonese. This phenomenon has been noted by Silverman (1992), that there seems to be a preference for disyllabic words in Cantonese. Thus the CC is simplified by vowel epenthesis if the insertion results in a disyllabic word.

If epenthesis would conflict with the disyllabic preference, deletion of the second consonant (usually liquid) is the preferred strategy.

The next type includes words that have initial stress in English, but the second syllable ends in a single stop (not a consonant cluster). The stressed syllable still carries a high tone, but the unstressed syllable carries the entering low tone, as in ‘omelet’ [ŋan HH lit L]; ‘cutlet’ [k□t H lit L]; ‘salad’ [sa: HH l□t L]. The reason that the final syllable does not bear a rising tone is possibly due to moraicity. The syllable ending in a stop is mono-moraic in Cantonese, while open syllables and syllables ending in sonorants are bi-moraic (Yip, 2002b: 176 – 77). The bi-moraic syllables can carry the six full-length tones, but the mono-moraic syllables can only carry the extra-short entering tones. The second syllable of these loanwords is borrowed as a mono-moraic syllable ending in a stop. Therefore the high-tone morpheme cannot be added to such syllables since they cannot carry the full-length tone. Accordingly these syllables remain an entering low tone.

The third type is when the English words can be treated as compounding of two free morphemes either historically or contemporarily. Some of them are listed in (6).

(6) <i>English</i>	<i>Cantonese</i>
doughnut	[t□:n HH n□t H]
pancake	[pan HH k□k H]
sirloin	[s□: HH lan HH]
ball shirt	[p□: HH s□t H]
bow tie	[p□: HH t□aj HH]

In the first three examples in (6), they originated from compounding of two free morphemes. Even if they are now a single word with stress on the first syllable, they are borrowed into Cantonese as two stressed syllables. Thus both syllables receive a high tone. The second two examples are clearly compounds, and both syllables bear a high tone.

Lastly there are some exceptions. They are illustrated in (7).

(7) <i>English</i>	<i>Cantonese</i>
copy	[k□□p H p□i: LL]
major	[mej HH t□œ: LL]
minor	[man HH na: LL]
cookie	[k□□k H k□ej LL]
sorry	[s□: HH lej LL]
euro	[ŋ□: HH l□: LL]
pudding	[p□: MM d□ŋ HH]

The majority of words in (7) show a high-low contour. The initial stressed syllable receives a high tone, while the final unstressed syllable bears a low tone. Thus the difference between these words and previous ones is that the high-tone morpheme does not seem to be attached. There are some possibilities. First, it may be due to the word

class. ‘Copy’ is borrowed as a verb, while ‘major’ and ‘minor’ can be used as both a verb and a noun. Therefore the tonal adaptation of verbs may be different from that of nouns. Second, recent borrowings may be different from older borrowings. For example, ‘euro’ is probably a very recent borrowing, and thus the high-tone morpheme attachment may be no longer necessary in the tonal adaptation. Third, the tone assignment may be influenced by the segments as well. For example, the palato-alveolar consonant in ‘major’ may block the high-tone morpheme attachment. It is also possible that these words are simply exceptions.

Then we will examine the English disyllabic words that have stress on the second syllable. There are not many such words in the loanwords, and the pattern is very regular. The unstressed syllable is assigned a mid tone and the stressed syllable carries a high tone. The examples are provided below.

(8) <i>English</i>	<i>Cantonese</i>
cigar	[ɿyt M ka:HH]
chiffon	[ɿyt M fɿŋ HH]
buffet	[pow MM fejHH]
insurance	[in MM sɿ:HH]
percent	[pɿœ:HH sɿn HH]

One word in (8), ‘insurance’, demonstrates that truncation occurs in Cantonese loanwords. It is not uncommon that only the first two syllables of the English word are borrowed. But the stress-to-tone relationship stays unchanged. As for the reason that the unstressed syllable before the stressed one does not carry a low tone but a mid tone, it may be that most of the vowels in this position are not reduced. Hence this position is possibly not as weak perceptually as the unstressed syllable after the stressed one. Then it carries the mid tone that is not as salient as the high tone, but more salient than the low tone. As for the word ‘percent’, it can be regarded as compounding of ‘per’ and ‘cent’ historically, and thus it is borrowed into Cantonese with high tone on both syllables.

2.3. Tri-syllabic Cantonese words

In some cases the disyllabic English words are expanded into three syllables in Cantonese through vowel insertion. These words are listed in (9).

(9) <i>English</i>	<i>Cantonese</i>
spanner	[si: LL pa: HH la: LH]
snooker	[si: LL lɿk H ka: LH]
forecast	[fɿ: HH kɿa: HH si: LH]
passport	[pɿa: HH si: LL pɿɿt H]
tennis	[tɿɿ: HH ni: LL si: LH]
disco	[tɿk H si: LL kow HH]
sandwich	[san HH mɿn LL tɿi LL]
cocaine	[hɿ: LH ka: HH jan HH]

The borrowed forms of ‘spanner’ and ‘snooker’ are inserted a vowel to break the CC onset. The created syllable receives a low tone, while the unstressed syllable after the stressed one receives a low tone and surfaces as a rising tone due to the high-tone morpheme attachment. The words ‘forecast’ and ‘passport’ can be viewed as compounds. Hence both syllables corresponding to the English form carry the high tone. The epenthetic vowel in word-final position bears a rising tone, while that in the non-final position bears the low tone. ‘Tennis’ conforms to all the tonal rules. The unexpected tonal assignment occurs with the last syllable in the Cantonese loanforms for ‘disco’ and ‘sandwich’. The last syllable in the loanword for ‘disco’ comes from the unstressed syllable in English. Thus it should receive a low tone and surfaces as the rising tone since it is in the word-final position. But it carries a high tone instead. As for ‘sandwich’, the last/created syllable in the loanform does not undergo high-tone morpheme attachment and remains a low tone. This may be similar to the cases we saw earlier such as ‘cash’ and ‘punch’, that the palato-alveolar consonants may block the high-tone morpheme attachment.

These examples seem to contradict the disyllabic word preference proposed by Silverman (1992). But notice that vowels are inserted in these words in order to preserve the sibilants /s/ and /tʃ/, which are very salient perceptually. As for the consonant cluster that is adapted through deletion, such as ‘brother’ [pa: HH ta: LH] and ‘broker’ [pʰk H ka: LH], the deleted consonant is a liquid, which is not as salient as sibilants. This phenomenon was noted in Yip (1993) that salient segments such as /s/ is never lost in loanword adaptation, even at the cost of violating the disyllabic word form preference.

One word with stress on the second syllable is ‘cocaine’. Previously we saw that the unstressed syllable before the stressed one carries a mid tone, but here it carries the rising tone. The stressed syllable in English is split into two syllables in Cantonese, probably because it is a diphthong. Since these two syllables both come from the stressed syllable in English, they both bear the high tone.

2.3.1. Tri-syllabic English words

Some tri-syllabic words become disyllabic in Cantonese due to truncation or simplified English pronunciation. Others remain tri-syllabic in Cantonese.

2.3.2. Tri-syllabic Cantonese words

The word ‘library’ is tri-syllabic in English according to the standard pronunciation. But it becomes disyllabic in Cantonese as [laj HH ba: LH]. Note that the CC onset of the second syllable is not broken by vowel epenthesis, but by consonant deletion. The last syllable is dropped. ‘Favorite’ is tri-syllabic in the standard pronunciation as well, but it is often pronounced as [fevʰt] in colloquial speech. It seems that this colloquial pronunciation is adapted into Cantonese as [fej HH fʰt L]. The CC in the second syllable is also simplified by liquid deletion rather than epenthesis. The word-final syllable does not carry a rising tone because it is mono-moraic.

We will first look at the tri-syllabic loanwords that have primary stress on the first syllable in English. They are listed in (10).

(10)	<i>English</i>	<i>Cantonese</i>
	saxophone	[sɔ̃k H si: LL fɔ̃ŋ HH]
	wide-angle	[wɔ̃j HH ɔ̃ŋ HH kɔ̃: LH]
	chocolate	[tɔ̃y: HH ku: HH lɔ̃k H]
	microphone	[maj HH kɔ̃: HH fɔ̃ŋ HH]

The word ‘saxophone’ has primary stress on the first syllable and secondary stress on the last syllable. In the loanform both stressed syllables receive a high tone. The middle syllable, being unstressed, carries a low tone. The word ‘wide-angle’ is clearly a compound. Thus it receives high tone on the first two syllables. The last syllable is assigned a low tone and then surfaces as a rising tone. The last two words in (10) display an unexpected tonal pattern: the high tone is assigned to the syllables with primary and secondary stress. But the middle/unstressed syllable also bears a high tone instead of a low tone. This phenomenon is similar to the plateauing effect observed in many tone languages (Cahill, 2007). In these languages the tonal sequence /HLH/ or /HØH/ is prohibited. Thus the TBU between the two high tones usually carries a high tone as well. Yet since there are only two such examples in Cantonese, and there are words like ‘saxophone’ that does not undergo plateauing, we are not certain whether such rules exist in Cantonese loanwords.

In (11) we list the tri-syllabic Cantonese loanwords that have primary stress on the second syllable in the English original form.

(11)	<i>English</i>	<i>Cantonese</i>
	commission	[kɔ̃an MM mi: HH sɔ̃n LH]
	assignment	[a: MM saj HH mɔ̃n LH]
	vanilla	[wɔ̃n MM lɔ̃: HH la: LH]

The rule that the stressed syllable receives a high tone is not violated. The second syllable of all these examples carries a high tone. The unstressed syllable after the stressed one should be assigned a low tone, and it becomes a rising tone if in the word-final position. This generalization also holds true. The unstressed syllable before the stressed one usually bears a mid tone in previous disyllabic cases. For the tri-syllabic words, this rule is also observed. Thus we generally see a mid-high-low tonal contour for the tri-syllabic loanwords that have primary stress on the second syllable in English.

2.4. Quadri-syllabic Cantonese words

In the data we collected, there is only one quadri-syllabic Cantonese loanword that comes from tri-syllabic English word. ‘Strawberry’ is borrowed as [si: LL tɔ̃: HH pɔ̃: HH lej LH]. Cantonese speakers probably perceived this word as a compound. Hence the stressed syllable of ‘straw’ and ‘berry’ receives a high tone. Epenthesis occurs to break the consonant cluster onset in ‘straw’, and this created syllable carries the low tone. The word-final syllable bears the rising tone. The stress-to-tone patterns in this word are canonical.

3. Summary and Conclusion

Some major tonal rules in the loanwords proposed by previous literature are mostly observed in the present data. For example, the stressed syllable in English usually bears the high tone in Cantonese (Kiu, 1977), and it includes both primary and secondary stress. When a vowel is inserted to break the consonant cluster, the created syllable usually carries the low tone (Silverman, 1992). A high-tone morpheme that indicates colloquial style is attached to the end of most of the loanwords. This morpheme changes the low tone to a rising tone (Silverman, 1992).

However, these rules sometimes fail to account for some loanwords. The stressed syllable in English may not be assigned a high tone if the borrowed word is a verb. The unstressed syllable may sometimes carry a high tone if it is between two syllables with a high tone (cf. plateauing effect). The reason that the unstressed syllable before the stressed one receives a mid tone while that after the stressed one receives a low tone may be due to positional salience. That is, the post-tonic unstressed syllable is perceptually weaker than the pre-tonic one. Thus tonal assignment for unstressed syllables also depends on their position.

The consonants in the English form may interact with the tonal assignment as well. For example, when the final unstressed syllable of the loanword ends in a stop, the syllable is mono-moraic and cannot be attached by a morphemic high tone. Thus the syllable carries an entering low tone instead of a rising tone. When the final unstressed syllable ends in a palato-alveolar consonant, the high-tone morpheme attachment also seems to be blocked.

The tonal adaptation of English loanwords in Cantonese is not just a stress-to-tone mapping. It also involves the consonant types, the morphology (whether it is considered a compound), and the word class (noun or verb) of the borrowed words. A more thorough study would be to consider also the vowel and consonant adaptation to fully capture the interaction of two phonological systems.

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Prosodic Influences on Chinese Tongue Twisters

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A diversity of structural alternations enriches tongue twisters, in form of a language game speakers consider intriguing while reciting. However, none of efforts are put into the interval between twister constituents. This study is an attempt to give a complimentary view to Chinese tongue twisters. The twister effects are actually affected both by unstable lexical structures and limited space between targeted constituents. Likewise, Optimality Theory (Prince and Smolensky 1993/2004) put forth a constraint-based account to these two issues.

1. Basics of tongue twisters

Tongue twisters are literary lines in which the twister readers are articulatorily stuck, especially at a fast speech rate. The intended speech errors come from those similar but distinct phonemes, such as *s* [s] and *sh* [ʃ] in the English example, or non-retroflex *s* [s] and retroflex *sh* [ʂ] in the Chinese case.

(1) English Tongue Twisters

Susan s[s]ells seash[ʃ] ells by the seashore.
Does she sell seashells by the seashore?
If she sells seashells by the seashore,
Where are the seashells she sells by the seashore?

(2) Chinese Tongue Twisters

bu zhi shi s[s]i sh[ʂ]i si zhi si shi-zi, hai shi si shi si zhi shi shi-zi
'We don't know whether they are forty-four dead lions, or forty-four stone lions.'

In Chinese tongue twisters, couples of homophones amount to a twister effect. Double consonants, e.g. *tang* 'soup'/*ta* 'tower', or duplicated rhymes, e.g. *shì* 'ten'/*sì* 'four' leave our tongue twistered. In that event, Chinese tongue twisters are known as *áo yǔ* 'language of twisters', *jí kǒu lìng* 'rhymes for fast reading', and *jīe kǒu rào* 'serial reading'.

· I am greatly indebted to Prof. San Duanmu and Prof. Yen-Hwei Lin for their valuable suggestions. The present work requires more efforts in feature theory, including the feature classification of targeted twisters. Also, the production experiment is expected with a detailed plan. All of the tasks are undertaken and the results will be shown in the future study.

This research furthers Yip (2001)'s self-compounding model in that twister constituents result from the recursive reduplication. In other words, the Chinese homophones, as in (2), are non-harmonically base-generated reduplicants. This research sets out for two goals. First, what are the types of the Chinese tongue twister effects? Second, what is the timing size triggering/blocking the twister effect?

This paper contains four parts. §1 presents the basics of Chinese tongue twisters, along with the goals of this research. §2 describes the types of Chinese twister effects with a review of reduplication issues, particularly Yip's (2000) self-compounding model. Also, this section proposes a constraint-based approach (Prince and Smolensky 1993, 2004) to account for twister effects. §3 looks into the diverse articulatory difficulty in terms of the prosodic interval, followed by an Optimality-theoretic account. §4 concludes this study.

2. Chinese tongue twister effects

2.1. Twister effects

This research collects data from two books. One is 'Chinese tongue twister dialogues' (Wei et al 1924); the other is 'Everybody plays with tongue twisters' (Yan 2000). 226 twister passages in total are under examination.

The twister effect shows a diversity of changes from homophones to words with an alternative tone, or in a reverse order. (3) and (4) exhibits typical examples of homophones. *si* 'four'/'*shi* 'ten' in (3) and *tang* 'soup'/'*ta* 'tower' in (4) form twister pairs respectively with different onsets and rhymes

(3) Onset Change

bu zhi shi si shi si zhi si shi-zi, hai shi si shi si zhi shi shi-zi

'We don't know whether they are forty-four dead lions, or forty-four stone lions.'

(4) Rhyme Change

he-shang duan tang shang ta

'The monk takes soup, going up to the tower.'

ta hua tang sa tang tang ta

'The tower is slippery, the soup spills out, and the soup burns the tower.'

On top of homophones, Chinese lexemes display different semantic meanings by changing its lexical tone and its word order. In (7) *zhuan*⁵⁵ 'brick' and *zhuan*²¹³ 'turn' in a sequence leads to the articulation difficulty. In (8) *niao* 'bird' and *dao-diao* 'hang down' are assigned alternative thematic roles in two clauses. Speakers feel confused while reading a passage in the reversed word order.

(5) Tonal Change

chang chong wei zhe zhuan⁵⁵ tui zhuan²¹³, zhuan²¹³ wan le zhuan⁵⁵ dui zuan⁵⁵ zhuan⁵⁵ dui.

‘Long worms surround piles of bricks and push turning. After moving around the brick piles, they bored those brick piles.’

(6) Linearity

liang shang liang dui dao-diao_(i) niao_(j); ni li liang niao_(j) dao-diao_(i)

‘At the top of beams are two pairs of birds who are hanging down. In the mud hang two pairs of birds.’

2.2. Twister constituents as nonharmonic reduplicants

In order to account for the diverse twister effects, we posit twister pairs are borne out through reduplication. Reduplication has been widely discussed from perspectives like Prosodic Morphology Hypothesis (McCarthy and Prince 1986, 1996), template constraints (McCarthy and Prince 1993a, b; Kager 1999; Downing 2000; Gouskova 2007), and generalized constraints (Hendrick 2001; Crowhurst 2004). Many sustainable contributions (Chiang 1992, Ou 1996, Yip 2001, among others) go to cases of reduplication and triplication in Chinese dialects, especially from a view of prosodic morphology. This study proceeds along the synchronic thinking that the word formation comes partly from reduplication. Consider (7):

(7) Chaoyang and Fuzhou Dialect

/hop/	Rankings
Pattern 1 hop hop	Alliterate, Rhyme >> Markedness
Pattern 2 hop lop (+ suffix)	Rhyme >> Markedness >> Alliterate
Pattern 3 hi hop (kio)	Alliterate >> Markedness >> Rhyme
Pattern 4 hi hop lop (kio)	Alliterate, Rhyme >> Markedness
Pattern 5 hɒp lop	Markedness >> Rhyme

Alliterate and Rhymes are two constraints partially faithful to the input. In Chaoyang and Fuzhou dialect, five patterns of lexemes are attested by ranking Alliterate, Rhyme and Markedness constraints. Yip’s (2001) self-compounding model underlines this idea.

(8) Self-compounding Model (Yip 2001)



One input can simultaneously yield more than one put. The IO-faithfulness relations are maintained with respect to such constraints as Alliterate and Rhyme. In Chinese tongue twisters we also find many similar cases. Under the framework of Optimality Theory (Prince & Smolensky 1993/2004), we successfully predict many twister types.

2.3. The optimality-theoretic account to twister effect

The interesting part of Chinese tongue twisters lies in the consecutive similar lexical pairs. The constraint (9) is posited to model these observed twister constituents. It is prohibited to see two identical constituents without any changes. Besides, Chinese is an isolation language. That is, a great number of morphemes can stand alone. Very few of Chinese morphemes are in adjunction to another morpheme. For instance, the diminutive ending *zi* with neutral tone is meaningless. Only when attached to other morphemes can it surface, e.g. *yizi* ‘chair,’ *zhuozi* ‘table.’ Therefore, the constraint F-Anchor is proposed.

(9) DistinctBase: A R-word that is segmentally identical to its base is ungrammatical.

(10) F-Anchor: The bound morpheme must be reduplicated without any internal change.

In §2.2. four types of twister effects have been shown. The constraints (11)-(13) are used to describe these four effects. In what follows are the analysis of these twister effects in OT tableaux.

(11) Alliterate: The input-output onset must be identical.

(12) Rhyme: The input-output rhyme must be identical.

(13) Linearity: The precedence structure of the input is the same in the output, and vice versa.

(14) Indent-T: The tonal categories of inputs must be identical to those of the output.

Language typology is predicted by ranking some of the universal constraints. When Alliterate is demoted, the candidate with onset change is selected. See (15).

(15) *shou-yi xue bu hui (S1) (B)*
 ‘Not learn well the handcraft.’

cai-liao-er yong de fei (S1) (R)
 ‘The material in need will be much.’

HUANG: PROSODIC INFLUENCES

/hui51/	F-ANCHOR	DISTINCT BASE	RHYME	LINEARITY	IDENT-T	ALLITERATE
☞ a. fei51						*
b. hui51		*!				
c. hui35					*!	
d. hao51			*!			

The second effect is rhyme changes. When rhyme is ranked lower than the other three faithfulness constraints, the candidate (16b) is chosen.

(16) *ma-po mai* *ma*₍₃₅₎-*hua* (B)

‘The grandma with rough face bought fried dough twisters.’

dai-po ao *mei*₍₃₅₎-*hua* (R)

‘The grandma who looks stupid bought plum blossom.’

/ma35 hua55/	F-ANCHOR	DISTINCT BASE	ALLITERATE	LINEARITY	IDENT-T	RHYME
a. ma35 hua55		*!				
☞ b. mei35 hua55						*
c. fa35 hua55			*!			
d. ma21 hua55					*!	
e. hua55 ma35				*!		
f. rong35 shu51			*(!)*			**

On the other hand, the tonal change is also attested in my data, when Ident-T is ranked at the bottom, as in (17). Likewise, in (18) when Linearity is outranked by all, the twister effect with a reversed word order is chosen.

- (17) **gui**₍₂₁₎ (B) yao **gui**₍₅₅₎ (R) pei gui de shui
 ‘The ghost asked the turtle to compensate for its water.’

/gui21/	F-ANCHOR	DISTINCT BASE	ALLITERATE	RHYME	LINEARITY	INDENT-T
a. gui21		*!				
☞ b. gui55						*
c. shui21			*!			
d. guo21				*!		

- (18) **ling35**₁ **long35**₂ **ta21**₃ (B)
 ‘An exquisite tower’

ta21₃ **ling35**₁ **long35**₂ (R)
 ‘The tower is exquisite’

/ling35 ₁ long35 ₂ ta21 ₃ /	F-ANCHOR	DISTINCT BASE	ALLITERATE	RHYME	INDENT-T	LINEARITY
a. ling35 ₁ long35 ₂ ta21 ₃		*!				
☞ b. ta21 ₃ ling35 ₁ long35 ₂						*
c. ling35 ₁ hong35 ₂ ta21 ₃			*!			
d. ling35 ₁ long35 ₂ tie21 ₃				*!		
e. ling51 ₁ long35 ₂ ta21 ₃					*!	

3. Prosodic influences on twister effects

3.1. Lapse

The lexical structures are not a main cause to explain twister effects. Actually, the twister effects are prosodically constrained. Consider (19)-(20) for example.

- (19) ‘The tower is slippery, the soup spills out, and the soup burns the tower.’
ta hua tang sa tang tang ta
 tower slippery soup spill soup soup tower

(20) ‘The eggplants are placed on that plate.’

die-zi li cheng zhe qie-zi
plate inside fill PROG eggplant

The twister morphemes (underlined ones) in (19) are adjacent or spaced with one syllable, while those in (20) are taken apart by three syllables. While much emphasis is on the relation between total reduplication and its semantic link, few doubts are cast towards adjacency. In Chinese tongue twisters, a reduplicant may not be adjacent to its base. One twister constituent can be spaced with another constituent by one, two or even more syllables. This study gains greater interest in the prosodic domain between these fully/partially reduplicated constituents in Chinese tongue twisters. Before we solve the question on the prosodic domain between twister pairs, we first look at some empirical cases.

(21) some shun sun shine

A 1 B 2 A 2 B 2

(22) ta hua tang sa tang tang ta

A1 A2 A 2 A1

In (21) we have A-B-A-B pattern. The distance between A and B is one syllable. In Chinese example (22), we get 1-2-2-1 pattern. The distance between 1 and 2 is one syllable, too. This articulatory distance between twister constituents is thus defined as ‘lapse.’ The follow-up question is what size of lapse responsible for the frustrated articulator.

3.2. Two-level twister effects

Schourup (1973) noted that the twister relationships within the metrical foot are quite important with respect to defining a tongue twister. In the present study, the twister tokens are parsed with the lapse of fewer than two syllables. The constraint MaxLapse=Ft is proposed to regulate the twister lapse smaller than one foot.

(23) MaxLapse=Ft: The twister lapse should not exceed one foot.

However, when MaxLapse=Ft is respected, some cases may run a risk of violating DistinctBase. Consider (26):

(24)² ‘The tower is slippery, the soup spills out, and the soup burns the tower.’ (=22)

ta hua tang sa tang tang ta
A1 A2 A2 A1

In (24) the second and the third constituent are parsed with one syllable interval in conformity of MaxLapse=Ft. Unfortunately, it incurs violations of MaxLapse=Ft with the identical words, i.e. A2-A2 pattern. But something different happens when the syntactic structure is carefully re-examined. The instance of (24) is reanalyzed into small IPs, as in (25).

- (25) ‘The tower is slippery, the soup spills out, and the soup burns the tower.’
 [ta hua]_{IP} # [tang sa]_{IP} # [tang [tang ta]]_{IP}

IP is the domain within which twister effects work well. To put it simply, the speech is processed by IPs. There is a pause between any given two IPs. The pairs in violation of DistinctBase are protected by an IP bound. The speakers feel better when they encounter a short break. The articulation difficulties thus rarely occur across IPs.

Furthermore, as many psycholinguists observe, twisters reflect a difficulty in speech planning. According to Kupin (1982), tongue Twisters *do not* literally twist the articulators. What we are confused with is sequential patterns, like A, B, and 1, 2. Their recurring pattern is always aperiodic. In both of his and the present production experiment, lowering speech rate and reducing difficult phonetic features do not help decrease the error rates. In (24) pattern 1-2 followed by pattern 2-1 randomly shows up, forming a difficulty in speech planning.

To summarize, Chinese tongue twisters show *faithfulness* to morphosyntactic alignment while show *minimal unfaithfulness* to segments and suprasegments. (cf. Steriade’s (2008) P-Map)

- (26) ‘A plate is on the palm.’
 [shou li [tuo zhe die-zi]]

‘The eggplants are placed on that plate.’
 [die-zi li [cheng zhe qie-zi]]

In (26) *shou li* ‘on the palm’ and *die-zi li* ‘on that plate’ are structurally aligned, but lexically different. We thus posit another constraint, as in (27).

- (27) Faith-BR (pos): The base and the R-word should be morphosyntactically aligned.

The present analysis shows there are two-level twister effects. One is within IP and the other is between IP. When twisters occur within IP, then MaxLapse=Ft is undominated. (28) illustrates this typical twister effect. Twister constituents must be different, and the lapse (time left for word processing) must be short. On the other hand, we have twister effect between IPs, as in (29). The bound between IPs can drive MaxLapse=Ft to the bottom. Faith-BR (pos) and the DistinctBase must be ranked high.

The restriction on speech processing is lengthened. Yet the morphosyntactic position must be aligned.

(28) Twister Lapse: Within IP
 DistinctBase, MaxLapse=Ft » Faith-BR (pos)

(29) Twister Lapse: Between IPs
 Faith-BR (pos), DistinctBase » MaxLapse=Ft

4. Concluding Remarks

The present study recapitulates the nature of Chinese tongue twister effects. This traditional Chinese game embodies a pile of issues to explore, like rhymes, complicated lexical structures, and so forth.

This paper pinpoints the twister effects are prosodically influenced. Four basic twister effects are attested with conflicting forces among constraints Alliterate, Rhyme, Linearity, Indent-T. However, many empirical experiments show that these complicated lexical structures do not increase the error rate. The prosodic influences play a crucial role. Twister effects are valid but need to be considered in two levels, within-IPs and between-IPs. Cophonologies are a way to resolve this complication.

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關於李方桂 sk-類聲母與 kr-類聲母的擬音

The reconstruction of sk- and kr- clusters about Fang Kuei Li

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李方桂先生在《上古音研究》中為《切韻》中與舌根音諧聲的照三、穿三、審三等母擬測為： $*skj-$ 、 $*skhj-$ 、 $*sthj-$ ，認為照系三等字是從有s詞頭 (prefix) 的舌根音變來的，例如： $*skj- > t'sj-$ ， $*skhj- > t'shj-$ 或 $'s-$ ，而這個s詞頭在上古漢語的構詞學裡占很重要的位置，與漢語有關係的藏語就很明顯的有個s詞頭。後來在〈幾個上古聲母問題〉(李方桂：1976)中，李先生對*s詞頭重新作了檢討，認為照三、穿三、床三、審三的字「跟*s-詞頭無關。從s詞頭來的字只有《切韻》的齒音字，s-、tsh- (少數)、dz- (少數)、z-等母的字主張與舌根音諧聲的喻四、禪以及牀三都是從*grj變來的，因此有必要重新考慮跟舌根音諧聲的照三、穿三及審三等母的字，並且把跟舌根音諧聲的照系三等字改擬為 $*krj-$ ($> t'sj-$)、 $*khrj-$ ($> t'shj-$)、 $*grj-$ ($> d'zj-$ ，zj-或ji)、 $*hrj-$ ($> sj-$)，而這樣的擬音在演變規律上的也似乎合理。本文中，筆者將對於李方桂先生將sk-類聲母改擬為kr-類聲母提出討論，針對於這樣的構擬提出些許個人的看法。筆者擬從漢語諧聲系列、同族語、漢藏同源詞等材料，結合梅祖麟、王珏、何大安、潘悟雲、鄭張尚芳、龔煌城、楊劍橋、竺家寧師等各家對於kr-類聲母的看法及擬音，嘗試對李方桂先生kr-類聲母這樣的構擬提出評述。並檢視文中各家 (不同於李方桂先生的各家學者) 理論與說法之優劣得失，希望藉此釐清照系三等字可能的上古來源及其最合適之擬音究竟為何。

關鍵字：sk-類複聲母、kr-類複聲母、照系三等字、舌根音

0. 前言

李方桂先生在《上古音研究》¹中為《切韻》中與舌根音諧聲的照三、穿三、審三等母擬測為： $*skj-$ 、 $*skhj-$ 、 $*sthj-$ ，認為照系三等字是從有s詞頭的舌根變來的，例如： $*skj- > t'sj-$ ， $*skhj- > t'shj-$ 或 $'s-$ 。後來在〈幾個上古聲母問題〉(李方桂：1976)中，李先生對*s詞頭重新作了檢討，認為照三、穿三、

¹ 李方桂《上古音研究》(北京：商務印書館，1998年)。

床三、審三的字「跟*s詞頭無關。從s詞頭來的字只有《切韻》的齒音字，s-、tsh-（少數）、dz-（少數）、z-等母的字」，並且把根舌根音諧聲的照系三等字改擬為*krj-（>t'sj-）、*khrj-（>t'shj-）、*grj-（>d'zj-，zj-或ji）、*hrj-（>sj-）。

而在本文中，筆者將針對李方桂先生將sk-類聲母改擬為kr-類聲母提出討論，並結合各家說法及其擬音、漢藏同源詞，嘗試對這樣的構擬提出評述，更進一步則希望能探討其中之優劣，最後並得出照系三等字最合適之擬音究竟為何。

一、關於《上古音研究》中的所討論的照系三等字

董同龢曾在《上古音韻表稿》²列出 24 個照三和見系接觸的諧聲系列，說明這不是少數例外現象。在《上古音研究》書中，李方桂先生將這類照系三等字擬音為sk類複聲母：*skj-、*skhj-、*sthj-，認為照系三等字是從有s詞頭（prefix）的舌根音變來的，而這個s詞頭在上古漢語的構詞學裡占很重要的位置，³與漢語有關係的藏語就很明顯的有個s詞頭。另外，李方桂先生還認為中古的審母三等's-除去某些從上古*hnj-（與鼻音諧聲）來的，其餘大部分是跟「舌尖塞音」（端系）諧聲的。其中，近代方言中往往有吐氣塞擦音的又讀，這類字似乎可認為是從上古*sth+j-來的，因而這類的心母字似乎可以認為是從上古的*st-或*stj-來的。除此，審母三等's-也有跟舌根音諧聲的，不僅僅是審母三等，就連照三、穿三、神三也有跟舌根音諧聲的，李先生因而主張這類字（照系三等字）是從舌根塞音來的，並且認為它們也都有個*s-詞頭。這類*s-詞頭的舌根字，到了中古演變為心母、照穿牀審禪的三等字、邪母、日母。它們演變規律大約如下九類：⁴

1	上古 *sk-、*sk ^w - > s、sw-	如：楔、損。
2	上古 *sk+j- > t's-	如：鍼、旨、茝、支。
3	上古 *sk ^w +j- > sw-	如：歲、總、宣、荀、恤、崧。
4	上古 *skh > tsh-（？）	如：造
5	上古 *skh+j- > t'sh-	如：樞、杵、車、赤、出...等，或者's-如赦、翅、收、燒等，原因不詳。
6	上古 *sg- > dz-（？）	如：造
7	上古 *sg+j- > d'z-	如：示，或是'z如：腎、跂、氏、視。
8	上古 *sg ^w +j- > zw-	如：松、訟、彗、旬...等。
9	上古 *sng+j- > 'n'z-	如：蕘、饒、兒...等。

² 董同龢《上古音韻表稿》（台北市：台聯國風出版社，1975年三版），頁5-7。

³ 根據鄭張尚芳〈上古漢語的s-頭〉，《古漢語複聲母論文集》（北京：北京語言文化大學出版，1998年），頁348。文中作者認為上古s-頭有兩種功能，一是構詞詞頭，二是表使動態的詞頭。

⁴ 此處分類依據竺師家寧《聲韻學》（台北市：五南書局，2002年第九刷），頁622。

後來在 1976 年的〈幾個上古聲母問題〉⁵中，李方桂先生修正了先前對照三、穿三、審三等聲母sk類複聲母的擬音，認為跟舌根音諧聲的喻四、禪以及牀三都是從*grj變來的，所以有必要重新考慮跟舌根音諧聲的照三、穿三及審三等母的字，因此李先生對*s詞頭重新作了檢討，主張照三、穿三、牀三、審三的字「跟*s詞頭無關。從s詞頭來的字只有《切韻》的齒音字，s-、tsh-（少數）、dz-（少數）、z-等母的字」，並且把舌根音諧聲的照系三等字改擬為*krj-（>t'sj-）、*khrj-（>t'shj-）、*grj-（>d'zj-，zj-或ji）、*hrj-（>sj-）、*ngrj-（>nzj-），而這樣的擬音在演變規律上的也似乎合理。李方桂先生在〈幾個上古聲母問題〉文中自述改變從前的擬音，總歸起來有三個理由：⁶

第一：就一般語音的分配情形看起來，不應當只有濁音的*grj-而沒有*krj-、*khrj-等，漢語更是往往清濁音相配的。如說只有*grj-而沒有*krj-、*khrj-等似乎是一個不可解釋的現象。

第二：在語音演變的原理上也比較容易解釋。我們認為 r 介音有央化作用（centralization），可以把舌面後音（即舌根音）向前移動，更受 j 介音的影響，就變舌面前音 t's-、t'sh-、d'z-等音了。這是央化作用的一個例子，跟把舌尖前音 t-、th-、d-等向後移動成為舌尖後音 t-、th-、d-一樣。

第三：我們曾經擬了一個s詞頭來解釋《切韻》的心母字跟各種聲母諧聲的字。同時也把些照三、穿三、牀三、審三等的字牽連在內。現在我覺得實在這些字跟s詞頭無關。從s詞頭來的只有《切韻》的齒音字，s-、tsh-、dz-（少數）、z-等母的字。⁷包括：

*st- > s-	如：掃、犀、筱、賜、修、髓、泄、雖、綏。
*sth- > tsh-	如：催、戚、邨。
*sd- > dz-	如：寂、摧。
*sdi- > zj-	如：詞、袖、續、誦、徐、遂、遁。
*sk- > s, *sk ^w - > sw-	如：楔、秀、損、歲、宣、恤。
*skh- > tsh- (?)	如：(造)。
*sg- > dz, *sgj- > zj-	如：造、邪、俗、松。
*sg ^w - > zjw-	如：彗、穗、甸。

基於上述三個理由，李先生因此把跟舌根音諧聲的照三、穿三、牀三、審三、禪、日等母的字認為是從上古的*krj-、*khrj-、*grj-、*hrj-、*ngrj-來的。例如：

⁵ 李方桂〈幾個上古聲母問題〉，《上古音研究》（北京：商務印書館，1998年）。

⁶ 李方桂〈幾個上古聲母問題〉，頁88。

⁷ 李方桂〈幾個上古聲母問題〉，頁88-92。

***krj- > t'sj-**

- 枝 *krjig > t'sje
只 *krjig, -x > t'sje
蒸 *krjəng > t'sjəng
箴 *krjəm > t'sjəm
抵 *krjigx > t'sje
旨 *krjidx > t'sji

***khrj- > t'shj-**

- 饴 *khrjəgh > t'shjī
樞 *khrjug > t'shu
杵 *khrjag > t'shjwo
處 *khrjagh > t'shjwo
赤 *khrjak > t'shjak
車 *khrjiag > t'shja
臭 *khrjəgwh > t'shjəu

***grj- > 'z, d'zj- (少數), ji**

- 丞 *grjəng > 'zjəng
豉 *grjigh > zje
氏 *grjigx > 'zje
視 *grjidx, -h > 'zji
示 *grjidh > d'zji
腎 *grjinx > 'zjen
頤 *grjəg > jīi
誘 *grjəgwx > jiəu
搖 *grjagw > jiau
藥 *grjakw > jia
裕 *grjugh > jiu
欲 *grjuk > jiwok
邪 *grjiag > jia
鹽 *grjam > jiam

***hrj- > 'sj-**

- 收 *hrjəgw > 'sjəu
守 *hrjagw > 'sjau
燒 *hrjagw > 'sjau
赦 *hrjigh > 'sja

聲 *hrjing > 'sjang
 著 *hrjid > 'sji
 歛 *hrjiep > 'sjap
 濕 *hrjöp > 'sjöp

*ngrj- > 'n'zj-

饒 *ngrjagw > 'n'zjau
 肉 *ngrjök w > 'n'zjuk
 兒 *ngrjig > 'n'zje

這麼一來，便有一整套的 *krj-、*khrj-、*grj-、*hrj-、*ngrj-來跟 *trj-、*thry-、*drj-、*nrj-、*tsrj-、*krj-、*tshry-、*dzry-、*srj-等相當。s-詞頭既可以諧舌尖塞音也可以諧舌根塞音，那麼是不是也能諧雙唇塞音，在系統上構成完整的一套呢？李方桂先生的看法是：

瑟 ʃ 是否從上古 spr 來的，不能肯定，也許 spr 先變 sr，再變成《切韻》的 ʃ。“鼻”字原與“自”字通，是否“自”字是 sbj > dzj？“鼻”字是否 sb > dz？這些都是很有趣的問題，一時不易解決。⁸

關於 sp-型的複聲母，無論是上古漢語內部比較還是語言之間的比較，sp-的例子都很少。⁹

總而言之，李先生在 1976 年將其所擬的 s-詞頭作了一次清查，把它的範圍縮小了，認為 s-舌根字只限於中古齒頭音，尤其是 s、z。至於照系三等字、喻四、日母都排除在 s-之外，而擬為帶 -r- 的舌根音，以此來解釋它們和舌根音的諧聲現象。這樣，比董同龢之擬為舌根前音¹⁰，用以解釋照系三等字和舌根音諧聲的現象，解釋起來要更合適。

二、各家對於 kr-類複聲母之看法

(一) 贊成 sk-類複聲母改為 kr-類複聲母

梅祖麟〈跟見系諧聲的照三系字〉¹¹文中贊成李方桂將照三系聲母（包括日母）跟舌根音的字構擬為 *krj-（>t'sj-）、*khrj-（>t'shj-）、*grj-（>d'zj-，zj-或ji）、*hrj-（>sj-）、*ngrj-（>nzj-），並運用閩語與同源詞的證據證明了李方桂擬音的正確性。梅氏認為李方桂 *Krj-來源的中古聲母除了照三系以外，還包括跟舌根音接觸的喻四，如：「欲」、「盐」等字，並且接受李氏 r 介

⁸ 李方桂〈幾個上古聲母問題〉，頁 91。

⁹ 周及徐《漢語印歐語詞彙比較》（四川：四川民族出版社，2002 年 7 月第一版），頁 66。

¹⁰ 舌根前音如：*ʀ、*ʀh、*ǵh-、*x'，這套音與舌根後音 *k、*kh、*gh、x 等互諧，詳見李方桂《上古音研究》，頁 11。

¹¹ 梅祖麟〈跟見系字諧聲的照三系字〉，《中國語言學報》第一期，1982 年，頁 114-126。

音有央化作用把舌面後音（即舌根音）向前移動的看法，因而使舌根音變成舌面音。因此**Krj-*失落了*r*介音，舌根音就能維持不變，運用李氏的上古擬音，可將閩語知系和端系的合流看作*r*介音在知系**Tr-*型複聲母失落的結果；失落*r*介音，閩語的就變成**T-*，不失落*r*介音則在其他方言就變成中古的捲舌音。梅祖麟更假設這樣的音變途徑曾出現過在閩語史上，即（甲）舌根音後失落*r*：**Krj-*→*Kj-*（乙）舌尖音後失落*r*：**Tr-*→*T-*。也就是說**krj-*有兩種不同的演變，保*r*介音就變成《切韻》時代的照三系聲母，失落*r*介音就保留舌根音，次型以閩語最古的層次為代表。除此梅祖麟先生在文中對**Krj-*類複聲母從上古到中古的演變步驟提出如下假設：**Krj-*→**Trj-*→*Tj-*→*T'Sj-*（Mei 1980）。

梅祖麟的擬音，誠如作者自己在文中所述，第二步問題恐怕最大，因為如此一來*Trj*將與知系三等字混同。因而筆者在此有不同看法，傾向認同**Krj-*→*Kj-*與**Krj-*→*Kj-*→*T'Sj-*兩途徑。第一條即在*r*介音失落後，*k*受*j*影響而顎化，如閩語最古層次的演化途徑、客家方言連城、四堡話中的知、章二系在一部份中古合口三等韻前讀為的*K-*、*Kh-*¹²；而第二條則是**Krj-*→*Kj-*後*Kj*又繼續向*T'Sj*演變，最後形成中原方言的照三系。

王珏〈見系、照三系互諧與上古漢語方言分區〉¹³對於李方桂先生與舌根音諧聲之照系三等字：**krj-*、**khrij-*、**grj-*、**hrj-*、**ngrij-*之擬音及其兩條演化途徑¹⁴表示認同，作者並結合現代齊魯方言、吳越方言對李先生的擬音提出有力的證據，例如：¹⁵

1. 《世本居篇注》：「姑之言諸也。」《毛傳》：「讀姑為諸。」此條還見於《史記吳太伯世家索引》「壽夢」條。古音「姑」為見母魚部，「諸」為章母魚部。兩字韻部相同，這是一個齊魯、吳越兩地方言中見系字讀為照系三等的直接證據。
2. 《詩經·齊風·猗侯》：「終日射侯。」「終日」即「竟日」。古音「竟」為見母陽部，「終」為章母冬部。冬、陽二部相近可通，「終」正是「竟」的記音。又《詩經》：「終...且...」句式，王引之《詩經釋詞》卷八譯為「終，詞之既也。」古音「既」為見母物部，與「竟」同為一系。因此可說「終」也是「既」的記音字。
3. 《史記夏本紀索隱》引《世本》云：「鯀取有莘氏女，謂之女媧。」驗之他書，《廣韻》同，《吳越春秋》作「女喜」或「女嬉」。考之古音，「喜、嬉」

¹²鄭曉華〈古音韻構擬與方言特別語言現象的研究〉《語文研究》1993年第3期。

¹³王珏〈見系、照三系互諧與上古漢語方言分區〉，《華東師範大學學報》哲學社會科學版，第32卷第4期，2000年7月，頁103-120。

¹⁴李方桂先生為**krj-*類聲母設想了兩條演化途徑如下：（1）**krj-*式複聲母如果保留介音**-r-*，則變成中古照系三等聲母；（2）**krj-*式複聲母如果脫落介音**-r-*，則繼續保持原來的舌根音。

¹⁵王珏〈見系、照三系互諧與上古漢語方言分區〉，頁105、107。

同為曉母開口三等，而「媿」為章母。「喜、嬉」在吳越方言中讀為照系三等字之聲母。那麼「女喜」、「女嬉」、「女媿」、「女志」當為同一個人名的異文。

當然，齊魯、吳越方言由*krj-向t'sj-演變的例子在〈見系、照三系互諧與上古漢語方言分區〉文中還有很多，本文限於篇幅不再贅述。除此，作者更指出在齊魯、吳越方言由*krj-向t'sj-演變的同時，中原方言可能已經完成了見系、照三系聲紐的分化，而荊楚方言或許早在上古時期就走上了或開始走向*krj-向k-的道路，例如：¹⁶

1. 舸與舟

《說文》：「舸，舟也。」《方言》卷一：「南楚江湘凡船大者為之舸。」《廣韻》引《方言》：「關西為之船，關東為之舟。」就古音來看，船為船母，舟為章母，舸為見母一等。這三個字的讀音正好分別代表了關西、關東和荊楚鼎足而立的三個方言區中「船」一詞的聲紐發音，也就是說「舟」在荊楚方言中讀*k-。

2. 「箴官」就是「諫官」

春秋時代，楚國有「箴尹」一職，又作「針尹」。《左傳·定公四年》有「針尹固」，《哀公十六年》作「箴尹固」。《呂覽勿躬》高《注》云：「楚有箴尹之官，諫臣也」。其實「箴」、「針」就是「諫」字在荊楚方言的記音。「箴」、「針」同由「咸」得聲，字義相同，又同為章母侵部；「諫」為見母元部三等。《左傳·莊公三十二年》：「針氏巫」之「針」，《釋文》注為「其廉反」，《廣韻》收有又音「巨盐切」。這可能是更早期的荊楚方言語音的殘餘。

以上梅祖麟、王珏兩位學者不僅對於李方桂先生的擬音*k-類複聲母的擬音表示贊同，並以漢語方言為之佐證，為李氏（1）*krj-式複聲母如果保留介音-r-，則變成中古照系三等聲母；（2）*krj-式複聲母如果脫落介音-r-，則繼續保持原來的舌根音，預設的兩條*k-類複聲母演化途徑提供了有利的支撐點。

（二）贊成 sk-類複聲母改擬為 kr-類複聲母，但須稍作修正，改為 kl-類複聲母

何大安在〈上古音中的*hlj-及相關問題〉¹⁷文中大致贊成李方桂先生將sk類複聲母改擬為kr類複聲母，卻也對李先生審母三等字的擬音提出修正。何先生主張若單從「分布」上著眼，審三應從*hrj-改為*hlj-較為適合。若將*hlj-作

¹⁶王珏〈見系、照三系互諧與上古漢語方言分區〉，頁109-110。

¹⁷何大安〈上古音中的*hlj-及相關問題〉，《漢學研究》1992年6月，第10卷第1期，頁343-348。

為審三的來源，一方面上古的 *hnj-、*hrj-、*hlj- 都變成中古的 'sj-，在演變上相當平行、一致、好解釋——這裡的 *h- 可能是一個詞頭；而另一方面上古配三等韻的舌尖塞音、鼻音、邊音到了《切韻》都舌面化，也能夠滿足音韻上條件相同走向也相同的原則。¹⁸此外，何大安認為與舌尖塞音諧聲的審母三等字在諧聲行為上有一點是大家在擬音時所忽略的。那就是審三不但諧舌尖塞音，同時還經常諧喻四 (ji-) 字。例如：¹⁹

它 th-：鉞 'sj-：迺 ji-：蛇 d'zj-
 余 ji-：除 dj-：除 'sj-：途 d-
 予 ji-：杼 dj-：杼 d'zj-：舒紓 'sj-
 俞 ji-：輸 'sj-：歛 d-：偷 th-
 延 ji-：槌 thj-：埏 'sj-：誕 d-
 兌 d-：脫 th-：說 'sj-：稅 t'sj-
 世屨 'sj-：葉柎 ji-：泄 'sj-：堞 di-
 申 'sj-：神 d'zj-：電 di-
 失 'sj-：佚 ji-：扶 th-：秩 dj-：跌 di-
 占 t'sj-：覘 thj-：苦 'sj-：玷 ti-：帖 thi-：跽 ji-
 易陽 ji-：暢 thj-：湯 th-：傷 'sj-：盪 d-
 罍 ji-：釋 'sj-：擇 d-：鐸 d-：穉 thi-：殫 t-
 延 di-：呈 dj-：逞 thj-：程 ji-：聖 'sj-
 易 ji-：剔 thi-：錫 si-：鬻 di-
 弋 ji-：式 'sj-：忒 thi-：代 d-：忒 thj-
 以 ji-：似 zj-：俟 dz-：治 dj-：笞 thj-：始 'sj-
 樂 l-，ngj-：鑠 'sj-：藥 ji-

在高本漢的《Grammata Serica Recensa》(Karlgren, 1975) 文中，這類諧聲大約佔與舌尖塞音諧聲的審三字之十之八九，值得注意。又假如喻四是 ji- 是 *l-，審三是 *hlj-，由於同具有舌尖音 l，自然可以有比較密切的諧聲關係。l 與 r 雖同屬流音但 l 別具有塞音的成分——例如廈門方言的 l 就很接近 d (董同龢 1957: 233)——因此 *l-、*hlj- 也就能夠常與舌尖塞音諧聲。²⁰

楊劍橋〈論端、知、照三系聲母的上古來源〉²¹文中從照三系字的諧聲表現、方言現象、漢藏語比較中推斷：照三系字的上古來源絕不是單純的端系，認為李方桂先生的 *krj- (>t'sj-)、*khrj- (>t'shj-)、*grj- (>d'zj-, zj- 或 ji)、*hrj- (>sj-)、*ngrj- (>nzj-) 構擬原則上是正確的，但尚有瑕疵。楊氏認為既然有 *krj-、*khrj-、*grj- 等，那麼從音位分布角度看，有應當有 *kr-

¹⁸何大安〈上古音中的 *hlj- 及相關問題〉，頁 345

¹⁹何大安〈上古音中的 *hlj- 及相關問題〉，頁 346。

²⁰何大安〈上古音中的 *hlj- 及相關問題〉，頁 346。

²¹楊劍橋〈論端、知、照三系聲母的上古來源〉，《語言研究》1986 年第一期 (總第 10 期)。

、*khr-、*gr-。事實上，跟見系字發生諧聲關係的不只是照三，往往同時還有端系、知系，他們應該有一個共同來源。但在李方桂的系統中，*kr-等卻是見系二等字，跟見系諧聲的照三擬成*krj-等，而同時諧聲的端系卻依然是t-，這是很不合理的。²²因此楊劍橋將李氏kr-類的擬音稍做修正，改為*k1-、*khl-、*gl-等，又有*klr-、*khlr-、*glr-，分別演變為*k1->t、*khl->th、*gl->d、*klr->t、*khlr->th、*glr->d。

對於後者*k1->t、*khlr->th、*glr->d的擬構，我們發現此類複聲母的輔音叢同時具有l、r兩個流音，這樣的現象不僅罕見於親屬語中（藏語亦僅有rl-），更是世界上語言中少見的，故對於楊劍橋這樣的擬音，筆者認為尚須斟酌。

鄭張尚芳亦提議將李方桂先生的*-r改為*-l。²³另外，龔煌誠〈上古漢語與原始漢語帶r與l複聲母的構擬〉²⁴一文當中漢藏語的比較提出照系三等字與舌根音（*kj-、*khj-、*gj-）的諧聲現象在上古來源應為*k1ji->t'sj-、*khlj->t'shj-、*glji->d'zj-或'zj、*hlj->'sj-。潘悟雲也贊成此說，他認為：

「李方桂先生擬來母作[l]，喻母四等作[r]，見母二等作[kr]，跟見母諧聲的章母作[krj]。但是，見母二等幾乎只跟來母諧聲，而不跟喻母四等諧聲。所以要麼見母二等為[k1]，要麼喻母四等為[l]，來母為[r]，否則不好解釋諧聲現象。我是非常贊成 Pulleyblank 的意見，定來母為[r]，喻母四等為[l]，還有大量的古漢語外譯材料和親屬語同源詞材料以為佐證。」²⁵

由上述可知以上幾位學者均採中古喻母為*j1-，其上古音值為〔l〕的觀點。因此主張將李方桂先生照系三等kr-類母之擬音改為k1-類聲母，這樣一來便較容易解釋，照系三等字與喻四之間的諧聲關係。

此外，龔煌城先生在〈The First Palatalization of Velars in Late Old Chinese〉²⁶文中根據漢藏語的比較，提出上古漢語當-l-介音後面跟著半元音-j-時則會發生「顎化」之現象，即*k1j->t's-、*khlj->t'sh-、*glj->d'z-或'zj、*hlj->'s-，原本的舌根音+流音l因受-j-介音的影響而發生顎化現象，接著造成發音部位前移，因此演變成中古照系三等字的舌面前塞擦音。

²²楊劍橋〈論端、知、照三系聲母的上古來源〉，頁110。

²³鄭張尚芳〈上古韻母系統和四等、介音、聲調的發源問題〉，《溫州師範學院學報》1987年第4期，頁69。

²⁴龔煌城〈上古漢語與原始漢語帶r與l複聲母的構擬〉，《漢藏語研究論文集》（北京：北京大學出版社，2004年9月第一版），頁183-212。

²⁵此段轉引自竺師家寧《論上古的流音聲母》第十八屆聲韻學研討會，輔仁大學，2000年5月20-21日。

²⁶龔煌城〈The First Palatalization of Velars in Late Old Chinese〉，《漢藏語研究論文集》（北京：北京大學出版社，2004年9月第一版）。

然而竺師家寧在〈論上古的流音聲母〉²⁷卻持相反意見，竺師家寧參考漢語親屬語、《苗瑤語方言詞匯集》²⁸、《侗台語概論》²⁹等書，列出苗語黔東方言有[l]、[r]的對立，而來母字都用來[l]對應。從藏文來看，亦可見到r-和喻四對應的例子，如：酉ru（布依語）、楊r-（布依語）、龍kluong（瑤語），這幾個例子都是來母念l-，喻四念r-；從侗台語看也有來母念l-，喻四念r-的，如：余ra、移re、泄ria、腋rak、艷riam³⁰；又從苗瑤語中量li（p90）、里li（p92）、利li（p92）、糧liang（p92）、兩liang（p92）³¹；爛la（p70）、聾long（p70）、來lau（p70）、老lo（p70）、兩lang（p70）、露lu（p70）、里li（p82）等字可知苗語黔東方言有[l]、[r]的對立，而來母字都用來[l]對應³²；即使由藏文來看，我們也可以見到r-和喻四對應的例子。「易」字藏語rje（交換、貿易）。³³在《原始漢語與漢藏語》書中同族語言中還有很多r-並不對應來母的例子，如：³⁴

原始瑤語rui	漢語「衣」（影母）	藏語rag	漢語「亞」（影母）
藏語rengs	漢語「擅」（禪母）	藏語rag	漢語「核」（匣）
藏語re	漢語「是」（禪母）	藏語rigs	漢語「域」（喻三）
藏語ran-pa	漢語「善」（禪母）	藏語ral	漢語「閒」（見母）
藏語ril	漢語「旬」（邪母）	景頗語ran	漢語「閒」（見母）

不過，何九盈在《語言叢稿》中對此提出批評，認為包擬古在《原始漢語與漢藏語》書中構擬的486組同源詞問題頗多，其中更有許多錯誤。³⁵事實上在藏緬語同源詞比較中，與漢語喻四對應的主要是[l]，當然也存在著相反的例子，鄭張尚芳就指出，「喻曉、了解」泰語ru、壯語ro、越語rō，藏文「余、陽自己」ra、「山羊」ra，都用r，但例子較少。³⁶之所以會出現這種情況主要有三個原因：第一，學者對於同源詞的取捨不同。例如「羊」字，龔煌城認為跟藏文的glang牛、象對應，³⁷但鄭張尚芳確認為跟藏文的ra羊對應，³⁸孰是孰非，可說見仁見智。第二，上古的來母和喻四都屬流音，因此出現少數相反的例子是可以理解的。第三，喻四在不同語族的語言中有不同的演變，³⁹換言之即不同語族的同源詞產生時代不一，因而產生不同的語音演變。

²⁷竺家寧〈論上古的流音聲母〉。

²⁸《苗瑤語方言詞匯集》（北京：中央民族學院，1987年）。

²⁹倪大白《侗台語概論》（北京：中央民族學院，1990年）。

³⁰Manomaivibool《A Study of Sino-Thai Lexical Correspondences》1975年。

³¹《苗瑤語方言詞匯集》（北京：中央民族學院，1987年）。

³²王輔世《苗語方言聲韻母比較》（北京：中國社會科學院民族研究所，1979年）。

³³包擬古著；潘悟雲、馮蒸譯《原始漢語與漢藏語》（北京：中華書局，1995年），頁121。

³⁴包擬古著；潘悟雲、馮蒸譯《原始漢語與漢藏語》，頁103-108。

³⁵詳見何九盈：《語言叢稿》（北京：商務印書館，2006年），頁49-54。

³⁶張尚芳〈上古音構擬小議〉《語言學論叢》1984年，第14輯，頁47。

³⁷龔煌城〈從漢藏語的比較看上古漢語若干聲母的擬測〉，《漢藏語研究論文集》（北京：北京大學出版社，2004年9月第一版），頁43。

³⁸鄭張尚芳〈上古音構擬小議〉，頁47。

³⁹丘彥遂《喻四的上古來源、聲值及其演變》，國立中山大學中國文學系碩士論文，頁45。

竺師家寧認為若從漢語方言來看流音問題，會發現來母字沒有一個方言念成[r-]的。而喻母四等字更沒有一個方言念成[l-]的。如果上古音果真把喻母四等字念成[l-]，把來母念成[r-]，就應該會有一些痕跡殘留下來，但是，我們一個這樣的證據也看不到，竺家寧師以為，漢語的古音研究更應該注意漢語本身「內部」的證據。不過根據鄭張尚芳〈上古音構擬小議〉一文指出：在現在漢語方言中是可以找到喻四讀[l-]的例子，如廈門方言「檐」liam，建陽方言「庠」lionŋ，益陽方言「孕」len，溫州郊區「鷓」（風箏）liə。⁴⁰

以上何大安、楊劍橋、鄭張尚芳、潘悟雲、龔煌城等諸位學者著眼於照三系聲母與喻四諧聲的情況，因而主張將李方桂先生的kr-類複聲母中的*-r-改為*-l-，即kl-類複聲母。如此一來較能合理解釋來自kr-的見母二等與來母（kr: r）及來自舌根音的照三系與喻四（kl: l）諧聲的情形。

（三）小結

最後，為了方便觀察照系三等字的諧聲狀況，筆者將《上古音研究》（含〈幾個上古聲母問題〉）李方桂先生所整理的照系三等字諧聲現象即其擬音結合《上古音韻表稿》⁴¹、《廣韻聲系》⁴²、兩書之字例與陸志韋先生《古音說略》廣韻五十一聲母在說文諧聲通轉次數統計表⁴³的各聲母諧聲次數，把照系三等字主要的諧聲情況大略整理如下：

諧聲	端系 ⁴⁴ (舌尖塞音)	見系 ⁴⁵ (舌根音)	鼻音 ⁴⁶	喻四 ⁴⁷
照三	*t+j- > t's- 佳：堆：錐： 士：寺：待：特 真：顛：癩 周：雕：彫：凋 詹：擔：膽：澹	*krj- > t'sj- 支：妓：跂：度：屨 只：枳 旨：耆：稽 咸：箴：鍼 旨：詣 襄：饜	受 _卩 (nʒ) 參：趁：跚 占：黏 錚 (nʒ)	*grj- > ji 佳：惟：維 ：唯 佚、維、唯、
諧聲 次數	135	58	13	23

⁴⁰鄭張尚芳〈上古音構擬小議〉，頁 47。

⁴¹董同龢《上古音韻表稿》（台北市：台聯國風出版社，1975 年三版）。

⁴²沈兼士主編《廣韻聲系》（北京：中華書局，2006 年第三次印刷）。

⁴³陸志韋《古音說略》（台北市：台灣學生書局，1971 年 8 月），頁 254-255。

⁴⁴此處含泥母n，本表泥母同時亦歸於「鼻音」之列。

⁴⁵此處見系包含見母、溪母、群母、疑母，亦含影母、曉母及匣母。

⁴⁶此處鼻音包含泥母、娘母、日母、疑母、明母。然明母與照三系諧聲之例僅有「勺：貌：藐：邈」等例，因例少故不於上表中列出。

⁴⁷此處僅列喻四而不列來母是因來母與照三系諧聲之例於陸志韋先生統計中僅四例。

穿三	* th+j- → t'sh- 出：銑：咄	* khrij- → t'shj- 臭：糗 赤：郝 區：樞 羔：糕 川：訓 出：屈：倔：窟 喜：饴 午：杵 車	狃 (n) 爾 (nz)：纒 冉 (nz)：疳	* grj- → ji
諧聲 次數	31	26	8	3
牀三	* d+j- → d'z-	* grj- → d'zj- 示：祁 襪：		* grj- → ji 食、射、麝
諧聲 次數	82	22	2 ⁴⁸	11
審三	* th+j- → 'sj 庶：度：遮：席 檣：敵：適：謫 詩：特 台：始 輸：偷 深：探 申：電	* hrj- → 'sj- 殼：聲：磬 赦：郝 翁：歛 向：餉 堯：燒：澆	* hn+j- → * h'n's+j- → 'sj (少數審三與鼻音諧，此類審母從清鼻音在三等介音j前演變而來，消失較早) 女：如：恕 聶：攝 曩：讓：饜(傷) 熱：勢	* grj- → ji 它：鉞：池 余：賒 予：紓：舒 俞：輸 延：埏 世：葉 失：佚 弋：式 罽：釋
諧聲 次數	50	23	17	46
禪三	* d+j- → z- 單：禪 氏：紙 臣：賢 蜀：獨 是：堤：鞮 石：拓 殳：投	* grj- → 'z 耆：嗜 臣：堅：腎：鯉：慳 殳：股 甚：堪	/	* grj- → ji 西甚
諧聲 次數	6	3	0	15

⁴⁸與陸志韋先生《古音說略》廣韻五十一聲母在說文諧聲通轉次數統計表，此處牀母與鼻音(泥、日、娘、疑三母)諧聲次數總共1次(僅牀與日母諧聲1次)，然筆者翻閱《廣韻聲系》卻查無牀母與日母諧聲的例字。

由上表數據可以發現照系三等諧聲現象主要集中在「舌尖塞音」與「舌根音」，可見照系三等字在上古至少有兩個來源。與「舌尖塞音」諧聲之照系三等字上古來源為 *t-、*th-、*d-。然而這個舌尖塞音亦不排除從kl-類複聲母而來，即kl>l>t，第二步k-失落而其特徵投射於流音l之上，造成流音塞化現象，使l演變為t。

與「舌根音」諧聲的照系三等字上古來源則為舌根音類複聲母，李方桂改其早期sk-類複聲母為kr-類複聲母，即*krj- (>t'sj-)、*khrj- (>t'shj-)、*hrj- (>sj-)、*ngrj- (>nzj-)，而喻四、禪母與牀三三母皆來自於複聲母*grj- (>d'zj-, zj-或ji)。換言之，若著眼於喻四(1)與照三系諧聲及見二與來母諧聲的情形，則部分學者建議將kr-類複聲母改擬為kl-類複聲母。即*klj- (>t'sj-)、*khlj- (>t'shj-)、*hlj- (>sj-)、*nglj- (>nzj-)。

筆者在第二節中曾提及董同龢曾在《上古音韻表稿》列出 24 個照三和見系接觸的諧聲系列，並指出這樣的諧聲現象絕非偶然，但金理新認為照三系與舌根音諧聲畢竟是少數，不是常態。故在此筆者查閱陸志韋先生《古音說略》廣韻五十一聲母在說文諧聲通轉次數統計表發現，若以「章」母字為例「古：之」諧聲為 3 次，「居：之」諧聲為 10 次，兩者相加為 13 次；而「古：古」相諧次數為 333 次，「居：居」互相諧聲有 147 次，兩者相加次數多達 480。相較於前者見母與章母諧聲的 13 次說來，見母與章母諧聲的比率僅 2.7% (13/480+13)，這麼說來或許金理新的推論並非是毫無根據的。

三. 結論

經由本文前幾節對於 sk 類與 kr 類複聲母之論述後，筆者據此提出下列看法：

第一，由本文第三節中的論述可知，各家學者對於李方桂先生將與舌根音諧聲的照三系字由sk類複聲母修正為kr類複聲母均表示贊同，也認為這樣的修改更能夠符合語音的演變的規律。唯獨對於kr類複聲母之*-r-介音是否該改為*-l-介音存在著不同的意見。換言之，即照系三等字與喻四聲母諧聲時，這個喻四聲母該擬為*-r-亦或是*-l-？假如喻四是ji-是「*l-」，由於同具有「舌尖音」*-l-，自然可以有比較密切的諧聲關係。李方桂先生擬來母作[l]，喻母四等作[r]，見母二等作[kl]，跟見母諧聲的章母作[krj]，但見母二等幾乎只跟來母諧聲，而不跟喻四等諧聲，所以要麼見母二等為[kl]，要麼喻母四等為[l]，來母為[r]，否則便不好解釋諧聲現象。

根據筆者觀察，目前學界多數學者傾向贊同這樣的*-r-、*-l-互換說法，並且舉出了許多同族語的例證來說明。筆者對這樣的主張大致贊同，也認為如此的確較能夠解釋某些諧聲的狀況，但相對地，尚有部分反例無法獲得合理的解釋與安排，筆者在此對於這樣的情形提出五個可能的解釋：

其一，學者對於「同族語」的定義不同，造成用以論證喻四與來母對應音值為[l]或[r]的同族語例證有誤差，如：侗台語與苗瑤語是否為上古漢語之同

族語，將成為影響喻四或來母音值的關鍵所在。同族語的認定不同，勢必造成^{*}-r-、^{*}-l-是否互換的不同看法，在此種情況下用來證明喻四為[r]或[l]的同源詞正確性也可能大打折扣。其二，「同族語」或「同一個語言中」喻四同時對應^{*}-r-、^{*}-l-情形，或許能用「詞彙擴散」之觀點解釋。例如：假設上古漢語之來母在上古漢語為^{*}-r-，後來變成了^{*}-l-，此種現象在上古漢語的詞彙系統的某一點逐漸擴散，以至於所有的漢語方言，這樣的擴散現象或許因其他音變之干擾而未完成，因此造成了語言中有的喻四對應r，有的則對應l等不同的情況。反之，上古漢語來母的情況亦可以「詞彙擴散」來解釋。其三，在漢藏對應之同源詞中，每個詞所產生的年代不一。眾所皆知語音是不斷在改變的，在不同的年代喻四有不同的音變，在不同的音變情況下喻四對應^{*}-r-或是^{*}-l-就可能有不同的情況發生。反之，上古漢語的來母亦如是。其四，學者對於同源詞的認並標準不一，例如「羊」字，龔煌城認為跟藏文的glang牛、象對應，⁴⁹但鄭張尚芳確認為跟藏文的ra羊對應⁵⁰。其五，因r、l皆為舌尖流音，發音部位相同，發音方法相似，故有少數的例外對應情況存在。

第二. 從本文第三節中小結的照三系諧聲情況表與陸志韋廣韻五十一聲母在說文諧聲通轉次數統計表可發現：「舌根音⁵¹：以」諧聲 101 次；「以：以」諧聲 247 次。可知舌根音與喻四諧聲比率極高，尤其是見母字，是故筆者推測舌根音為喻四的上古來源之一，可以擬作^{*}K-l-（包含^{*}k-l-、^{*}k'-l-、^{*}g-l-），由於喻四與見母通轉次數最高，因此可以^{*}k-l-作為代表。同時部分與喻四通轉的照三系等母他們的上古音值可擬作^{*}klj-、^{*}khlj-、^{*}glj-，但亦不排除當中有^{*}kj-、^{*}khj-、^{*}gj-的可能。⁵²至於章母字帶l與否則是看它有無跟來、喻四、定、澄通諧。⁵³

第三，關於李方桂先生在《上古音研究》中曾經提及有少數的審母三等字也跟鼻音聲母諧聲，這類字示清鼻音在三等介音j前演變而來原故，鼻音失去較早，李先生擬音為^{*}hn+j->^{*}h'n's+j->'sj。據筆者考察陸志韋先生廣韻五十一聲母在說文諧聲通轉次數統計表⁵⁴發現，照系三等字與鼻音聲母（泥、娘、日、疑等母）諧聲次數共 40 次，占「鼻音：鼻音」通轉達 380 次⁵⁵的 10.5%。可知照三系上古來源除了前文中所說的「舌尖音」、「舌根音」，尚有部分來

⁴⁹龔煌城〈從漢藏語的比較看上古漢語若干聲母的擬測〉，《漢藏語研究論文集》，頁 43。

⁵⁰鄭張尚芳〈上古音構擬小議〉，頁 47。

⁵¹此處舌根音包含見母、溪母、疑母，亦含影母、曉母及匣母。其中「見母：以」相諧多達 43 次，比例將近所有舌根音與喻四諧聲的二分之一強。

⁵²丘彥遂《喻四的上古來源、聲值及其演變》，頁 72。

⁵³鄭張尚芳《上古音系》（上海：上海教育出版社，2003年12月第一版），頁124。

⁵⁴陸志韋《古音說略》，頁 255。

⁵⁵鼻音與鼻音通轉含：(1)「五：五」63 次 (2)「五：魚」47 次 (3)「魚：魚」75 次 (4)「五：而」21 次 (5)「五：奴」5 次 (5)「魚：而」2 次 (6)「魚：奴」1 次 (7)「而：而」85 次 (8)「而：女」16 次 (9)「而：奴」50 次 (10)「女：女」6 次 (11)「女：奴」9 次，總共 380 次。

自於「鼻音」成份，至於這個鼻音成份是學者們所說的鼻音前綴還是鼻冠音，則需要更深入與細緻的探討。

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Tests of Analytic Bias in Native Mandarin Speakers and Native Southern Min Speakers^{*}

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In this study, I did the experiment in two language groups. Groups 1 were the speakers whose first language is Mandarin and Group 2 were speakers whose first language is Southern Min. In the experiment, the subjects had to learn two artificial languages, HH (a vowel agrees with another vowel in height) such as [titi], and HV (a high vowel is followed by a voiced consonant, or a low vowel is followed by a voiceless consonant) such as [tidi]. My goal is twofold. The first goal is to figure out whether HH is learned better than HV due to typological asymmetry. The second goal is to find out whether language-specific phonology such as Mandarin and Southern Min help subjects to learn HH and HV. Mandarin generally has no voicing contrast, but Southern Min has voicing contrast. Both languages have no vowel harmony. The findings showed that Group 1 and 2 learned HH better than HV. However, Group 2 did not learn HV better than Group 1 did. Two implications could be inferred. First, L1 phonology plays no role in learning HH and HV, because Group 2 did not learn HV better than Group 1 did. Second, both groups learned HH better than HV.

1. Introduction

Analytic bias and channel bias have been considered as two factors giving rise to typological differences in phonology (Moreton 2008, in press). The former is systematic predispositions like Universal Grammar, which help people to learn some patterns but restrain people from learning other patterns (Steriade 2001 and Wilson 2003). The latter is phonetically systematic errors, which occur when phonological representations are transmitted between speakers and hearers, caused by phonetic interactions, which act as precursors for phonologization (Ohala 1993).

Moreton (2008) ran the experiment to figure out which bias can affect typology: analytic bias, channel bias or both. The experiment was to test native English speakers to learn two patterns, height-height and voice-voice, both of which were designed in two artificial languages. The height-height patterns mean that a vowel agrees with

^{*} I would like to thank Professor James Myers for suggestions and comments. Thanks also to Professor Elliott Moreton for clarifying his experiment design and his helpful suggestions. None of them should be responsible for defects. I take responsibility for errors.

another vowel in height such as [piki] or [piku]. The height-voice patterns mean that a high vowel is followed by a voiced consonant such as [pigo], or a non-high vowel is followed by a voiceless consonant such as [poko]. The result showed that native English speakers learned the height-height patterns better than the height-voice patterns and this result was consistent with the fact that the height-height patterns are typologically more frequent than the height-voice patterns. The claim for typology frequency difference for these two patterns was confirmed by Moreton (2008). He tested eighteen language families and the height-height patterns outnumbered the height-voice patterns by fifteen language families to three language families.

The typological asymmetry for the height-height and height-voice patterns can result from channel bias or analytic bias. If the phonetic precursor of height-height is larger than the precursor of height-voice, then channel bias could be the cause. This hypothesis follows Ohala (1994), who claims that the more the precursor is, the more chances occur for phonologization, and therefore the more frequent the phonological pattern is. However, Moreton surveyed 7 studies, and the precursors of the height-height and height-voice patterns were calculated by measuring the vowel F1. The results showed that the vowel F1 for the height-height patterns was not larger than the height-voice patterns. That is, the phonetic precursor for the height-height patterns was not larger than the phonetic precursor for the height-voice patterns. Hence, the typological asymmetry for the height-height and height-voice patterns were not due to channel bias, because channel bias such as phonetic precursor could not assist native English speakers in learning the height-height patterns better than the height-voice patterns.

In this study, I followed the method of the experiment of Moreton (2008) and ran this experiment in two groups. Group 1 is the speakers whose first languages are Mandarin and Group 2 is the speakers whose first languages are Southern Min. The reason why I ran this experiment is that because Moreton (2008) only tested native English speakers, and he claimed that English phonology, which is irrelevant to typology, could not explain his experimental results; however, I doubt his claim. It is also possible that the height-height patterns will not be learned better than the height-voice patterns by different language speakers. That is, if the height-height patterns are not learned better than the height-voice patterns or there is no significant difference for learning the height-height and height-voice patterns, then Moreton's results are only specific to English phonology, rather than language-universal.

In order to figure out whether language-specific phonology affects height-height vs. height-voice learning, I preferred to run this experiment in two language groups, one is Mandarin and the other is Southern Min. Mandarin generally has no voicing contrast except for [ʃ] and [z] while Southern Min has voicing contrast, and both languages have no vowel harmony. If language-specific phonology really plays a role in learning the height-height and height-voice patterns, then native Southern Min speakers are supposed to learn at least the height-voice patterns better than native Mandarin speakers. The reason is that Southern Min has voicing contrast, so it is easier for them to notice the relationship between vowel height and voicing in the height-voice patterns. Furthermore, both languages have no vowel harmony, so it is also impossible for the phonologies of Mandarin and of Southern Min to help both native speakers to learn the height-height patterns better.

In terms of the above assumptions, there are two goals in my study. The first goal is to find out whether both native Southern Min speakers and native Mandarin speakers

learn the height-height patterns better than the height-voice patterns. If not, the results can suggest that the results of Moreton (2008) are specific to English phonology instead of language-universal. If yes, then the second goal is to find out whether L1 phonology results play a role. If native Southern Min speakers learn the height-voice patterns better than native Mandarin speakers do. Then the results suggest Southern Min phonology help the subjects to learn the height-voice patterns. However, if native Southern Min speakers do not learn the height-voice patterns better than native Mandarin speakers do, then it implies that L1 phonology has no help for native Southern Min speakers to learn the height-voice patterns. Besides, L1 phonology does not affect both languages to learn the height-height patterns better, because both languages have no vowel harmony. If the experiment rules out L1 phonology as a factor, then I can suggest that this learning asymmetry for the height-height and height-voice patterns is language-universal. In that case, analytic bias can be the only factor to lead to the asymmetry for the height-height and height-voice patterns because the channel bias such as phonetic precursors is ruled out in terms of Moreton (2008).

The paper is organized as follows. Section 2 presents Group 1's (native Mandarin speakers) results and discussion. Section 3 presents Group 2's (native Southern Min speakers) results and discussion. Section 4 concludes this paper.

2. Group 1: native Mandarin speakers

The height-height (HH) and height-voice (HV) patterns were designed in two artificial languages, and this experiment used the Artificial Grammar (AG) paradigm (Reber 1989) to compare learning of HH and HV. Wilson (2003) said a typical AG experiment includes two phases. One is the study phase, and the other is the test phase. In the study phase, subjects are exposed to stimuli which have been generated with a grammar. Then in the test phase, subjects are tested on their ability to distinguish novel stimuli (not occur in the study phase), which conform to the same grammar of the study phase from the stimuli, which does not obey the same grammar of the study phase. Besides, the AG paradigm does not have explicit negative evidence (i.e., feedback) when subjects do not choose the correct stimuli in the test phase. Hence, AG paradigm is like natural first-language acquisition.

In this study, the experiment had two language groups, native Mandarin speakers and native Southern Min speakers. In this section, I introduce Group 1, native Mandarin speakers about the method, results and discussion as follows.

2.1. Method

2.1.1. Design

The 'words' used in two artificial 'languages' had phonological structure C1V1C2V2. C1 and C2 were selected from the set /t d k g/, and V1 and V2 from the set /i u æ ɔ/. Within these limited sets, 256 'words' were possible. A word was HH-conforming if V1 and V2 were both phonologically high (/i u/) or phonologically non-high (/æ ɔ/). A word was HV-conforming if V1 and C2 were high and voiced, or non-high and voiceless. Therefore, there were 64 'words' that were both HH- and HV-conforming, 64 that were HH- but not HV-conforming, 64 that were HV- but not HH-conforming and 64 that were neither HH- nor HV-conforming. Half of the subjects were be tested the HH artificial language, and another half of subjects were be tested the HV artificial language.

In the HH artificial language, for each subject, 32 HH-conforming ‘words’ was randomly chosen for use in a study phase, which allowed subjects to be familiar with this artificial language. These 32 ‘words’ were subject to the constraint designed by Moreton (2008:99) (See table 1 below): (a) vowels agree in height and $\{V1 \neq V2\}$, (b) vowels agree in height and $\{V1 = V2\}$, (c) vowels disagree in height and $\{V1 \neq V2\}$, and (d) vowels disagree in height and $\{V1 = V2\}$. In the HV artificial language, an analogous procedure was followed, 32 HV-conforming ‘words’ were chosen and conformed to the constraint: (a) V1 high iff C2 voiced and $\{V1 \neq V2\}$, (b) V1 high iff C2 voiced and $\{V1 = V2\}$, (c) V1 high iff C2 voiceless and $\{V1 \neq V2\}$, and (d) V1 high iff C2 voiceless and $\{V1 = V2\}$ (See table 1). Note that the number (8 or 16) listed in the table 1 means that how many stimuli were put in each cell. The reason why stimuli were designed in this way is that if the study phase were designed as table 1, which had two factors, $\{V1 = V2\}$ and $\{V1 \neq V2\}$, then it is easier to see whether “Same-Vowel” affects the results. If not, then the results show that the subjects really learn the height-height and height-voice patterns, rather than depending on the patterns, which have the same vowels.

In the test phase, stimuli also obey the selection restrictions of the table 1. Another 32 HH-conforming ‘words’ as positive test items, which did not occur in the study phase were chosen in the HH artificial language, so did the HV artificial language. Finally, 64 ‘words’ which were neither HH- nor HV-conforming were randomly selected for the HH and HV artificial languages as negative test items. That is, the HH artificial language had 32 negative test items in its test phase, and the HV artificial language also had 32 negative test items.

Table 1

Same-Vowel	Order	HV Artificial Language		HH Artificial Language	
		HH-non-conformity		HV-non-conformity	
		(vowels agree in height)	(vowels disagree in height)	(V1 high iff C2 voiced)	(V1 high iff C2 voiceless)
$\{V1 \neq V2\}$	(1st half)	[tidu]	[tidæ]	[tidu]	[titu]
	(2nd half)	(N=8)	(N=16)	(N=8)	(N=8)
$\{V1 = V2\}$	(1st half)	[tidi]	<i>impossible</i>	[tidi]	[titi]
	(2nd half)	(N=8)		(N=8)	(N=8)

Note that Moreton (2008) tested each participant to learn both artificial languages, HV and the HH. However, in my experiment, I separated the experiment into two small experiments, HH and HV. In that case, participants only learned one artificial language, either HH or HV, because learning two artificial languages were too time-consuming and tiring for a subject.

2.1.2. Subjects

Twenty participants were recruited from the students at the National Chiayi University, and National Cheng Kung University in Taiwan. All reported Mandarin as their first language and normal hearing, and all of them did not major in English or

other foreign languages. All participants had early childhood dialect exposure (HV Artificial Language: Southern Min 8, and Hakka 2; HH Artificial Language: Southern Min 8, and Hakka 2). All had studied a foreign language (HV Artificial Language: English 10 and Japanese 1; HH Artificial Language: English 10 and Japanese 1). Ten participants were tested in the HV artificial language, and another ten participants were tested in the HH artificial language. The average age for the subjects of the HV artificial language was 25.4 (SD= 1.8) and the average age for the subjects of the HH artificial language was 24.8 (SD=2.0). Participants were rewarded with chocolate for the experiment, which lasted about twenty minutes.

2.1.3. Stimuli

I adopted Moreton (2008)'s stimuli, which were synthesized using the MBROLA diphone concatenative synthesizer (Dutoit et al. 1996), voice is 'US 3' (a male speaker of American English), and each 'word' was synthesized respectively. The duration of the consonant is 100 ms, the duration for the vowel is 225 ms, the duration for silence is 150 ms, and silence occurred initially and finally. Hence, the total duration for C1V1C2V2 is 950 ms (150 + 100 + 225 +100 + 225 +150). Furthermore, in order not to disturb the natural intensity difference between high and low vowels, no amplitude normalization was applied. In that case, every subject heard each stimulus with the same voice quality and duration, both of which might potentially affect the empirical results.

2.1.4. Procedure

The experiment was run by E-Prime (Schneider et al. 2002). The experiment had two parts. The first part was a study phase and the second part was a test phase. For the study phase, there were totally 32 words in this phase. Native Mandarin speakers heard a word, and pronounced it back once. The second part was a test phase, which was to test how well they could recognize 'words'. The test phase has 32 positive stimuli, which were different from stimuli in the study phase, and 32 negative stimuli. The computer said two words sequentially. One is a word of the artificial language, and the other is not. Subjects would choose '1' if it was the first word, '2' if it was the second word. The words, which belong to the artificial language in the test phase, are not the same as the words in the study phase. Half of the positive stimuli were designed to be the first word, and another half of the positive stimuli were designed to be the second word. E-Prime randomly chose these positive stimuli, so the subjects could not be able to detect the order.

2.2. Results and discussion

The result for the HV artificial language and the HH artificial language had two parts respectively. One was the raw percentage of correct response for total subject responses for HV and HH. The other was the raw percentage of correct response for four types of subject responses (like Table 1). Correct response means that the subject chooses stimuli conforming to the artificial language, rather than stimuli not conforming to the artificial language.

2.2.1 Correct response for total subject responses

The raw percentage of correct response for total subject responses and their averages for the HV artificial language and the HH artificial language are given by table 2. Mandarin speakers really learned HH better than HV (73.3% vs. 53.1%).

Table 2

	HV Artificial Language: Mandarin	HH Artificial Language: Mandarin
Average	49.1	73.3

2.2.2 Correct response for four types of subject responses

The raw percentage of correct response for four types of subject responses and their averages for the HV artificial language and HH artificial language are given by table 3 and table 4. The averages indicated that native Mandarin speakers learned HH better than HV.

Table 3

	HV Artificial Language: Mandarin			
	vowels agree in height and (V1 ≠ V2)	vowels agree in height and (V1 = V2)	vowels disagree in height and (V1 ≠ V2)	vowels disagree in height and (V1 = V2)
Average	55.0	40.0	51.9	<i>impossible</i>

Table 4

	HH Artificial Language: Mandarin			
	V1 high iff C2 voiced and (V1 ≠ V2)	V1 high iff C2 voiced and (V1 = V2)	V1 high iff C2 voiceless and (V1 ≠ V2)	V1 high iff C2 voiceless and (V1 = V2)
Average	68.8	75.0	72.5	73.8

3. Group 2: native southern Min speakers

My first goal is to find whether the results for learning the height-height and height-voice patterns are consistent with Moreton (2008). In Group 1, the results for testing native Mandarin speakers showed that the HH Artificial language was learned better than the HV artificial language.

In section 3, I want to find out whether native Southern Min speakers learn the height-height patterns better than the height-voice patterns. If yes, it implies that the learning asymmetry was not specific to English phonology.

In addition to the first goal, the second goal second goal is to find out whether

Southern Min phonology such as voicing helps native Southern Min speakers to learn the height-voice patterns better than native Mandarin speakers.

3.1. Method

Twenty participants are recruited from the community at South Region Water Resources Office, Pingtung, Taiwan. The experiment followed the same procedure as Group 1 in all respects. All reported Southern Min as their first language and normal hearing, and all of them did not major in English or other foreign languages. All had early childhood language exposure around age seven (HV Artificial Language: Mandarin 10; HH Artificial Language: Mandarin 10 and Hakka 2) and all had studied a foreign languages (HV Artificial Language: English 9 and Japanese 2; HH Artificial Language: English 8 and Japanese 2). Ten participants were tested the HV artificial language, and another ten participants were tested the HH artificial language. The average age for the subjects of the HV artificial language was 42.8 (SD= 5.1) and the average age for the subjects of the HH artificial language was 41.3 (SD= 5.7).

3.2 Results and discussion

The result for the HV artificial language and the HH artificial language also had two parts respectively as Group 1 did. The first part was the raw percentage of correct response for total subject responses for HV and HH, and the second part was the raw percentage of correct response for four types of subject responses in HV and HH.

3.2.1 Correct response for total subject responses

The averages for the HH and HV artificial languages showed that native Southern Min speakers really learned HH better than HV (66.4% vs. 43.8%). Consider table 5 as below.

Table 5

	HV Artificial Language: Southern Min	HH Artificial Language: Southern Min
Average	45.0	66.4

3.2.2 Correct response for four types of subject responses

The averages for the HV artificial language and the HH artificial language respectively demonstrated that native Southern Min speakers learned HH better than HV. Consider table 6 and table 7 as below.

Table 6

	HV Artificial Language: Southern Min			
	vowels agree in height and (V1 ≠ V2)	vowels agree in height and (V1 = V2)	vowels disagree in height and (V1 ≠ V2)	vowels disagree in height and (V1 = V2)
Average	47.5	36.3	48.8	<i>impossible</i>

Table 7

	HH Artificial Language: Southern Min			
	V1 high iff C2 voiced and (V1 \neq V2)	V1 high iff C2 voiced and (V1 = V2)	V1 high iff C2 voiceless and (V1 \neq V2)	V1 high iff C2 voiceless and (V1 = V2)
Average	61.3	52.5	63.75	66.3

4. General discussion

In this section, I give the summary of the main findings of the experiment for two groups and try to rule out two possibilities other than analytic bias, which also lead to the leaning asymmetry for height-height and height-voice patterns in terms of the empirical results.

4.1. Summary of empirical results

In the Group 1, ten native Mandarin speakers and another ten native Mandarin speakers were tested the HV and HH artificial languages respectively. The averages toward the raw percentage of correct response for total subject responses and the one for four types of subject responses corresponded to Moreton's result, which showed that the height-height patterns were learned better than the height-voice patterns.

In Group 2, ten native Southern Min speakers and another ten native Southern Min speakers were tested the HV artificial language and the HH artificial language individually. The average toward the raw percentage of correct response for total subject responses and the average for four types of subject responses were also consistent with Moreton's result.

Above all, native Southern Min speakers did not learn the height-voice patterns better than the native Mandarin speakers did, which suggested that voicing contrast did not affect the results.

4.2. Possibilities other than analytic bias

Two possible reasons other than analytic bias can explain why Group 1 and Group 2 learned height-height patterns better than height-voice patterns.

First, the subjects in the HH artificial language heard only HH-conforming positive test items, but the subjects in the HV artificial language heard HH-conforming and HH-non-conforming positive test items. In that case, the better performance in the HH artificial language might have no relations with learning in the experiment; instead, this result was due to a pre-existing preference for HH-conforming test items. If so, subjects in the HV artificial language would be likely to choose the HH-conforming positive test items. That is, the average for both (vowels agree in height and {V1 \neq V2}) (55.0 %) and (vowels agree in height and {V1 = V2}) (40.0) would be higher than that of (vowels disagree in height and {V1 \neq V2}) (51.9%). However, in the Group 1 and Group 2, the average for HH-non-conforming positive test items (vowels disagree in height and {V1 \neq V2}) was not the least. Consider table 8 and 9.

Table 8: correct response for four types of subject responses

HV Artificial Language: Mandarin				
	vowels agree in height and (V1 ≠ V2)	vowels agree in height and (V1 = V2)	vowels disagree in height and (V1 ≠ V2)	vowels disagree in height and (V1 = V2)
Average	55.0	40.0	51.9	<i>impossible</i>

Table 9: correct response for four types of subject responses

HV Artificial Language: Southern Min				
	vowels agree in height and (V1 ≠ V2)	vowels agree in height and (V1 = V2)	vowels disagree in height and (V1 ≠ V2)	vowels disagree in height and (V1 = V2)
Average	47.5	36.3	48.8	<i>impossible</i>

Second, in half of the study phase and positive test items in the HH artificial language, the stimuli, which had the identical vowels, occurred 50% (e.g. in the [titi] and [tidi] cells in Table 1). In the HV artificial language, only 25% of the stimuli that had the same vowel occurred (e.g. the [tidi] cell). Maybe the subjects in the HH artificial language did not learn to recognize stimuli, which agreed in height, but only learned to recognize stimuli, which had identical vowels. By the same logic, the better performance in the HH artificial language might have nothing to do with learning in the experiment; instead, this result was due to a pre-existing preference for repeated vowels. If so, the subjects in the HH artificial language would be likely to choose positive items whose vowels are the same. In Experiment 1, the average for items whose vowels are identical (V1 high iff C2 voiced and (V1 = V2) & V1 high iff C2 voiceless and (V1 = V2)) was really higher than that of items whose vowels are different (V1 high iff C2 voiced and (V1 ≠ V2) & V1 high iff C2 voiceless and (V1 ≠ V2)). Nevertheless, in Experiment 2, the average for items whose vowels are identical was not always higher than the average whose vowels are different. Consider table 10 and table 11.

Table 10: correct response for four types of subject responses

HH Artificial Language: Mandarin				
	V1 high iff C2 voiced and (V1 ≠ V2)	V1 high iff C2 voiced and (V1 = V2)	V1 high iff C2 voiceless and (V1 ≠ V2)	V1 high iff C2 voiceless and (V1 = V2)
Average	68.8	75.0	72.5	73.8

Table 11: correct response for four types of subject responses

	HH Artificial Language: Southern Min			
	V1 high iff C2 voiced and (V1 ≠ V2)	V1 high iff C2 voiced and (V1 = V2)	V1 high iff C2 voiceless and (V1 ≠ V2)	V1 high iff C2 voiceless and (V1 = V2)
Average	61.3	52.5	63.75	66.3

4.3. Theoretical implications

According to the results of two experiments, two implications are presented. First, in terms of my assumptions mentioned in the introduction, if language-specific factor such as voicing contrast plays a role, then native Southern Min speakers learn at least height-voice patterns better than native Mandarin speakers. However, the results showed that native Southern Min speakers learned height-voice pattern worse than native Mandarin speakers (see table 12-14). In that case, it suggested that the language-specific phonology such as voicing in Southern Min did not help native Southern Min speakers to learn the height-voice patterns better than native Mandarin speakers. Besides, if language-specific phonology such as vowel harmony plays role, then I expected that native Mandarin and native Southern Min speakers native do not learn the height-height patterns better, because there is no vowel harmony in both languages. However, my results demonstrated that both native Southern Min and native Mandarin speakers learned the height-height patterns better than the height-height patterns. In that case, analytic bias such as Universal Grammar can explain the learning asymmetry for the height-height and height-voice patterns. The channel bias such as the phonetic precursor can not explain my results, because according to Moretion (2008) as I mentioned in the introduction, the phonetic precursor for the height-height patterns is not larger than the phonetic precursor for the height-voice patterns.

Table 12: correct response for total subject responses

	HV Artificial Language: Mandarin	HV Artificial Language: Southern Min
Average	49.1	45.0

Table 13: correct response for four types of subject responses

	HV Artificial Language: Mandarin			
	vowels agree in height and (V1 ≠ V2)	vowels agree in height and (V1 = V2)	vowels disagree in height and (V1 ≠ V2)	vowels disagree in height and (V1 = V2)
Average	55.0	40.0	51.9	<i>impossible</i>

Lin: ANALYTIC BIAS

Table 14: correct response for four types of subject responses

	HV Artificial Language: Southern Min			
	vowels agree in height and (V1 ≠ V2)	vowels agree in height and (V1 = V2)	vowels disagree in height and (V1 ≠ V2)	vowels disagree in height and (V1 = V2)
Average	47.5	36.3	48.8	<i>impossible</i>

Second, analytic bias prefers phonological (structural) simplicity, which means that it is easier to learn the patterns, which has one place feature, than the patterns, which has more than one place feature. That is, if the patterns have more than one place feature, then the patterns are complex (Gordon 2004). In the previous literature, linguists observed that many languages consider certain syllable types to be heavier than others (Allen 1973, and Levin 1985). Thus, Gordon (2004) used syllable weight to clarify what phonological simplicity is. He claimed that many languages regard all syllables having long vowels as heavy. Some languages regard CVV and CVC as heavy, because both of them have branching rhymes (nucleus + coda), which are the only legal positions to get moras (Hyman 1985, and Hayes 1989). Some languages regard all syllables having a certain vowel quality like treating low vowels as heavy. Nevertheless, there are no attested languages which regard all syllables having long vowels and are closed by a lateral as heavy, because no single feature can include long vowels and the syllables closed by a lateral. That is, no place feature can have [+syllabic] and [+lateral] at the same time. The phonological simplicity can explain why the height-height patterns are learned height-voice patterns. The reason is that the height-height patterns involve one place feature [height], but the height-voice patterns involve two place features [height] and [voice]. That is, the height-height patterns are phonological simple, but the height-voice patterns are phonological complex.

4.4. Unsolved problems

First, if L1 phonology plays no role, then the results of Group 1 and of Group 2 should be equal. However, native Mandarin speakers learned both the height-height and height-voice patterns better than native Southern Min speakers did. This suggested that maybe the speakers who I chose in the Group 1 and Group 2 lead to these learning difference.

Second, in the Group 1 and Group 2, both subjects speak Mandarin. Although in the Group 2, I tried to choose the native Southern Min speakers who started to learn Mandarin around 7 years old, I could not avoid the possibility for Mandarin learning experiences affect the results. The possible solution is that to broadcast Mandarin talk shows before the subjects in the Group 1 run the experiment, and that to broadcast Southern Min talk shows before the subjects in the Group 2 run the experiment.

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漢語鼻尾小稱與詞根的互動

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鼻音是漢語方言中普遍容許的輔音韻尾，在具有鼻音小稱的漢語方言中，小稱音段併入詞根音節的現象極為普遍；藉由文獻材料與田野調查收集的語料，本文主張鼻尾小稱與詞根音節所產生的變化，主要是由三項限制(constraints)的互動所致，即方言音節結構保留、小稱音義對應性、韻尾響度優先原則等。

1. 前言

漢語鼻尾小稱詞的散佈相當廣，在徽語、吳語、粵語、閩語、與晉語都可見。鼻尾小稱的來源一般為帶有鼻音特徵的小稱詞，從完整音節逐步弱化成僅剩鼻音韻尾的語音形式；有來自原鼻音聲母特徵的日母字兒(徽語、吳語、粵語)，也有來自古陽聲韻的囡(閩語)。與北京話中的捲舌兒尾小稱不同，鼻輔音在絕大多數漢語方言都是常見韻尾，鼻音小稱詞在語音弱化後，都會進入詞根成為詞根音節的韻尾；也因此，對原有詞根音段造成一定的衝擊，產生一連串相關的音韻調整。

本文將探討漢語方言鼻尾小稱，進入詞根音節後所產生的互動與調整變化；分析的語言材料包括，整理自文獻的吳語、粵語、徽語，以及由作者田野調查所得，包括閩語尤溪與晉語翼城方言。一方面從多方言的比較，看漢語鼻音小稱進入詞根音節後可能的變化類型；另一方面，由於我們收集的尤溪方言與翼城方言，他們的鼻音小稱併入詞根音節都是進行中的變化，所以可以藉由不同年齡發音人的語音變異現象，捕捉實際演變歷程。

2. 文獻中的鼻尾小稱

本節主要是整理自文獻的材料探討，包括徽語、粵語與吳語的鼻尾小稱材料介紹，並就單一方言進行初步分析討論，跨方言的類型比較分析則會在第四小節呈現。

2.1. 徽語

有關徽語鼻音小稱的相關音韻演變，依據趙日新(1999)徽語鼻音小稱可分為四類：1) 自成音節的 n, ni (旌德、績溪、建德、遂安，旌德)：燕兒 i²¹³ ni, 建德：蝦兒 ho⁵³ n²¹³；2) 鼻韻尾小稱 -ŋ, 加綴後詞根音節元音拉長(岩寺)：瓢兒 [p'io:n⁵⁵], 篾兒 [k'ua:n³¹³], 雞兒 [tɕi:n²²]; 3) 鼻韻尾小稱，加綴後詞根音節長度不變，詞根原有之 [i, u, ɯ] 韻尾與鼻音韻尾皆刪除，主要分布在屯溪、休寧、黟縣、祁門、壽昌；4) 鼻化小稱(婺源)：僅個別詞例。

表 1. 徽語鼻音小稱 (整理自趙日新 1999)

小稱形式	(1) 自成音節	(2) 鼻韻尾(長音節)	(3) 鼻韻尾(正常音節)	(4) 鼻化
	ŋ, ni	-ŋ	-n	∇
方言	旌德、績溪、建德、遂安，旌德	岩寺	屯溪、休寧、黟縣、祁門、壽昌	婺源

本文主要觀察第(3)類的小稱加綴現象，正常音節長度中，小稱韻尾與原有音節韻尾的互動。徽語第(3)類的小稱加綴的音韻調整部份，主要是讓小稱鼻尾取代原有詞根韻尾，以維持原有音節結構特徵，以黟縣方言為例。黟縣方言小稱[-n]加綴後的變化，依據趙日新(1999)的說明，依韻母結構不同，可分為三大類變化。

表 2. 徽語黟縣小稱加綴變化(整理自趙日新 1999)

詞根韻母	單/非高元音 <small>結尾</small>	高元音韻尾	鼻尾韻
		ɿ, u, a, ua, oɐ, ʏɐ, iɛɐ, yɛɐ, iɛ, uɛ, yɛ	i, u, ɯ (au, aɯ, ɛi, iɛi)
加綴方式	直接加綴	韻母縮併\取代	鼻尾丟\央元音
e.g.	ɿŋ, aŋ, ʏɐŋ, iɛŋ	un, əŋ, in	əŋ, uəŋ
	鎮 tsɿ → tsɿŋ, 坑 k'a → k'aŋ, 帽 mɯɐ → mɯɐŋ 線 si:ɛ → sien	包 pau → puŋ 頭 t'au → t'əŋ 瓶 pei → piŋ 引 iɛi → in	龍 laŋ → ləŋ 滾 kuəŋ → kuəŋ

如果依照高元音韻尾的加綴變化來看，不是單純的取代原詞根韻尾特徵，或可說，除了[ɯ]韻尾，最後都是高元音韻尾保留在小稱音節中。鼻音韻尾則是直接取代，同時主元音也改為央元音；黟縣方言音系中，一般音節只有舌根鼻音韻尾，[-n]韻尾都是小稱加綴而來。

伍巍、王媛媛(2006)的〈徽州方言的小稱研究〉，同樣提到黟縣方言鼻韻尾小稱，在記音材料上與趙日新(1999)有些差異；也許是不同的發音人變體。文中也提到黟縣方言音系中沒有舌尖鼻韻尾，兒化音節末尾均加帶-n。該文將小

稱變化依聲調分成三類，但本文只處理韻母變化，所以把伍巍與王媛媛的記錄，依韻母變化重新整理。

表 3. 徽語黟縣小稱加綴變化(整理自伍巍、王媛媛 2006)

詞根韻母	單元音	非高+非高	高+非高	高元音韻尾	鼻韻尾
	ɿ, u, (a)	ɔ:ɐ, ə:ɐ, e:ɐ	u:ɐ, y:ɐ, i:ɐ, ie	i, u, ɯ	aŋ
方式	直接加綴	韻母縮併	央元音-n	韻母縮併/取代	央元音-n
e.g.	ɿn, un,	ɔn, ʏn, en	-en, in	ən, in, en, yn	ʏn
	孀 sɿ → sɿn 兔 t'u → t'un	盒 xɔ:ɐ → xɔn 杯 pə:ɐ → pɿn 帽 mə:ɐ → men 餅 pe:ɐ → pen	花 xu:ɐ → xuən 圈 tɕ'y:ɐ → tɕ'yen 碟 t'i:ɐ → t'ien 琴 tɕie → tɕin	牛 niɑɯ → niən 蓋 kuɑɯ → kuən 凳 tei → tin 橘 tɕyei → tɕyn 几 tɕiei → tɕin 錘 tɕ'ɣɯɯ → tɕ'yen 鳥 niu → tyn	籠 laŋ → lɿn

表 3 資料顯示[ɐ]在黟縣方言是一個弱元音，本身特性是低央元音，與其他元音共現於同一音節時，都是由其他元音當音節核心(拉長)。趙日新(1999)提供的[ɐ]例僅有一個，保留到加綴後小稱音節，如表(2)。在表(3)資料中，與非高元音組合的[ɐ]都是直接被小稱鼻音尾取代，與高元音組合的[ɐ]則轉為[e]。

祁門方言的-n 尾小稱加綴相對簡化，趙日新與伍巍等的分析都是直接將鼻尾加到詞根音節，原有聲韻調不變。就他們所舉的祁門材料中，沒有以高元音當韻尾的音節，古陽聲韻也多為鼻化韻，因此不會有韻尾競爭的問題。錢惠英(1991)提到屯溪方言小稱特色，小稱音變形式是在基本韻母後面加上[-n]尾，同時聲調發生變化，多為 24，少數為 55 調。屯溪共 29 個基本韻母，[ue, ye, au, iau, əu]沒有小稱加綴形式，[an, ian, yan, in]加綴形式與詞根形式不分，聲調有變。其他 20 個韻母基本上都是直接原詞根韻+[-n]，僅少數出現韻母調節現象。[ue, ε]韻母+[-n]後，主元音[a~ε]之間變換，如餅[pɛn ~ pan]，棍[kuən~kuan]；但[iɛ, ye]+[-n]後，元音不變。這部分可能是因為閉音節中，元音區辨度減弱，所以低元音與中低元音出現一定程度的合流。[iu]+[-n]後，大多說為[in]韻，慢讀可以為[iun]，所以鳥有二讀，[liun~lin]。由於屯溪方言其他 20 個韻母都是單元音或上升複合音(rising diphthong)，所以，加綴方式與祁門相似，差別在於帶有小稱聲調變化。

總體而言，徽語鼻尾小稱與詞根音節的互動變化，以黟縣方言最為多樣化，與其他兩點的差異為詞根元音出現部分變異。這些徽語方言都沒有阻塞音韻尾，因此在韻尾的競爭上，若詞根是鼻尾，則直接取代，若詞根為元音韻尾

則有兩種可能，一個是直接被小稱韻尾取代，另一個是先與詞根主元音融合再納入鼻尾。

2.1. 粵語

粵語鼻音小稱主要出現在茂名市，相關文獻可見於葉國泉、唐志東(1982)與邵慧君(2005)。葉國泉、唐志東(1982)介紹茂名市信宜縣小稱變音特徵包括調值與韻尾變化；調值皆為特高而上揚，韻尾變化則因詞根音節不同而有別。若詞根音節是單韻母 [i, y, ɛ, œ, a, ɔ, u] 直接加上 -n；若是塞音韻尾 -p, -t, -k，則小稱韻尾加綴後，取代原韻尾，變成相應的 /m, n, ŋ/；若詞根音節是響音韻尾 /i, u, m, n, ŋ/，則無變化。

邵慧君(2005)提到茂名市(轄五縣：茂名、高州、信宜、電白、化州)的小稱使用特徵，獨立音節兒尾是茂名市內各區普遍存在的詞彙。此外，信宜縣主要採取鼻韻尾加綴形式表小稱，使用兒尾時，實詞意味濃(可指動物後代)。化州則以獨立音節兒尾為主，老派讀音 [ni]，新派讀音 [ŋ]。茂名、高州兩地的小稱形式兼具兩者，同一詞既可加兒尾，也可變音；電白則以小稱變調為主。整個看來，粵語鼻韻尾小稱與詞根音節互動所產生的變化，主要為小稱鼻尾取代原音節韻尾。下表介紹信宜小稱加綴的特色，邵慧君說明信宜小稱調，比陰上 35 更高，起調介於 4~5 之間，終調超出 5，原文以斜線圖示，本文暫以數字 46 表示。

表 4. 信宜小稱加綴現象

單元音韻	高元音韻尾	鼻音韻尾	塞音韻尾
聲調改變+鼻尾	聲調改變	聲調改變	聲調改變+同部位鼻尾
試 $\text{ʃi}^{33} \rightarrow \text{ʃin}^{46}$ 豬 $\text{tʃy}^{53} \rightarrow \text{tʃyn}^{46}$ 車 $\text{tʃɛ}^{53} \rightarrow \text{tʃɛn}^{46}$ 坐 $\text{tʃœ}^{13} \rightarrow \text{tʃœn}^{46}$ 架 $\text{ka}^{33} \rightarrow \text{kan}^{46}$ 多 $\text{tɔ}^{53} \rightarrow \text{ton}^{46}$ 姑 $\text{ku}^{53} \rightarrow \text{kun}^{46}$	頭 $\text{t'eu}^{13} \rightarrow \text{t'eu}^{46}$ 杯 $\text{pui}^{53} \rightarrow \text{pui}^{46}$	深 $\text{ʃem}^{53} \rightarrow \text{ʃem}^{46}$ 片 $\text{p'ien}^{33} \rightarrow \text{p'ien}^{46}$	鴨 $\text{ap}^3 \rightarrow \text{am}^{35}$ 闊 $\text{fut}^3 \rightarrow \text{fun}^{55}$ 腳 $\text{kiak}^3 \rightarrow \text{kiaŋ}^{35}$

邵慧君(1997)的〈吳語、粵語小稱變音與兒尾〉，提到粵語小稱變音與兒尾並存的方言，主要在粵西、桂南一帶，包括玉林、容縣(廣西)、信宜、化州、高州(廣東)。下表列出玉林話的材料。

表 5. 玉林話的小稱變音(粵語勾漏片，整理自梁忠東 2002)

元音結尾	鼻音結尾	塞音結尾
聲調改變	聲調改變	聲調改變+同部位鼻音

Liu: 鼻尾小稱

羊 ja ³² → ja ³⁵	燈 taŋ ⁵⁴ → taŋ ⁵⁵	竹 tɕok ⁵ → tɕoŋ ⁵⁵
手 ɕau ³³	嶺 lɛŋ ²³ → lɛŋ ³⁵	木 mok ² → moŋ ³⁵
→ ɕau ³⁵	担 tɔn ⁵² → tɔn ⁵⁵	鴨 ɔp ³ → ɔm ³⁵
雞 kai ⁵⁴ → kai ⁵⁵	件 kin ²³ → kin ³⁵	汁 tɕap ⁵ → tɕam ⁵⁵
薯 ɕy ³² → ɕy ³⁵		鐵 t'it ⁵ → t'in ⁵⁵
姐 tɛ ³³ → tɛ ³⁵		髮 fət ³ → fən ³⁵

容縣的小稱變音現象，依照邵慧君(1997)的材料，與玉林話相似，僅塞音韻尾出現鼻音取代。若廣西容縣、玉林的小稱尾，與廣東茂林市同樣是[-n]的話，這地區的方言現象，一部分與其他方言的鼻尾小稱演變趨勢相似，阻塞音韻尾首先被取代。但元音結尾的韻母，都未出現鼻音韻尾併入詞根音節部分，則與其他鼻尾小稱方言表現不一致。一般說來，鼻尾小稱都會盡可能併入詞根音節，並保留鼻音特徵，除非有其他排斥因素，如不同韻尾競爭或音系區辨性要求等；當詞根為單元音結尾時，韻尾競爭的困擾不存在，一般也是率先納入鼻尾的音節，在我們觀察到的鼻尾小稱方言中，都是如此。但玉林話的元音結尾音節，小稱加綴後卻仍是呈現單純的口元音；因此，玉林小稱音是否源自鼻尾小稱，仍有待進一步確認。

邵慧君(1997)比較吳語與粵語的小稱變音與兒尾現象，認為粵西、桂南缺乏如吳語連續性的演變過程，吳語在各相近方言可找到單音節[ŋ]到[-n]尾的連續變化，但粵語則否，所以無法證明粵語小稱變音與兒尾有共同詞源。邵慧君(2005)針對廣東茂名市的研究，推翻自己之前的說法，認為隨著越來越多的材料挖掘，粵西的小稱變音可以與兒尾構成一個連續體，[ɲi] → [ŋ] → [-n]，因此，應有共同來源。

不過，如表 4 與表 5 所展現的小稱變音差異，信宜縣的小稱變音，一方面因為茂林市可以找到連續的變化體，另一方面，它在鼻尾加綴的行為表現上，與吳語等鼻尾小稱相似，所以與兒尾同一來源的可信度高。但是，就桂南粵語的材料，一方面鄰近方言仍未有連續變化材料浮現，另一方面，玉林與容縣都是單元音不能加鼻尾，與一般鼻尾小稱大不相同，同時，就玉林的材料來看，作者未提出小稱變音的底層形式以及當地兒尾形式，所以是否源自兒尾，或小稱原始形式是否為鼻尾，仍有待確認。

我們在台灣海陸客家話小稱尾使用變異中，可以看到從獨立小稱音節[i⁵⁵/ə⁵⁵]，到「詞根尾特徵覆蓋小稱音節，i弱讀」，更進一步到「詞根音節拉長¹」的連續變化體。在此一演變過程當中，詞根是元音或鼻音韻尾結尾的音節，都是直接將最末尾音段拉長；而詞根為塞音韻尾的音段，則須經歷濁化、擦音化

¹ 詞根同化小稱，見劉秀雪(2008)，海陸小稱詞綴的同化演變速率相當快，兩代之間就有差異。

等歷程才能達到拉長效果，因此鴨子[ap³]加綴後會呈現[apβ³¹⁵]。因此，若玉林的小稱變音現象，同樣只有塞音尾出現變化，雖然是鼻化，但也有可能是非鼻尾小稱所造成的拉長，以及後續變化效應等。²

在陳小燕(2006)的文章中，介紹廣西賀州本地話的兒尾，認為該方言的小稱詞[ni52]與兒[ni231]相同詞源，可用來指涉形體小、親暱、時間短暫等。同時作者引用了賈正(1996)的〈容州白話特點談〉，來佐證粵語小稱變韻與變調是屬於同一個加綴變化，因為容州白話的尾音[r]與奇特高揚調是同時出現。賈正(1996)的說法，似乎也可以用來佐證我們提出的，容縣(與玉林)方言的小稱變音，可能不是來自鼻尾形式的小稱。

容州白話指的是容縣通行的廣東粵語，俗稱白話。賈正(1996)說容州白話裡，有一個特殊的尾音[r]，出現在所有詞或詞組的最後一個字的後面；「…讀時舌根稍微向上隆起，與普通話的兒不一樣，不是舌尖頂到上顎，更沒有發出明顯的兒的聲音。」針對入聲字+[r]，賈正說由於發音使力的作用，使入聲字的塞音韻尾變成鼻音韻尾，因此，凡是有入聲韻母的字，都變成帶鼻音，如「鴨 ab →amr」³。陳小燕(2006)後續調查容縣方言，主張這個[r]尾音應是[n]，發音是舌尖起作用，而非舌根向上隆起，只在小稱詞時才出現。⁴不過，整體看來，容縣鼻音小稱仍是只出現在塞音尾詞根音節上；因此，我們認為賈正(1996)的說明，極可能是容縣小稱的一個演變歷程，常用詞組最後音節都有一個類[r]加綴存在，不管是元音韻尾、鼻音韻尾或塞音韻尾。由於這個類[r]音，對元音韻尾、鼻音韻尾造成的差異變化主要在音段拉長上，進一步演化調整為正常音節長度時，可能就看不到相關作用力；陳小燕(2006)看到的是後續變化，僅塞音尾詞根能看到音段變化特色，但超音段的聲調變化一直都存在。

2.3. 吳語

鼻尾小稱與詞根音節互動現象較為複雜的是吳語。金華、義烏、湯溪各有不同。本節將逐一介紹。

² 元音小稱加綴後，與詞根韻尾同化，顯示的語音特色是詞根韻尾拉長。在海陸客家小稱觀察到的現象是塞音韻尾濁化加上擦音化，以達到拉長效果；但若是以塞音韻尾的濁化加上鼻音化，也可以達到目的，只是會與原有的鼻音韻尾合流。

³ 賈正(1996)採用的標音方式偏向漢語拼音方案，所以「鴨 ap →amr」。但依照他對“r”的描述，頗像是一個元音小稱，與台灣海陸客家小稱音近似。有可能，仍是來自兒尾[ni]，但在兒[ni]的加綴弱化過程中，聲母[n]先消失。在音節縮併歷程中，一般以兩端音段保留最完整，中間音段會相對容易丟失。

⁴ 海陸客語促成詞根拉長變化的元音小稱，發音部位其實是等同於普通舌尖元音 ɿ，ə元音小稱沒有直接引起相關變化。

2.3.1 金華

朱加榮(1992)介紹金華郊區長山方言的小稱詞綴為[-n]。

表 6. 金華長山方言兒化音變規律 (朱加榮 1992)

ɿ → ʅn 絲	i → in 梨	u → un 虎	y → yn 櫛
ieu → ɰn 狗	in → in 餅	uo → uen 或	ye → yen 桌
ɤ → ɰn 鴿	ie → in 辮	uoʔ → uen 屋	ioʔ → yen 桔
	ieʔ → in 雀		
	en → in 卵		
æ → æn 梅	iaə → iən 鐵	uaə → uæn 鬼	
a → æn 個	iau → iən 鳥	ua → uan 鴨	ya → yæn 櫛
aŋ → æn 狼	iaŋ → iən 娘		
aʔ → æn 柏	iaʔ → iən 夾	uaʔ → uæn 骨	
	ioʔ → ioŋ 竹		

當詞根為不帶韻尾的元音時，直接加上-n尾，若詞根帶有 [n, ŋ, ʔ, u] 等韻尾，加綴後被小稱 -n 取代。除了韻尾取代，部份詞根元音在小稱加綴後出現前化、高化現象。我們認為這些小稱加綴後，元音的前化、高化現象，不是單純小稱詞綴的特徵散播，而是出於詞根元音與鼻音韻尾，不同發音部位的共存限制，所導致的結果。

江敏華(2006)處理了金華方言鼻化與鼻尾小稱的韻母層次與歷時演變，提到表(6)的「桔、狗」的單字音韻母，應是對應到不同的語音層次，「ye → yen, ɤ → ɰn」，與「桌、鴿」同一層次。在討論有豐富文白異讀方言的小稱詞調整變化時，要特別注意現存的單字音與小稱詞是否屬於同一個時間層次。排除掉文白異讀的變化後，長山方言的[n, ŋ, ʔ, u]韻尾取代這部分，現象很一致，都是直接取代原有韻尾，不干擾後續元音變化。較難解釋的部分，在於[o, a]元音加綴之後的變化。

表 7. 金華長山方言兒化音變的[o,a]元音調整

ioʔ → ioŋ 竹叔	ua → uan 鴨話髮襪蝦攤 山籃衫	ya → yæn 櫛
uo → uen 或 uoʔ → uen 屋	uaʔ → uæn 骨 k-蠟 k-	aŋ → æn 狼 iaə → iən 鐵 iaʔ → iən 夾

幾乎所有的詞根[a]元音，加綴之後都是調整為前元音，我們認為，[a]元音加綴後的調整，是因為發音部位共存限制，舌尖韻尾傾向與前元音併存，在長山方言音系中，我們也僅見[in, en, ien]等韻；同時在[i-v -n]之間，[a]到[ɛ]的變化，是漢語方言常見的低元音高化現象，獨立於小稱加綴變化之外。

然而，為何[ua/uaʔ]加綴後，元音會有不同的變化，差別在於喉塞尾，雖然兩者都是[ua]結構，入聲音節中的主元音一般較短促，固有語音特徵上也較不顯著，因此優先滿足元音與韻尾部位共存限制，與[uæ]韻同組變化。鴨類字讀[uan]韻的現象，應該是藉由[u]介音與舌尖韻尾，發音部位的巨大差距，讓主元音得以維持原有音位特徵，不用前化。

[o]元音部分，我們也看到[o, e]兩種變化，但其實都遵守著韻母發音部位共存限制，[oŋ, en]，後元音搭配後鼻音，前元音搭配前鼻音。這部分的差異變化，可能是基於表層[o]元音有不同的底層架構。[u]介音之後的[o]元音，應該只帶有[非高、非低]的特徵值，單字音的[uo]是來自介音特徵的傳遞；所以加綴之後，基於發音部位共存限制，改為[uen]韻。但是[ioʔ]韻中的[o]自身就帶著[後，圓]的發音特徵，小稱加綴後，與鼻尾特徵相衝突，最後是主元音特徵保留，鼻尾部位特徵做了調整，由一般的舌尖鼻音改為舌根鼻音[ioŋ]韻。

2.3.2 義烏

義烏方言小稱加綴材料，最早在方松熹(1986)出現，侍建國(2002)也後續討論了〈浙江義烏話的[n]尾韻及其音變〉。

表 8. 義烏方言 n 尾韻(方松熹 1986, 侍建國 2002)

單元音	高+非高	高元音韻尾	鼻/塞韻尾
ɿ, e, ε, o, ɔ, a, i, u, y	ie, iε, io, iuɿ, ua, uo, ue, ye, uε, ye, uia, uɿ	ai, əu, iəu, au, iau,	əŋ, oŋ, əʔ, oʔ, yəʔ, uəʔ
V: +n	-V: +n	韻母縮併 V: +n	韻尾取代 V: +n
絲 sɿ → sɿ:n	尖 tsie → tsie:n	蔔 bau → bo:n	頂 nəŋ → ne:n
杯 pe → pe:n	蛇 zie → zie:n	狗 kəu → kə:n	桶 doŋ → do:n
梅 me → me:n	腳 tɕio → tɕio:n	塞 sai → se:n	卒 tsəʔ → tsə:n
襖 o → o:n	橋 dʒiuɿ → dʒiuɿ:n	牛 ɲiəu → ɲiə:n	鹿 loʔ → lo:n
單 nɔ → nɔ:n	花 hua → hua:n		刷 ɕyəʔ → ɕyɛ:n
鞋 ɦa → ɦa:n	鵝 ɦuo → ɦuo:n		挖 uəʔ → ua:n
枝 tsi → tsi:n	船 ɿye → ɿye:n		
姑 ku → ku:n	馬 mɿa → mɿa:n		
珠 tɕy → tɕy:n	帽 mɿɿ → mɿɿ:n		

如方松熹介紹，義烏話共有 54 個韻母，其中 32 個白讀韻，19 個文讀韻，3 個文白同韻。侍建國(2002)說只有白讀韻母有鼻尾加綴現象，方松熹(1986)附

註說明，入聲韻白讀時，去掉喉塞尾，歸入相應韻母，如北[əʔ]讀[pai³³]。因此，義烏小稱加綴時，古入聲單字音應是以沒有喉塞尾的白讀韻為基底。所以，表 8 在轉換對應上最有疑慮的喉塞尾組，相互對照的應該是未列出的白讀音，方松熹(1986)給的是文讀音的對應，這部分的問題就無須處理。

義烏方言的元音韻尾，在小稱加綴-n 時，不是採用直接取代，而是先將複合韻母縮併為單元音，而後加上[n]，這點與金華長山方言有別。另外，需要進一步探討的部分是[əŋ, əuŋ]韻的主元音表層都一樣，但加綴之後卻有不一樣的表現，分別為[e:n, ə:n]。這有兩種可能，一是因為[əŋ]韻的底層或早期形式為[en]，表層弱化成央元音，但拉長後還是以固有音值呈現；這種說法極有可能成立，一來，在長山方言音系沒有表層[en]韻形式，另外[əŋ]韻的「頂平心」等詞，在金華方言也常為前元音，如《金華方言詞典》記為[iŋ]韻。

另一種可能是，如侍建國(2002)提出的分析，詞根的舌尖鼻音特徵，帶入央元音，使其前化；這種分析法，搭配上義烏元音韻尾加綴時，元音特徵先縮併再拉長加綴，似乎也有一定的可能性。我們目前仍先採前一種說法，為了與其他方言的材料分析一致，若是以鼻尾小稱的部位特徵帶入詞根元音來解釋相關元音變化，或可解決目前在義烏方言看到的現象，但其他方言(如湯溪)則無法說明。

2.3.3 湯溪

接下來我們看吳語湯溪方言的材料。下表是整理自曹志耘(2001)對吳語湯溪方言韻母音位與小稱加綴的介紹，表中以直行分類湯溪方言鼻尾小稱加綴模式。

表 9. 湯溪方言的韻母 (整理自曹志耘 2001)

直接加綴		取代韻尾	主元音調整			其他邊緣韻母	
ɿ	ɑo	uə	a	ia	ua	iu	eŋ
i	iaɔ	iuə	ɑ	ia	ua	yu	oŋ
u	ai	ei	o	io	uo	少例	iaŋ
y	iai	iei		ɤ	iɤ	uɤ	ɑŋ
u	uai	uei	ɛ	ie	ue	iaŋ	擬聲韻

ə	σ-ŋ	-ŋ取代 韻尾	a → aŋ, 共存限制 a → aɔŋ, 推擠效應 [-hi] → [+hi] / __ŋ	uaŋ	aɔŋ
iə				yaŋ	合音韻
σ-ŋ				文讀韻	

過去以小稱詞綴特徵傳遞而影響詞根元音變化的模式，難以解釋為何‘a → aŋ, a → aɔŋ’，兩者分別是後化、高化，兩個不同方向演變；同時也無法解釋為何有的音節產生變化(取代韻尾、主元音調整)，有的音節又完全不變(直接加綴)。若我們從方言所容許的音節結構、音位間的共存限制、以及加綴後維持音位組合區辨性所造成的推擠效應切入，就可以無需假設湯溪方言小稱詞綴帶著多種，時而前化，時而高化，時而一點也不起作用的語音特徵。

簡單來說，如果鼻尾加綴後的音節是方言可以容許的音位組合，則毋須調整；如果加綴後的音節，不是方言容許的，就作最小調整來符合結構訴求，並在原有音節系統與小稱音節系統取得一致的對應性。所以，若鼻尾加綴後的音節是在發音上相容的音位組合(-ŋ, -uŋ, 都帶有+high 特徵)，則直接保留原組合；若加綴後音節，並非方言容許的(如*aŋ, 在 high, back 特徵上都衝突)，採最小調整以符合結構訴求。並且，還需要維持原有音節之間的區辨，因此[a] → [aɔŋ]。

表 10. 湯溪方言的韻母調整

a → aŋ	ia → iaŋ	ua → uaŋ
a → aɔŋ	ia → iaɔŋ	ua → uaɔŋ
o → uŋ	io → iuŋ	uo → uŋ
ɤ → uŋ	iɤ → iuŋ	uɤ → uŋ
ɛ → eŋ	iɛ → ieŋ	ue → ueŋ

但為什麼爲了維持區辨而產生調整的，似乎只有只有[a] → [aɔŋ]這一類變化。一來，[aɔŋ]這組音是方言中本來就存在的音位組合，出現於擬聲韻或合音韻中，因此變化上較爲容易；二來，如果是由[a] → [aɔŋ]，是種跳躍性的變化，增加使用者在本音與小稱音連結上的難度。還有，小稱加綴變化後的單一音節，其實是對固有兩個音節連讀時的語流音變的重新分析，原本[a]+[ŋ]的兩個獨立音節之間，聯繫上會有類似[o]的過渡音出現；一般這種連讀上的過渡音最後不一定保留，但因整體系統中，已經有[a + ŋ → aŋ]的音節存在，所以，[a]的小稱音最後重新分析爲 [aɔŋ]。

其他語音如 ɤ 的高化，仍是維持區辨與音位組合搭配上的互動結果，以[o]來說，轉為[u]與原來的[u]韻合流，[u+ŋ → uŋ]；但維持[o]加上鼻尾後，則與擬聲韻[oŋ]合流。一般的[o]元音的發音位置高於[oŋ]韻中的元音，所以單元音

[o]與小稱鼻音[ŋ]連讀時，音值上是高於原有的[oŋ]擬聲韻，所以最後轉為與[uŋ]韻合流。[v也是在[u]和[ə]之間偏向了高元音的組合。

總之，鼻尾小稱，不管是舌尖鼻音[n]，或是舌根鼻音[ŋ]，併入詞根音節時所造成的元音變化，除了原有詞根元音韻尾可能造成的元音縮併現象外，一般會出現的變化，都是基於音位組合搭配限制所致；舌尖鼻音一般較少與元音搭配，而舌根鼻音則傾向與後元音或高元音搭配。這樣的解釋方式，可以將鼻尾小稱音加綴之後產生的變化，與一般方言音系常見的音位組合限制聯繫起來，就整體音系分析會較為簡捷、一致；也可以進一步說明，小稱加綴後的變化，其實是一種小稱音段特徵保留(藉以指涉小稱語意)，與方言音位系統維持之間的拉鋸競爭。

3. 晉語、閩語的鼻尾小稱

晉語與閩語的鼻尾小稱，相對前面三個方言群，極度稀少，目前都只有一個例子。晉語鼻尾小稱出現在東南方的翼城縣城關方言(辛菊 1999)，閩語鼻尾小稱則是在多方言交界的尤溪，同樣是城關方言(伍巍 1993)。

3.1. 晉語翼城話

翼城方言依據辛菊(1999)說明，小稱詞尾帶有鼻音成分[ŋ~nəŋ]；對翼城方言[ŋ~nəŋ]的幾點分析。1) 使用分佈，[ŋ]尾的使用侷限於翼城城關片及其鄰近之五鄉鎮，其餘地區主要使用[nəŋ]⁵。2) 構詞方式主要如下列四類：a) 加在單音節詞根與雙音節詞根之後，表示名詞，詞根可以是名詞、動詞或形容詞；b) 加在重疊詞之後，省去[ŋ]尾不改變詞意，如「鍋鍋」與「鍋鍋ŋ」都表示駝背，而「鍋ŋ」指小鐵鍋；c) 小 + X [ŋ]，小 X 不成詞，如「小鋸ŋ」表示小鋸子，「鋸ŋ」表鋸子通稱，沒有*小鋸用法；d) 仵 X + [ŋ]，仵 X 可單獨使用，但不能去掉仵詞頭單用*X-ŋ，如「仵台-ŋ」，表示台階儿。辛菊未曾說明該小稱鼻尾是否併入詞根音節，我們後續到山西做了田野調查，表 11, 12 是我們在 2007 年收集的翼城語料。

表 11. 翼城小仵小稱使用(2007 年記錄)

⁵ 辛菊提出聲母 pf 與詞尾ŋ在晉城次方言區中有著共存制約，只有容許聲母 pf，才可能有詞尾ŋ形式。但兩者間就語言演變觀點而言，缺乏具體關聯動機，應只是晉城方言兩條獨立的音變規律，tʂ → pf/_u(VX) 與 nəŋ → ŋ / __]DIM；兩條規律間也許存在發生時間上的差異，前者不只存在於翼城話，也存在其他南區方言中，後者為翼城特有的小稱詞型弱化音變，興起的時間較晚。在翼城方言區內某些方言點兩條規律皆存在，如城關片，某些方言點則是僅有第一條規律，有的兩者皆無。

Liu: 鼻尾小稱

草帽儿	ts ^h au ⁵⁵ moŋ ⁵³³	桌子	pfa ⁵³ ŋ ¹
小鎖儿	siəu ⁵⁵ swaŋ ³³	小桌子	siəu ⁵⁵ pfa ⁵³ ŋ ¹
小匙儿	siəu ⁵⁵ ʃɿ ³³ ŋ ¹	小圓桌	siəu ⁵⁵ ye ¹¹ pfaŋ ⁵³
鬍子	hu ⁵³ ŋ ¹	細沙	si ⁵³ saŋ ³¹
脖子	puaŋ ⁵³¹	小丸子	siəu ⁵⁵ ve ⁵³ ŋ ¹¹
鼻子	pi ⁵³ ŋ ¹	肉丸子	zu ⁵² weŋ ¹¹

翼城有不少外來人口，在尋找發音人上其實需要一段時間篩選，當時受時間壓力，只找到兩位發音人老李與小元，只有小元是在城關出生長大，他家是祖父那一輩從山東遷來。老年發音人老李是來自翼城鄰近郊區，因此，與青年發音人小元之間的語音差異，除了年齡因素，也有地理因素。

表 12. 翼城小稱老年層與年輕層對比(2007 年記錄)

	翼城老李	翼城小元
鑷子	nie ⁵⁵ nəŋ ¹¹	nia ⁵⁵ ŋ ²²
鉗子	ts ^h ie ⁵³ nəŋ ¹¹	ts ^h iŋ ⁵³
錐子	tsye ²⁴ nəŋ ⁵⁵	
鋸子	tsy ⁵² nəŋ ¹¹	tsy ⁵⁵ ŋ ¹¹
釘子	tie ¹¹ nəŋ ⁵⁵	tiaŋ ²⁴
鐮刀	lie ³³ ŋ ³ , lye ¹¹	lie ³³
碟子	tie ³³ nəŋ ³³	siəu ⁵⁵ tiaŋ ³¹
窗戶	ts ^h ua ³³ nəŋ ⁵⁵	ts ^h ua ¹¹ ŋ ⁴ – – ts ^h uaŋ ²⁴
孫子	suŋ ¹¹ nəŋ ⁵⁵	suŋ ¹²⁴
夫之妹	siəu ⁵⁵ ku ³³ nəŋ ¹¹	siəu ⁵⁵ koŋ ³³¹

雖然缺乏全面性材料以進行相關音系調整分析，但從小元的材料可驗證，鼻音小稱確實很容易併入前一音節。一般仍是以常用詞先併入，而後逐步形成一致的規律。

3.1 閩語尤溪話

2000 年我在廈門大學收集閩語小稱詞語料時，採訪到一位 23 歲尤溪城關發音人；其[ŋ⁵⁵]尾在許多詞例上已經附著到前一音節中。以「小刀子」為例，

即使請發音人重複一遍，在[tx̣]跟[-ŋ]也不存在停頓。這種現象與我們在 2005 採訪到的老年發音人有別，老年發音人隨意說話時，可能將小稱詞尾縮併入前一音節，但重複確認時，仍會將小稱詞尾，獨立唸成一個單一音節。

表 13. 尤溪小稱詞(發音人 2000 年受訪時為 23 歲)

豬/小豬	刀/小刀	溝/小溝	腸/小腸	狗/小狗
tui ³³ /tuiŋ ⁴⁵	tx̣ ³³ /tx̣ŋ ⁴⁵	kau ³³ /koŋ ⁴⁵	tsoŋ ¹¹ /tsoŋ ⁴⁵	kuẽ ⁵⁵ /kuẽŋ ⁴⁵

兩相比較之下，反映著小稱詞的使用，在尤溪城關地區，存在著年齡層的區別演變，年輕一輩的小稱詞，在語音形式上進一步弱化，從獨立音節到韻尾化。尤溪小稱詞綴韻尾化之後，與詞根韻母所產生的互動。依據我們收集到的方言詞例，小稱詞韻尾化過程中，主要有三類相關音韻變化；包括：i) 詞根鼻音韻尾消失(腸、小腸)，ii) 下滑雙元音韻母(off glide)縮併，(溝、小溝)，其他雙元音韻不變(豬、小豬)，iii) 縮併後音節讀為高升調 45。

詞根鼻音韻尾消失現象在老年層讀音就有相關過渡例子，如‘蟲/小蟲，tx̣ŋ¹¹/tx̣¹¹ŋ⁵⁵’，我們將這類現象歸納為詞根韻尾消失，因為在老年發音人的詞根與詞綴之間，單唸仍有停頓，可聽辨出清晰詞綴鼻音自成一音節，而詞根鼻音韻尾則消失。第二類雙元音縮併現象，例子不多，具體縮併的都是：au → o/ __ + -ŋ；老年層發音人也曾發現一例，「上衣/小上衣 au → oŋ」。不過在年輕層讀音中，也出現 au 加綴後變成 aoŋ 的例子，表示這類音節縮併，最後並未形成方言中一個穩定的規律。ai 元音加綴的例子較少，田調時(2005, 2000)詢問過發音人“小獅子”說法，老年層採用分立的兩個音節，年輕層則表示沒有「小獅子」的用法；「學徒」一詞沒有「師囡」的說法，倒是「女孩子」一詞，某位年輕層發音人給出「a sai → a saiŋ (阿畚 女孩/阿畚囡 小女孩)」，「阿畚」在尤溪普遍用來指稱女孩子，還有其他用法並存，收集到的語料中只有一位發音人提供「阿畚囡」指小女孩的表達方式。[ue, ui, ia]等雙元音韻母，小稱加綴後仍維持不變，直接將鼻音韻尾加諸其後。

4. 綜合分析

各方言在鼻音小稱韻尾化後，與詞根原有音節的互動表現不一，但又有著一定的傾向；鼻韻尾小稱構詞音韻中，韻尾位置的爭奪取決於響度，響度越高越能保留為韻尾。整理如下表。

表 14. 鼻韻尾小稱與詞根音節的互動

韻尾響度	金華 ^{吳語}	義烏 ^{吳語}	湯溪 ^{吳語}	黟縣 ^{徽語}	屯溪 ^{徽語}	信宜 ^{粵語}	尤溪 ^{閩語}	翼城 ^{晉語}
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Liu: 鼻尾小稱

-p, t, k/?	取代	---	---	---	---	Cn 融合 dimT	取代	---
-n, m/ŋ	取代	取代?	---白/文讀	VN 融合 +n	取代	Nn 融合 dimT	取代	取代
V+Glide	取代	VG 融合 +n	ai → ain ei → en	VG 融合 +n	--- [無相關 結構]	VG ^{dimT}	VG 融合 +n VG +N	---[無相 關結構]
V _{Nuc}]	V 調整+n	V:n	[+hi]V:+ n [-hi]>[+hi]	Vn	Vn	Vn ^{dimT}	Vn	Vn

由表中可見，整體趨勢上，塞音韻尾的取代最普遍，之後，逐步為鼻音韻尾、而後介音韻尾。同時，小稱韻尾特徵都會盡可能保留，可能採用各種手段來達成，包括取代原來韻尾，或與詞根韻尾融合，或迫使詞根韻母融合調整以納入小稱韻尾(因為詞根元音與韻尾部位的組合搭配限制所促使的變化)等。

綜合來看，漢語鼻尾小稱與詞根韻母的互動，是三種動力間的競爭，亦即音節組合結構限制 (phonotactic combination constraints)，保有音節區辨性 (Syllable Contrast preserving)，及小稱形式的保留 (Dim-form preserving, 藉以指涉小稱語意)。漢語鼻韻尾小稱加綴後的相關音韻變化，主要是韻尾響度互競與上述三項動力的制衡；在各方言中，因為各類限制比重不同，而有了不同的變化演變。

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Partial-Reduplication with Fixed Segmentism in Chinese Dialects— An Optimality Theory Approach

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In this study, reduplication with fixed segmentism would be analyzed in Optimality Theory (McCarthy & Prince 1995). In this approach, the language-specific syllabic template for reduplication is not needed. The non-copied part is due to avoid the marked structure (Yip 2001). In the Chinese dialects, the reduplicated forms are produced by reduplicating the root and insertions of some fixed segment, e.g. the lateral /l/, such as in the Fuzhou dialect. The relevant markedness constraints are: O_{NSET} , for inserting a fixed segment /l/ as the onset of the second syllable; N_{OCODA} , for no copying the final coda; the prosodic-word form CVCVC. The faithful constraints are $F_{\text{AITH-IR}}$, $F_{\text{AITH-IB}}$, $F_{\text{AITH-BR}}$, for Input-RED, Input-RED, $R_{\text{ED-BASE}}$ correspondences. The ranking of the constraints is as: $F_{\text{AITH-IR}} \gg N_{\text{OCODA}}$, O_{NSET} , PrWd-F $\gg F_{\text{AITH-IB}} \gg F_{\text{AITH-BR}}$. Generally speaking, the ranking of the constraint, N_{OCODA} , is not so high since Fuzhou syllables have different kinds of codas such as vocalic glides, the velar nasal or the glottal stop. Incomplete copying shows that the truncation of the coda and the insertion of the fixed segment /l/ are argued to avoid the marked structure.

1. Introduction.

Reduplication is an interesting topic in the area of the prosodic morphology, even in Optimality Theory (McCarthy & Prince 1995). In Chinese Fuzhou dialect, there are many kinds of reduplicated forms. For example, the total reduplication forms (A>AA) of a monosyllabic noun could be represented as the diminutives (Chen 1998). Partial reduplication forms (AB>ABB or AAB) of disyllabic adjectives in Fuzhou (Qu 1995) amplitude the degree of modification. Moreover, monosyllabic words could be augmented to disyllabic words by composing of reduplication and insertions of fixed segments, such as Fuzhou Qiejiaoci (henceforth FQ), e.g. *tui>tuo luoi* ‘holding hands’. In FQs the final coda segment of the first syllable is always truncated and the /l/ is always inserted as the onset. In this paper, reduplication, augmentation, truncation and fixed segmentism in FQs would be analyzed in Optimality Theory (henceforth OT). The important issue is that the language-specific syllabic template for reduplication is not needed. And the appearance of non-copied part is due to avoid the marked structure.

2. Fuzhou Phonology.

2.1. Consonants.

The Fuzhou consonantal system (Zhan 1981, Chen & Zheng 1990, Chen 1998) listed in (1), Fuzhou has fifteen consonants.

- (1)
- | | | | |
|----|-----------------|---|---|
| p | p ^h | m | |
| t | t ^h | n | l |
| ts | ts ^h | | s |
| k | k ^h | ŋ | x |
| ? | | | |

Some important phonotactic rules are listed below:

- (2a) Bilabial stops change to the labial fricative /β/ between two vocalics, while become to the labial nasal /m/ when follow a nasal.
- (2b) The apical consonants /t, ts, s/ change to the lateral /l/ between two vocalics, while become to the coronal nasal /n/ when follow a nasal.
- (2c) /ts, ts^h, s/ would be palatalized to /tɕ, tɕ^h, ç/ if they are followed by high front vocalics.
- (2d) The velar consonants would be deleted between two vocalics, while become to the velar nasal /ŋ/ when follow a nasal.

2.2. Vowels.

The basic vowels in Fuzhou are /a, e, œ, o, i, u, y/. The three vocalics /i, u, y/, could be the on-glide or the off-glide. Fuzhou vowels could be divided into two sets of the phonetic forms, the lax and the tense, depending on the tones they are associated with (Liang 1982, Qu 1995). The so-called tense vowels co-occur with the tones, Pingsheng, Shangsheng, Yangru while the lax forms with the Qusheng and Yinru. In case of undergoing tone sandhi, the lax vowel will change to its tense counterpart. Generally speaking, the major differences are: a tense vowel tends to higher (e.g. au > ou), or more fronted (e.g. a > ɛ), and the lower half of a lax diphthong is dropped, leaving behind a tense monophthong (ɛi > i) (Qu 1995). The lax/tense forms of the vowels are listed in (3) (Wang 1969:118)

- (3)
- | | |
|-------------------|---------------------|
| Pingsheng, | Qusheng, |
| Shangsheng | Yinru Yangru |
| i | ɛi |

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y	œy
u	ou
a	ɑ
œy	ɔy
ou	ɔu

2.3. Tones.

Fuzhou has seven citation tones, traditionally called Yinping, Yangping, Shangsheng, Yinqu, Yangqu, Yinru, Yangru. According to the pitch value, the seven tones are represented as below in (4) (Liang 1982, Qu 1995, and many other)¹.

(4)

The tones	tonemes
Yinping (55)	HH
Yangping (53)	HL
Shangsheng (31)	Lor M
Yinqu (213)	LH
Yangqu (353)	LHL
Yinru (13)	LH
Yangru (5)	H

As mentioned above, in Fuzhou [-high] tonal domain the vowels must be the lax forms, while the tense forms mostly are associated with the higher tones. In a disyllabic word domain the tones of the preceding syllable may undergo tone sandhi. The rules of tone sandhi in Fuzhou are complicated. Some of the rules concerned with the FQs would be listed in the next section, and the other irrelevant rules will not be mentioned here.

¹ Zhang (2000) organizes the previous studies about the pitch values of Fuzhou tones.

	Yinping	Yangping	Shangsheng	Yinqu	Yangqu	Yinru	Yangru
Maccy & Baldwin 1929	44	53	33	13	341	13	4
Tao1956	44	52	31	113	452	24	4
Yuan 1989	44	53	31	213	242	23	4
HanYu Fangyan 1989	44	52	31	213	342	23	4
Lan1953	55	61	33	11	242	13	56
Wang1969	55	51	33	113	242	24	45
Li & Liang1994	44	53	31	213	242	23	5
Liang & Feng 1996	44	53	32	212	242	23	5
Chen1998	55	53	33	213	242	24	5
Feng1998	55	53	33	212	242	24	5
Zhang2000	55	51	31	11	353	13	5

3. Fuzhou Qiejiaoci (FQ) Formation.

In Fuzhou many monosyllables are augmented into disyllabic words (Chen 1998). The meaning of FQs is almost identical to the original monosyllables. The formation of FQs is explained below.

- (5a) *tuoi*>*tuo luoi* ‘holding hands’
 (5b) *taŋ*>*ta laŋ* ‘sunshine’
 (5c) *tau*>*ta lau* ‘hang’
 (5d) *moʔ*>*mo loʔ* ‘stick’

The data in (5) shown the source syllable is totally copied to form the FQs. The first derived syllable of FQs is alliterated with the source syllable and the second derived syllable is rhymed with the source syllable. The lateral segment /l/ is inserted as the onset of the second derived syllable of FQs. Comparing the two derived syllables of FQs the Final (rime) of the source syllable is reduplicated as the nucleus in the second derived syllable while the coda segments such as /i, u/ (vocalic codas), /ŋ/ (a nasal coda), /ʔ/ (a glottal coda) in (5a-d) are truncated (Liang 1982).

The tone of the second derived syllable of FQs is identical to the source syllable. The tone of first syllable undergoes the two tone sandhi rules listed in (6):

- (6a) Pingsheng
 Shangsheng>Shangsheng (31, a mid/low tone)
 Yangru
 (6b) Qusheng
 Yinru > Qusheng (11, low tone)²

Generally speaking the sandhi tones of the first syllable in FQs are the low ([-high]) tones, 31 tone, and 11 tone (Liang 1982). If the tone of the source syllable is high, as in (6a), the derived syllable would change to the lower tone. If the source syllable is with the low tone, the tone of the derived syllable would be more lower. As mentioned in (3) a syllable in Fuzhou with the Shangsheng and Qusheng has to be with the tense vowel form. Therefore the derived form with the sandhi tone would be with the tense vowel form.

The special character of FQs is to truncate the coda segment of the source syllable

² The sandhi tone (11) appears in the sandhi domain but not in the citation Fuzhou tones. Comparing with other tones it is very low so I use Qusheng to represent it.

in derivation of FQs. That is, the CV and CGV syllabic structures are the only two possible types in the first syllable of FQs. In Fuzhou $C_1C_2VC_3C_4$ seems to be the largest template. However in Fuzhou syllables only two of the C_2, C_3 (C_2C_3 to be vocalic glides), C_4 (a nasal or a glottal stop) are allowed to appear in a syllable simultaneously. Liang (1982) listed the fourteen syllabic types in Fuzhou. No matter what the syllabic type is, the formation of the first syllable of FQs is to reduplicate form the onset to the nuclear vowel, but the coda would not be copied. The more data are listed in (7). This interesting phenomenon would be analyzed and explained in OT in the following sections.

(7a)	CVGC	tuoi>tuo luoi	‘holding hands (as in 5a)
(7b)	CVN	taŋ>ta laŋ	‘sunshine’ (as in 5b)
(7c)	CVC	mɔʔ>mɔ loʔ	‘stick’ (as in 5d)
(7d)	CVG	tau>ta lau	‘hang’ (as in 5c)
(7e)	CV	pə>pə lə	‘kick with strength’
(7f)	VGC	ouʔ>o/u louʔ	‘fold’
(7g)	VG	au>a lau	‘indented’
(7h)	VC	əʔ>ə ləʔ	‘sound of vomit’
(7i)	V	o>o lo	‘stick’
(7j)	CGVC	siaʔ>sia liaʔ	‘slim’
(7k)	CGVG	pieu>pie lieu	‘spring out’
(7l)	CGV	tie>tie lie	‘drop down’
(7m)	GVC	kuoŋ>kuo luoŋ	‘roll up’
(7n)	GVG	uai>ua lai	‘slope’
(7o)	GV	uo>uo luo	‘getting together’

4. An OT analysis.

4.1. Optimality Theory and Reduplication

Reduplication has been attracted a lot of attention in phonological theory and OT. Many languages seem to have more than one pattern of reduplication, e.g. total or partial reduplication, augmentation or truncation. Reduplication is a kind of morphological word formation where a phonological string with morphological information is repeated. Many kinds of reduplication data have shown that the whole source is copied (total reduplication) with or without phonological change, while some part of the source is copied or disappear or something new appears. Steriade (1988) proposes the derivation is not haphazard, but to avoid marked structures. That is, the many kinds of the surface reduplicating forms derive from a single linguistic system. This idea, *the emergence of the unmarked* (henceforth TETU), also has been given by McCarthy & Prince (1994) and Spaelti (1997).

In previous studies of reduplication, a template has been postulated onto which segments from the base are mapped. A typical approach of partial reduplication suggests that this is the result of templates proposed by McCarthy (1979), Marantz (1982), McCarthy & Prince (1986) and many others. However such templates have no status in imposing the proper size restriction on the morphological constituent. And the determination of which part to be the reduplicant or the base is so tricky, and sometimes arbitrary. In a language a kind of pattern is made on morphological (or morph-syntactic) grounds while the other may be on phonological or lexicalized grounds. The several types seem to be mutually exclusive. It is argued that they could be combined in a single system implemented in OT. Here it is argued that partial reduplication, e.g. the coda-truncation in FQs is to avoid marked structures. And it is argued that no special reduplication-specific devices are required.

In OT framework, reduplication is explained that an abstract RED is copied from the base in accordance with constraints which are universal and violable. Therefore the different phenomena of reduplication among languages are due to the ranking of the relevant constraints. The deviation between the base and the reduplicant is often found. This is the result of markedness pressure. Whether the pressures affect the reduplicant is due to constraint ranking. M&P (1994) show that TETU account of partial reduplication is possible. If a reduplicative system copies everything in the base that is not marked, the result will be a variety of different forms of truncation of the reduplicant. In total reduplication every segment in ROOT or BASE is required to be parsed in Reduplicant to avoid the violation of the high copying constraint. However some constraint concerning with the TETU is higher than the total copying constraint some part would be deleted or truncated. The ranking of constraints for the FQs is argued as: $TETU_{CON} \gg COPY_{CON}$.

4.2. An OT analysis of FQs.

The Optimality Theory claims that there is a linguistic mechanism, called $G_{EN(ERATOR)}$, which can produce indefinite Outputs in case of Input in it. The optimal selected output is called the optimal candidate. It is selected according to the ranking of the relevant constraints. The optimal candidate compels others by minimal violations of higher constraints. For FQs the relevant constraints are discussed below.

In OT, reduplication is explained that there is an abstract RED to represent the reduplicants. The phonological materials RED are copied from Input. The model for the analysis of reduplication implemented in OT is listed in (8a) (M&P 1995). The model shows that the IO relationship is the Stem-Base relationship. While the identity between RED and Base is the Output-Output comparing relationship. The ranking of the

faithfulness constraints shows the interactions of the domains.

(8a) Full Model

Input: /Affix_{RED} + Stem/
 ↗ ↘ ↓↑
 I-O Faithfulness
 Output: RED ⇔ Base
 B-R Identity

- (8b) FAITH-IB : every element in Input must have a correspondence in Base.
- (8c) FAITH-BR : every element in Base must have a correspondence in RED.
- (8d) FAITH-IR : every element in Input must have a correspondence in RED.

The constraint (8b) requires GEN to produce Output where every element has its correspondence in Input. That is, no deletion or insertion is allowed. In FQs the monosyllable is augmented to disyllabic words. The coda segment in the source syllable is not parsed in Base; that is, there would be violations of FAITH-IB. FQs are formed by total reduplication so FAITH-BR should be violated and not ranked very high. The phonological materials of the rime in RED are totally copied from Input. Although the segment /l/ has to replace the original onset, the onset element has the correspondence in Base, so there is no violation. The ranking of the three constraints is : FAITH-IR >> FAITH-IB >> FAITH-BR

Tableau 9

Input: tau ‘hang’, RED Output: ta lau ‘hang’
 Ranking: FAITH-IR >> FAITH-IB >> FAITH-BR

tau, RED	FAITH-IR	FAITH-IB	FAITH-BR
9a. tau lu	*!(a)		*
☞ 9b. ta lau		*(u)	*
9c. tau la	*!(u)		*

In Tableau 9 the black line indicates the constraints are crucially ranked. The candidates (9a) and (9c) delete a segment /a/, /u/ respectively, so they have a fatal violation (* indicating as a violation and *! indicating as violated fatally) of the higher constraint, FAITH-IR. In the candidate (9b), the segment /u/ in Input does not have their

correspondence in Base³ but it violates a lower constraint so (9b) is selected as the optimal candidate (as the symbol ☞ indicated).

(10a)ANCHORL-BR: the initial element in RED must correspond to the initial element in Base.

(10b)CONTIGUITY-BR(no skipping): adjacent elements in RED are required to correspond to adjacent elements in Base.

(10c)LINEARITY-BR (no reversion or mutation): the linear order of elements in R is identical to the linear order of their corresponding elements in B.

In FQs the elements are copied from the left edge contiguously and respected to the linear order of the source syllable. The three constraints listed in (10a-c)(M&P 1995) require the initial element in RED to correspond to the initial element in Base; that is, no skipping or reversion is allowed. The different rankings of the three constraints can explain the different kinds of reduplication, e.g. prefixation, suffixation, among languages. In FQs the three constraints are not crucially ranked. Tableau 11 shows the analysis.

Tableau 11

Input: *tuoi*, RED Output: *tuo luoi* ‘holding hands (as in 5a,7a)

Ranking: ANL-BR, CONT-BR, LIN-BR

tuoi, RED	ANL-BR	CONT-BR	LIN-BR
11a. <i>uo loi</i>	* (t)		
☞ 11b. <i>tuo luoi</i>			
11c. <i>to lou</i>		* (tuo:to)	
11d. <i>tuoi liuo</i>			* (uoi:iuo)

The initial /t/ in Base does not have its correspondence in the candidate (11a). The candidate (11c) violates the constraint CONT-BR for the skipping of /u/. The linear order of the segments in Base is not respected, so there is a violation in the candidate (11d). The candidate (11b) does not have any violation so is selected as the optimal candidate.

As mentioned above, the segment /l/ always appears as the onset in the second syllable of FQs. If there is a consonantal initial onset in Input, /l/ would replace it in RED, as shown in (7a-7e, 7j-7m). While not, /l/ would be inserted, as in (7f-7i, 7n-7o). Therefore

³ In this stage there would be another candidate, *tau lau*. The coda is not allowed to appear in FQs. Thus this candidate would be fatal for some other higher constraint. The problem would be discussed more in the following paragraphs.

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there is a constraint (in 12a) which requires every syllable must have an onset.

- (12a) ONSET: every syllable must have an onset.
- (12b) * Labial >> * Dorsal >> * Coronal
- (12c) INTERSONORANT VOICING : * [+son] [-vcd] [+son]

Among languages the reduplication data show the incomplete copying with various segments (or tones or features) in Input replaced by fixed segments. For example, Yoruba nominalizations, the reduplicative morpheme has the fixed vowel *i* (Alderete et al 1999). In Chinese reduplicative data, /l/ is found as the fixed segment in onsets. Yip (2001) argues that the fixed segmental replacement is an instance of TETU; that is, the appearance of /l/ is to avoid the marked structure. Yip (2001) proposes that the choice of /l/ results from the markedness hierarchy (Prince & Smolensky 1993), listed in (12b).

The hierarchy means that to parse the labials or the dorsals is less harmonious than the coronals. The coronals are the unmarked segments among languages. In Fuzhou the consonant /l/ is a coronal lateral and is analyzed as the variance of /n/ (Chen 1998:7). The preference of /l/ over /t/ is attributed to the avoidance of the markedness structure. It is usually found among languages that the segment between two sonorants would be voiced. Therefore the constraint listed in (12c) prohibits a voiceless segment between two sonorants.

As mentioned above in Fuzhou the stops would change to voiced fricatives between two sonorants (in 2a) and the apical coronals /t, ts, s/ change to the lateral /l/ between two vocalics (in 2b). The phonotactic rules are given the evidence of the constraint (12c). Therefore the choice of /l/ would be attributed to intersonorant voicing since the onset in the second syllable of FQs always be between two vowels. In a sum the ranking of the constraints for the fixed segmentism of /l/ in FQs is : * Labial, Dorsal >> ONSET >> * INTERVED >>* Coronal. The ranking is specially relevant to the onset of the second syllable. An example is given in Tableau 13.

Tableau 13

Input : pœ, RED Output: pœ læ ‘kick with strength’ (as 7e)

Ranking : * Labial, Dorsal >> ONSET >> * INTERVCD >>* Coronal

pœ, RED	* Labial, Dorsal	ONSET	* INTERVED	* Coronal
13a.pœ pœ	*!		*	
13b.pœ tœ			*!	*

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☞ 13c.pœ lœ				*
13d.pœ œ		*!		

The candidate (13a) has copied the labial voiceless stop as the onset so it violates the undominated constraint. *ONSET* rules out the candidate (13d) with an onsetless syllable in RED. The coronal /t/ in (13d) is voiceless between two vowels so it is fatal. The candidate (13c) with the unmarked segment /l/ is selected as the optimal candidate.

Another interesting phenomenon of FQs is the truncation of the coda in RED. The incomplete copying is also attributed to the avoidance of marked structure. It is argued that the markedness constraints outrank the faithfulness constraints. Yip (2001) argues that cross-linguistically codas are marked. The CV structure is made by the truncation of the coda in FQs. The CV structure is the unmarked structure cross-linguistically. Thus the constraint *NoCODA* (in 14a) which is the markedness constraint can capture the fact. In FQs the first syllable has no coda while the second syllable copies the whole rime. The ranking of the markedness constraint and the faithfulness constraints is in (14b) and an example is given in Tableau 15.

(14a) *NoCODA*: every syllable has no coda.

(14b) *FAITH-IR* >> *NoCODA* >> *FAITH-IB* >>> *FAITH-BR*

Tableau 15

Input : taŋ, RED Output: ta laŋ ‘sunshine’ (as in 5b, 7b)

taŋ, RED	<i>FAITH-IR</i>	<i>NoCODA</i>	<i>FAITH-IB</i>	<i>FAITH-BR</i>
15a.ta la	*!		*	
15b.taŋ laŋ		**!		
15c.taŋ la	*!	*		*
☞ 15d.ta laŋ		*	*	*

The two candidates (15a) (15c) are fatal since the coda in Input does not has its correspondence in RED. (15b) has more violations than the optimal candidate (15d) for it has two codas in that word. The phonetic form of the vowel has to change because of the tone sandhi. This part is not discussed here. Generally speaking, the ranking of the constraint, *NoCODA*, is not so high since Fuzhou syllables have different kinds of codas such as vocalic glides, the velar nasal or the glottal stop. However the ranking changes to avoid the marked structure.

5. Conclusions.

In this paper the formation of Fuzhou Qiejiaoci is analyzed in OT framework. A monosyllable is reduplicated and augmented into a disyllabic word. Incomplete copying shown by two points; the truncation of the coda and the insertion of the fixed segment /l/. However the partial reduplication is argued to avoid the marked structure. In OT the total reduplication is due to the effects of the faithfulness constraints. FQs are not formed by total reduplication so the B-R identity is not relevant. The coda-truncation and the fixed segment insertion form the unmarked structures, e.g. CV structure. This is done by the higher markedness constraints.

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偃师方言的儿化及相关问题*

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本文以偃师方言为例, 分析了汉语方言儿化出现新的中间音的现象, 认为在这些方言中虽然“儿”后缀引发了复杂的音系变化, 但同北京话一样, 都是“儿”后缀特征左扩展形成的。基于“特征扩展”理论, 文章提取了偃师儿化特征左扩展的具体规则, 预测了特征左扩展的两种模式。声学特征 F3 的两种走势也支持这个预测。因为偃师儿化是同类现象中最复杂的, 对偃师儿化的分析也是对相关理论的一个检验。文章还比较了偃师儿化和北京儿化 F3 两种走势分布条件的差异, 认为元音[a]和[ə]的舌尖特征取值是造成方言间 F3 走势分布条件不同的重要因素。

关键词: 儿化 特征扩展 中间音 F3 走势

0. 引言

与印欧语系语言相比, 汉语缺乏形态变化。但是在一些汉语方言中, 小称后缀“儿”却会引发复杂的音系变化。山西平定(徐通锵 1981)、山东阳谷(董绍克 1985)、山东高密(董绍克 1993)、山东金乡(马凤如 1984)、河南泌阳(李宇明 1996)、河南偃师(马克章 1990)等方言中, 儿化不仅表现为韵母卷舌, 在某些条件下, 在声母和韵母之间还产生了一个类似边音或闪音/颤音的中间音(medial)。目前已经有各种理论提出以解释这种现象, 其中重要的有: 中缀说(infixation)(Yu 2004, Lin 2008)、环缀说(circumfixation)(Yip 1990, 引自 Duanmu 1990)、卷舌特征扩展说(retroflex feature spreading)(Duanmu 1990, Chen 1992, 王洪君 2008)、认可说(licensing account)(Yip 1992)。

儿化后产生一个新的中间音, 这样的现象目前仅见于山西、山东和河南地区。根据历史记载(裴泽仁 1988), 明洪武时期政府曾组织从山西到山东和河南的大规模移民, 随后此类移民现象贯穿有明一代。至今这个区域的方言尚保留诸多相同之处。另外, 在已报道有儿化闪音/边音的方言点中, 儿化后产生的新中间音虽然具体音色有所不同, 但语音条件基本是相同的。因此, 笔者认为, 上述不同方言点发生的这些现象应该是同一类现象, 需要一个统一的理论来解释。这样, 我们只需要就一个方言点做具体而微的分析, 分析结果应该也适用于拥有此类现象的所有方言。

河南偃师方言中, 声母和韵尾都成为儿化结果分化的条件, 是目前所报道的此类现象中最复杂的。本文将分析偃师方言儿化的音系表现和声学性质, 从

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而检验哪种理论能最好的解释此类现象。马克章（1990）曾经报道过偃师方言的儿化，但描写不太明晰，也没有找到偃师方言儿化的全部条件。因此笔者两次深入偃师县缙氏镇，做了更为全面和详实的调查。本文使用的所有关于偃师的材料，都来源于笔者本人的调查和整理。

1. 偃师方言音系

因为偃师方言儿化的结果与声母和韵尾都有关系，因此需要先了解偃师方言的音系。偃师方言有 23 个声母，39 个韵母，见（1）和（2）。声调在儿化中不起作用，这里暂不列出。

(1) 声母: p p^h m f v t t^h n l ts ts^h s tʂ tʂ^h ʂ ʃ tɕ tɕ^h ɕ k k^h x 0

(2) 韵母¹: ɿ ʅ i u y a ia ua ɤ uo yɔ ε iε uε ye ai iai uai əi uəi au iau əu
iəu an ian uan yan ən iən uən yən aŋ iaŋ uaŋ əŋ iəŋ uəŋ yəŋ

2. 偃师方言的儿化

2.1 四种儿化模式

偃师方言的“儿”音形是一个卷舌边音[ɻ]。“儿”后缀与前行音节融合，引起前行音节发生复杂的变化。从听感上，儿化音节可以分为四种：卷舌近音加韵母卷舌、颤音加韵母卷舌、闪音加韵母卷舌、纯粹韵母卷舌。举例见（3）。

(3) a. [ɿ ... ɻ]	pa	>	pɿa ^r	八	eight
	kau	>	kɿau ^r	羔	lamb
	pu	>	pɿa ^r	醜	white mould
	mo	>	mɿa ^r	沫	foam
	paŋ	>	pɿa ^r	帮	side
b. [r ... ɻ]	tau	>	trɔ ^r	刀	knife
	tu	>	tru ^r	犊	calf
	t ^h u	>	t ^h ru ^r	兔	rabbit
	tjəŋ	>	tra ^r	钉	nail
c. [ɻ ... ɻ]	nɿjau	>	nɿjɿɔ ^r	鸟	bird
	pj ^h əŋ	>	pj ^h ɿa ^r	瓶	bottle
	tɕjau	>	tɕjɿɔ ^r	饺	dumpling
	tsa	>	tsɿa ^r	渣	residue
	ts ^h u	>	ts ^h ɿu ^r	粗	thick
d. [... ɻ]	tʂuaŋ	>	tʂua ^r	庄	village
	tʂ ^h un	>	tʂ ^h uə ^r	唇	lip
	pjan	>	pja ^r	边	edge
	tai	>	ta ^r	带	lace
	tan	>	ta ^r	单	sheet
	kan	>	ka ^r	干	dry
	san	>	sa ^r	三	three

¹这里在汉语传统意义上使用“韵母”概念。“韵母”结构是GVX，不同于英语的“rime”。

(3) 中所有儿化音节上标的“r”只表示韵母卷舌，不表示一个独立的音段。声母和韵母之间的“r”表示舌尖颤音。声调在儿化变音中不起作用，所有词例声调均不标出。关于介音在音节中的地位，端木三(1990, 2000)认为属于声母，包智明(1990, 1996)认为有方言差异和不同介音行为的差异，王洪君(2008)认为介音占有独立的时间格，可以依据研究目的来决定介音归声母还是独立成份，朱晓农(2005)观察到介音接近声母还是韵母有随机性，孙景涛(2006)将介音视为独立于声韵的一个单位。下文暂时把介音处理为声韵之间的独立成分，并用滑音(glide)标写介音，以示其独立地位。但在(2)韵母系统中尊重汉语研究的传统习惯，用元音标写。例如“钉”字在上文(3)中标写为[tjəŋ]，但在(2)韵母系统中，标为[iəŋ]。

从(3)我们看到，a、b、c三类儿化在声母和韵母之间产生一个新的中间音(medial)，并且依声母的不同有不同的语音性质。为了区分两种不同的medial，以下称儿化后产生的medial为中间音，称基本音节中原有的medial为介音。当然，(3)中的描写(transcription)完全依据听感。儿化中间音的语音性质及其在音节中的地位将会在(4)中进一步讨论，这里为了描写方便，放在声母和韵母之间。

2.2 儿化条件和再分类

从(3)中词例可以看到，偃师方言四种儿化模式的产生条件既与声母有关，又与韵尾有关。a类儿化形式的产生条件是：声母是唇音或软腭音，且韵尾是后元音或腭鼻音(后鼻音)；b类的条件是：声母是龈塞音，且韵尾是后元音或腭鼻音(后鼻音)；c类的条件是：声母是舌尖音，且韵尾是后元音或腭鼻音(后鼻音)。d类还可以分为两个小类。d1类的条件是：声母是卷舌音，没有韵尾条件；d2类的条件是：韵尾是前元音或前鼻音，没有声母条件。偃师方言儿化四个模式的条件概括为(4)。

(4)	声母	韵尾
a.[ɹ ...]	唇音或软腭音 (Labial or Velar)	后元音或腭鼻音 ([+back] vowel or velar nasal)
b.[r ...]	龈塞音 (Alveolar stop)	后元音或腭鼻音 ([+back] vowel or velar nasal)
c.[ɹ ...]	舌尖音 (Coronal)	后元音或腭鼻音 ([+back] vowel or velar nasal)
d1.[...]	卷舌音 (Retroflex)	
d2.[...]		前元音或龈鼻音 ([+front] vowel or alveolar nasal)

从(4)可以看出，偃师儿化4个模式中，a、b、c三类韵尾都是后元音或腭鼻音，并且听感上都在声母和韵母之间出现一个中间音。d2类要求韵尾是前元音或龈鼻音，并且听感上在声母和韵母之间也没有中间音产生。因此如果把卷舌音声母暂时排除在外，就可以根据是否产生中间音把偃师儿化再分类为(5)。

(5) 产生中间音：韵尾必须是后元音或后鼻音。

不产生中间音：韵尾必须是前元音或前鼻音。

2.3 初步结论

因为“儿”后缀附着在实词之后，因此“儿”与前行音节的融合过程就是从右向左的过程。在阳谷、平定、泌阳等方言中，因为只有声母的发音位置决

定是否产生中间音，这个融合过程是否分步骤无法观察。因此有“中缀”、“环缀”、“认可说”等多种理论提出来，来解释儿化中间音的产生。但是在偃师方言中，声母和韵尾都是分化儿化结果的条件。韵尾的前后不同决定是否产生中间音，声母发音位置的不同只能决定产生什么性质的中间音，因此提供了一个观察儿化步骤的很好的实例。我们再来比较一下相关词例。见（6）。

- (6) 帮儿 paŋ + ʅ > pjaʳ 钉儿 tʃəŋ + ʅ > traʳ
班儿 pan + ʅ > paʳ 单儿 tan + ʅ > taʳ

从（6）我们看到，偃师方言中，同样都是唇音，儿化后有的产生卷舌近音，有的不产生卷舌近音；同样都是舌尖音，儿化后有的产生颤音，有的不产生颤音。关键在于韵尾前后的不同。就是说，在声母条件起作用之前，韵尾条件已经先起了作用：韵尾特征为后的产生中间音，韵尾特征为前的不产生中间音。因此可以判断韵尾是分化儿化结果的第一步条件，声母是第二步的条件。即儿化结果是受两个条件的制约、分两个步骤实现的，方向是从右向左。这样的儿化结果，“特征扩展”理论可以很简单的解释。正是因为“儿”后缀特征向左扩展，前行音节的韵尾、韵腹、介音和声母都有可能成为特征左扩展的条件，从而造成扩展过程的步骤性。“中缀”、“环缀”、“认可说”等理论无法解释这个步骤性。这样，我们可以有一个初步的结论：

- (7) 偃师儿化是“儿”后缀特征左扩展形成的。

王志洁（1997）用特征理论来分析北京儿化韵的形成。偃师方言的儿化看似非常复杂，但同样也是特征扩展形成的，可以用特征理论来分析其生成过程。

3. 特征左扩展

3.1 有关项目的赋值

与北京话相比，偃师方言的儿化条件分化更精细，结果也更为复杂。但如果使用非充分赋值（underspecification）只分析相关特征，就会简化音系表达。使用主动发音器官模型²，相关项目的非充分赋值见（8）。英文部分Cor代表Coronal，SP代表Soft Palate，Dor代表Dorsal，nas代表nasal，ant代表anterior。

- (8) “儿”后缀[ʅ]：舌尖-[-前]，软腭-[-鼻音]（Cor-[-ant]，SP-[-nas]）

唇音和软腭音：非舌尖音（Non Coronal）

龈塞音：舌尖-[+前，+塞]（Cor-[+ant，+stop]）

龈音：舌尖-[+前]（Cor-[+ant]）

卷舌音：舌尖-[-前]（Cor-[-ant]）

后元音：舌体-[+后]（Dor-[+back]）

前元音：舌体-[-后]，[舌尖]³（Dor-[-back]，[Coronal]）

腭鼻音：舌体-[+后]，软腭-[+鼻音]（Dor-[+back]，SP-[+nas]）

² 关于主动发音器官模型的理念、理论和方法，请参看Ladefoged & Halle（1988）、Halle（2003）和端木（2009）。

³ 根据Halle（2005），所有元音的主动发音器官都有舌体，但是具有[-后]特征的元音的主动发音器官还有舌尖。注：Halle这里把主动发音器官也作为一个特征。

龈鼻音：舌尖-[+前]，软腭-[+鼻音] (Cor-[+ant], SP-[+nas])

3.2 扩展规则

偃师方言儿化是“儿”后缀的两个特征舌尖-[前]和软腭-[鼻音]左扩展形成的。概括的说，特征左扩展要受到非曲拱原则 (Non Contour) 的制约，即同一个音段中不可以出现同一发音器官同一特征的正反取值。相反特征值要么阻挡舌尖-[前]和软腭-[鼻音]的左扩展，要么被删掉。偃师儿化特征左扩展的具体规则见 (9)：

(9) a 特征舌尖-[前] (Cor-[anterior]) 左扩展，删除相反特征，或者被阻挡。

如果前行音节只有一个相反特征值舌尖-[+前] (Cor-[+anterior])，它就会阻挡特征舌尖-[前]的左扩展；如果前行音节有超过一个相反值舌尖-[+前]，最右面的一个被删掉，左面的一个阻挡舌冠-[前]左扩展。

b 特征软腭-[鼻音] (SP-[nasal]) 左扩展，删除韵尾位置的鼻音。

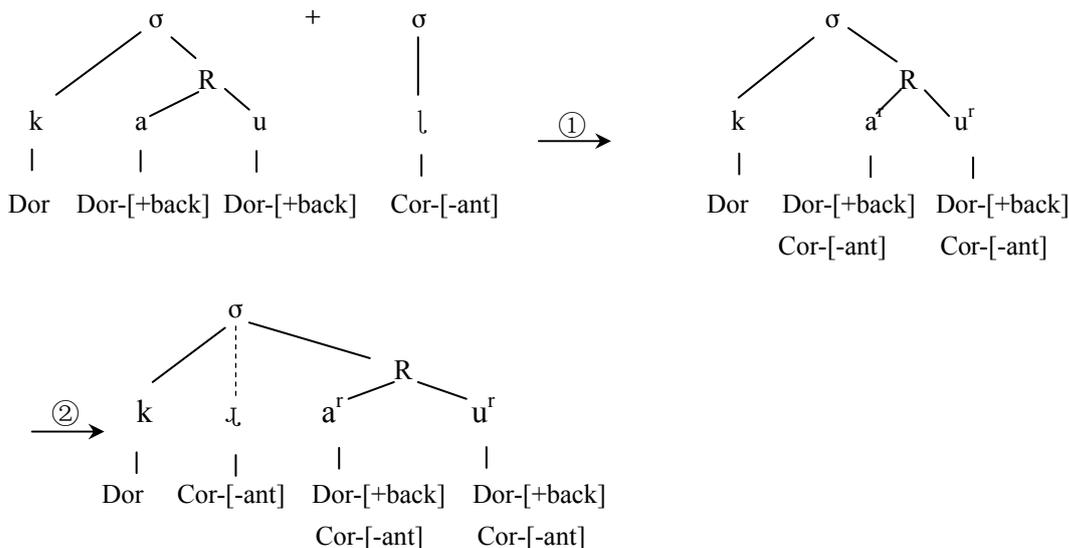
3.3 举例分析

下面逐一举例分析偃师方言四种儿化模式的生成。为了行文的方便，在文字部分使用中文术语，示例部分采用英文术语。中英文术语的对照见 (8)。这里的分析只集中在“儿”后缀特征的左扩展和中间音产生的条件，儿化后韵母合并有自己的规则，本文暂不涉及。

3.3.1 模式 a

在模式 a 中，声母是非舌尖音（唇音或腭音），韵尾是后元音或腭鼻音。目前所收集到的儿化词都没有介音。一般来说，韵腹受韵尾的影响大于受韵头的影响（石峰 2008）。韵尾后元音和腭鼻音都是舌体-[+后]，因此韵腹主元音也具有特征舌体-[+后]。“儿”后缀左扩展特征的主动发音器官是舌尖，因而可以叠加到韵尾和韵母上，一直扩展到声母。声母是非舌尖音，整个韵母卷舌，从非舌尖声母到卷舌韵母之间作为过渡产生一个卷舌近音。(10) 以音节[kau]为例分析模式 a 的生成。

(10) kau > k_ɹau^r



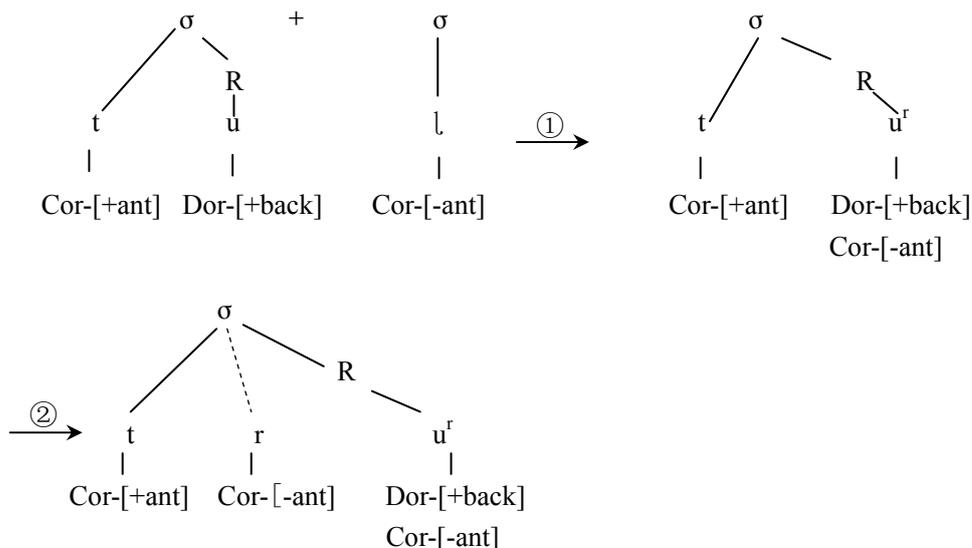
根据 (10) 所示，模式 a 的生成共需要两步。第一步：因为没有遭遇相反特征

值，特征舌尖-[-前]左扩展贯穿整个韵母；第二步：在非舌尖声母与舌尖-[-前]韵母之间作为过渡产生一个卷舌近音。

3.3.2 模式 b

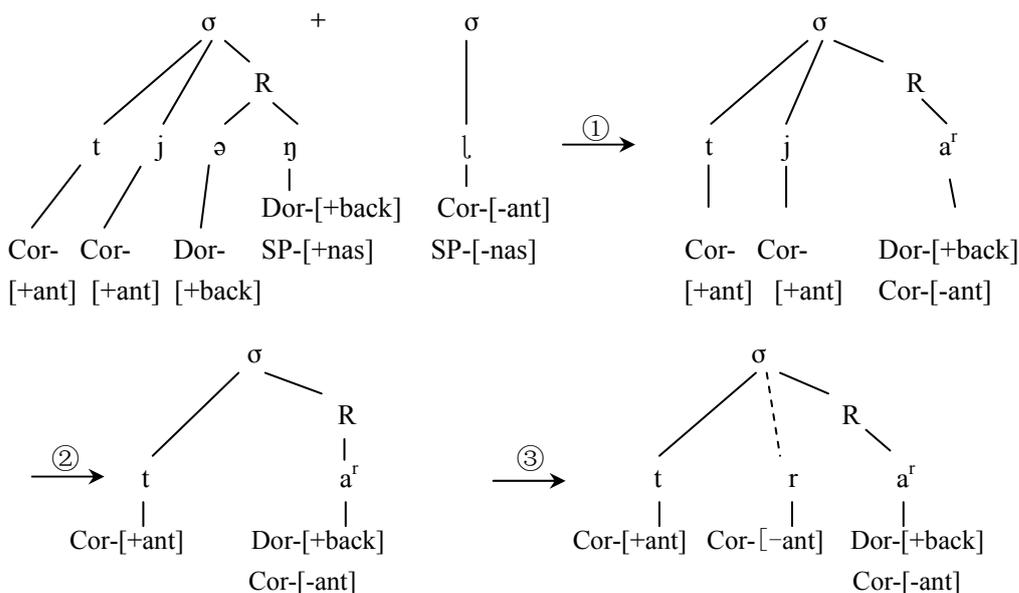
在模式 b 中，声母是龈塞音，韵尾也是后元音或腭鼻音。因此同模式 a 一样，特征舌尖-[-前]左扩展贯穿整个韵母，直至声母。从声母的特征舌尖-[-前]，到韵母的相反特征舌尖-[-前]，加上爆破的强气流，产生了过渡音舌尖颤音。(11) 以音节[tu]为例分析只有一个舌尖-[+前]特征的音节的儿化生成。(12) 以音节[tjəŋ]为例分析有两个舌尖-[+前]特征的音节的儿化生成。

(11) tu > tru^r



音节[tu]的儿化生成比较简单。第一步，特征舌尖-[-前]左扩展至整个韵母，并被声母的舌尖-[+前]阻挡；第二步，在声母舌尖-[-前]与韵母舌尖-[+前]之间产生一个过渡性颤音。

(12) tjəŋ > tra^r



(12) 中音节[tjəŋ]有两个特征舌尖-[+前]，因此儿化生成比较复杂。第一

步，根据扩展规则（9）b，腭鼻音韵尾的特征软腭-[+鼻音]与左扩展特征软腭-[-鼻音]相反，被删去。第二步，根据扩展规则（9）a，介音特征舌尖-[+前]与扩展特征相反，被删除；声母特征舌尖-[+前]阻挡特征舌尖-[-前]左扩展。第三步，作为从舌尖-[+前]到舌尖-[-前]过渡，产生一个舌尖颤音。

3.3.3 模式 c

在模式 c 中，声母是舌尖音，韵尾是后元音和腭鼻音。特征舌尖-[-前]左扩展贯穿整个韵母，直至被声母舌尖-[+前]阻挡，例如 *tɕ* 组和 *ts* 组。或者被介音舌尖-[+前]阻挡，如 *pj* 组。模式 c 的生成过程与模式 b 大致相同，不同之处在于，模式 c 的声母不是舌尖塞音，气流不太强，因此没有产生颤音。作为过渡，声母和韵母之间产生一个闪音 [ɾ]。

3.3.4 模式 d1

在模式 d1 中，声母是卷舌音。这就意味着无论韵尾是什么，卷舌声母的儿化音节，从发音开始舌尖就处于后卷状态，并且卷舌状态持续到发音结束，整个音节都是特征舌尖-[-前]。

3.3.5 模式 d2

在模式 d2 中，韵尾必须是舌尖-[+前]，韵腹主元音受韵尾同化，也具有特征舌尖-[+前]。这样就有至少两个舌尖-[+前]。根据扩展规则（9）a，最右面的韵尾被删掉，前行主元音阻挡特征舌尖-[-前]左扩展。

3.4 预测：特征左扩展的两种程度

根据以上 4 个模式的分析，可以预测特征左扩展有两种程度：一种是左扩展贯穿整个韵母，到达声母；一种是左扩展只替代了韵尾的位置，在韵母的中间。模式 a、b、c 属于第一种，听感上都产生一个中间音。模式 d 的共同特征是在声韵母之间没有产生新的中间音，但是 d1 类因为声母就是卷舌，从发音开始舌尖就处于后卷状态，特征左扩展应该也是贯穿整个韵母。d2 属于第二种。

当然，这只是一个理论的预测，还需要声学方面的证据。因为卷舌韵母的一个最重要的声学性质就是 F3 的下降，根据特征左扩展两种程度的预测，可以预测 F3 的下降应该有两种表现模式。

3.5 声学证据：F3 的两种走势

四种儿化模式样本的声学分析表明，偃师儿化的 F3 走势可以分为两类。一类是从韵母一开始就下降，并且整体表现为水平或略上升走势，包括模式 a、b、c 和 d1。一类是从韵母中间部分才开始突然下降，或者从韵母开始逐渐下降，仅包括模式 d2。下文均称第一种 F3 走势为水平型，第二种 F3 走势为斜线型。下面分别从非卷舌声母和卷舌声母来观察 F3 的两种走势。

3.5.1 非卷舌声母

图 1 到图 5 举例展示了非卷舌声母四种儿化模式 F3 的两种走势。其中图 1 是 a 类，图 2 是 b 类，图 3 是 c 类，图 4 和图 5 是 d2 类。每幅图中左面一个语图是单字音，右面的语图是一个双音节或三音节儿化词，儿化音节在儿化词的末尾。F3 数据使用 Praat 语音软件测得。图 1、图 2 和图 3 中单字音节和儿化音节 F3 大致呈水平走势，因而取中值。图 4 中因为 F3 在中间部分有明显断裂而分为两段，分别采用两段的中值。图 5 中 F3 从韵母一开始就斜线式下降，采用起始段最高值和收尾段最低值。

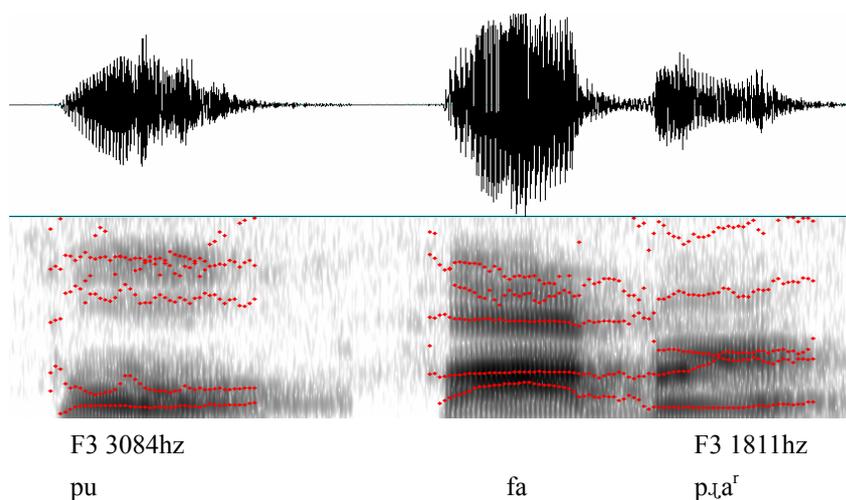


图 1: a类儿化模式。相对于单字音[pu], 儿化音节[pɿaʳ]的F3 从声母一结束就下降, 并整体呈水平走势。

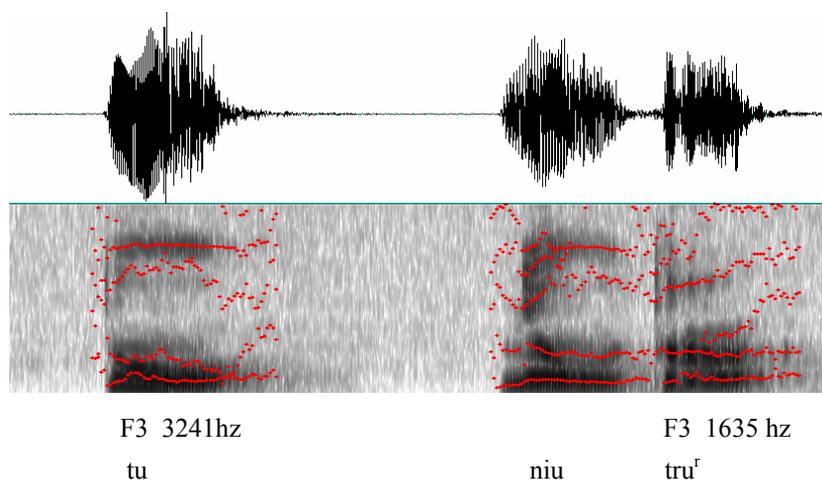


图 2: b类儿化模式。因为颤音造成能量弱化, 韵母前半部分表现为波形图振幅大小相间, 频谱图共振峰浓淡相间, 影响F3 的提取。但是仍然可以看出相对于单字音[tu], 儿化音节[truʳ]的F3 从声母一结束就下降, 并整体呈水平且略上升走势。

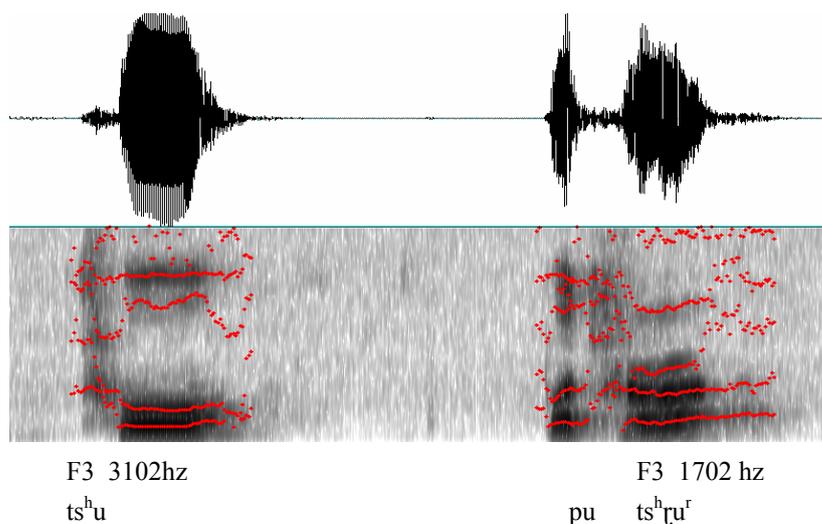
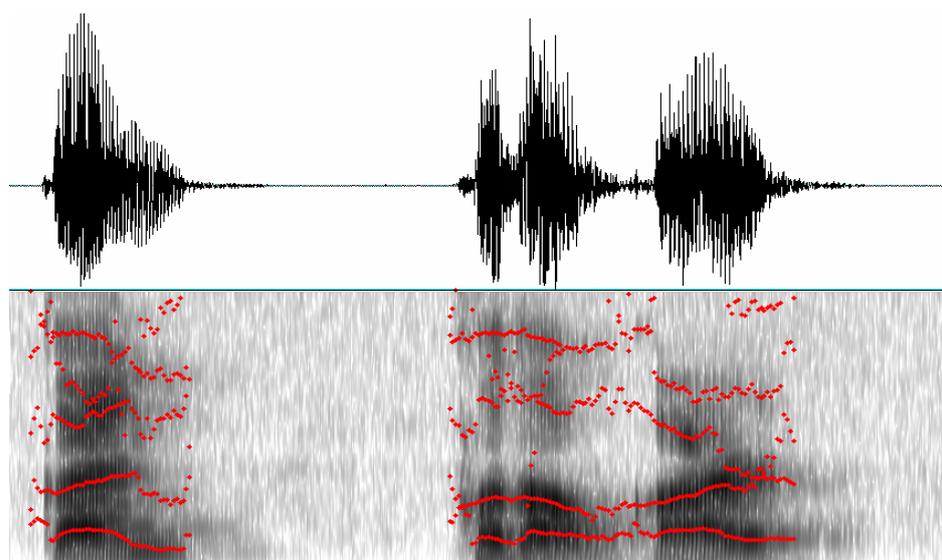


图 3: c类儿化模式。相对于单字音[tsʰu], 儿化音节[tsʰɿuʳ]的F3 从声母一结束就下降, 并整体呈水平走势。



F3 2578hz

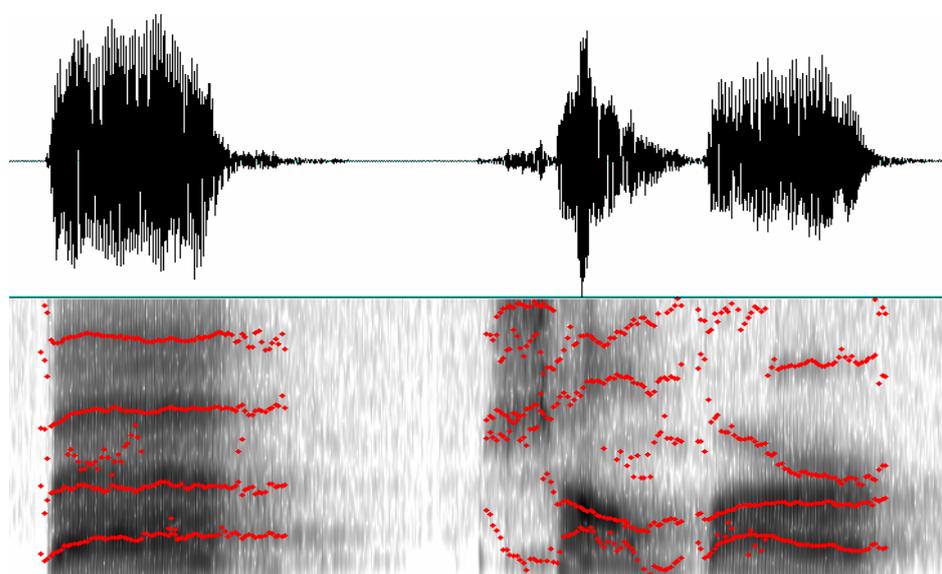
kan

F3 2701-1828hz

p^hu t^hau

ka^r

图 4: d2 类儿化模式。相对于单字音[kan], 儿化音节[kar]的F3 从韵母中间部分突然下降。



F3 3032hz

pan

F3 2962-1811hz

saŋ

pa^r

图 5: d2 类儿化模式。相对于单字音[pan], 儿化音节[pa^r]的F3 从韵母一开始斜线式下降。

3.5.2 卷舌声母

从听感上，卷舌音声母属于 d 类，没有中间音产生。但是从声学表现看，F3 的走势与 a、b、c 类相同。无论单字音韵尾特征是前还是后，儿化音节的 F3 都是从韵母一开始就下降，并整体表现为水平走势。可见 F3 的走势与韵尾的前后无关，而完全由卷舌声母的特殊性质决定。

3.6 小结

F3 的两种走势证实了 3.4 的分析和推测，从而也证明了偃师儿化是“儿”特征左扩展形成的。F3 从声母一结束韵母刚开始就直线下降，并且整体呈水平走势，说明“儿”特征舌尖-[-向前]左扩展至声母；F3 从韵母中间部分突然下降，或者从韵母开始部分逐渐下降，说明“儿”特征舌尖-[-向前]左扩展只到韵母中间。这样的结果也印证了 2.3 的初步结论。斜线型说明特征左扩展只实现了第一步，只有韵尾条件起作用，声母条件没有起作用；水平型说明儿化特征扩展实现了两步，韵尾条件和声母条件都起了作用。如果不是特征左扩展生成的，就不会出现这样的 F3 的两种走势。

4. 中间音的语音性质和音系处理

4.1 闪音/颤音与边音

偃师儿化模式 a 的中间音是一个卷舌近音。听感上这个近音处于声母和韵母之间，但是从语图上看（例如图 1），这个近音完全是卷舌韵母的一部分，很难提取出来。因此这里主要讨论模式 b 和模式 c 中间音的性质。

与其它方言中所报道的相同，偃师方言在舌尖声母后产生一个类似边音和闪音的中间音。要确定这个中间音的语音性质，首先要区分闪音/颤音（flap/trill）和边音（lateral）。《语音学与音系学词典》（特拉斯克 2000）对闪音（flap）的定义是：通常是舌尖与口腔上部快速接触一次产生的辅音。⁴对颤音的定义是：一个发音器官快速接触另外一个发音器官，或者发音器官（除了声带）快速颤动产生的辅音。⁵从定义可以看到，闪音和颤音有一个共同特点就是发音器官之间的快速接触（rapid contact），因此这里先把闪音和颤音放在一组，分析它们与边音的区别。从声学性质来看，闪音/颤音和边音的区别有下面几点：

a. 闪音/颤音常常表现为元音部分能量的弱化。例如英语中清塞音在元音之间弱化为一个闪音，语图表现为两个元音之间振幅的减小。图 6 是英语 marketability 末音节首辅音 t 的波形图。语音样本来自 On-line Webster 的真人发音。两边振幅大的部分是两个元音 i 和 y，中间振幅小的部分是闪音化的 t（实际发音为[r]）。边音不依赖元音而存在，可以在元音前、元音后，也可以在元音中间。图 7 是偃师方言音节[lau]的一部分。左面共振峰结构较为简单、振幅较小的部分是边音，右面共振峰结构较为复杂、振幅较大的部分是元音。

b. 元音的周期结构比较复杂，闪音和颤音只是表现为能量的弱化，周期结构并没有简化。而边音的周期结构相对元音比较简单，看起来比较干净。

c. 闪音和颤音部分的振幅非常小，与没有弱化的元音振幅对比强烈；边音的振幅虽然也比元音要小，但是对比不太强烈。

⁴ 原文为：A consonant produced by a single rapid contact between usu. the tip of the tongue (which then returns to rest) and the roof of the mouth.

⁵ 原文为：A consonant made by the rapid tapping of one articulator against another or the vibration of the articulator (excluding that of the vocal cords).

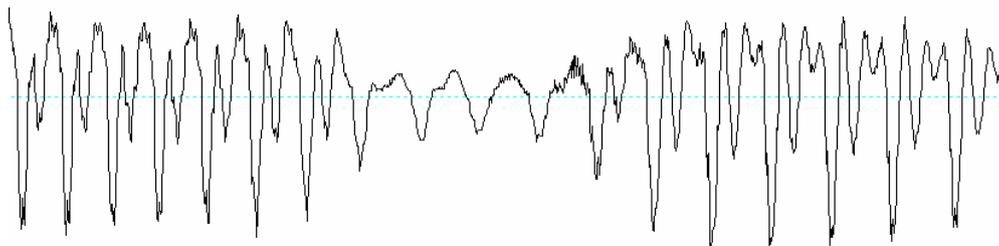


图 6：英语 marketability 的一部分。中间振幅小的部分是末音节首辅音 t，两边是元音部分。

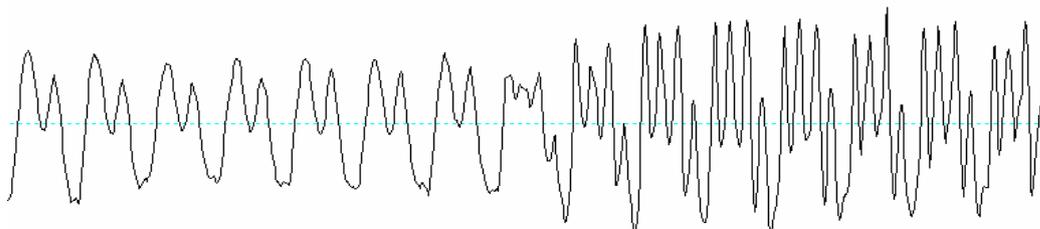


图 7：偃师方言音节 lau 的一部分，左面是边音，右面是元音。

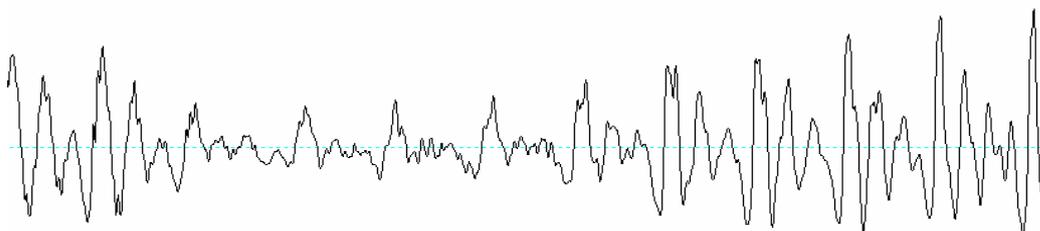


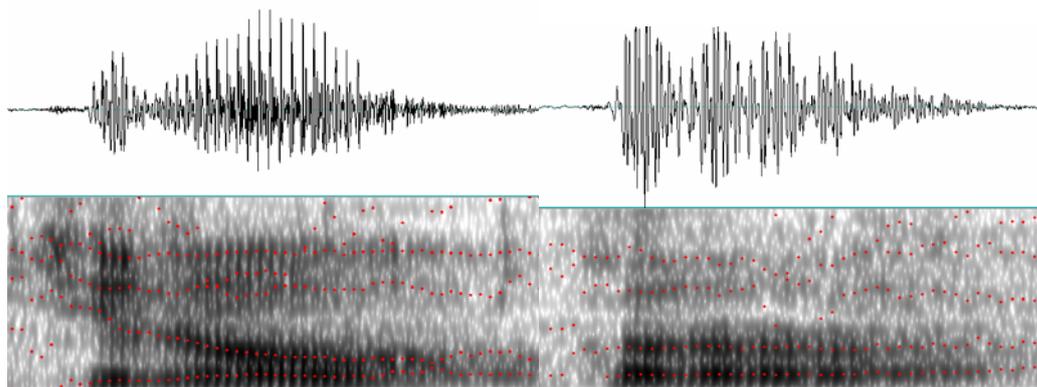
图 8：偃师方言音节“饺儿”[tɕjɹau]的一部分。中间振幅小的几个周期是闪音部分，两边是元音部分。

图 8 是偃师方言音节“饺儿”的一部分。中间音在元音部分出现，相对于两边元音，中间音的振幅非常小，并且周期结构没有简化，因此判断这个中间音是闪音/颤音，而不是边音。

4.2 闪音和颤音

从《语音学与音系学词典》(特拉斯克 2000) 关于闪音和颤音的定义我们还可以看到二者的不同。闪音是主动发音器官与被动发音器官之间的一次快速接触 (single rapid contact)，颤音可能是多次接触 (rapid tapping or the vibration of the articulator)。因此我们大致可以从语图上能量弱化的次数来区分闪音和颤音。

偃师方言中如果舌尖声母是塞音，元音部分的能量弱化就不止一次。例如图 9 中“饺儿”元音部分只有一次能量弱化，我们记为闪音 (flap)。“犊儿”元音部分有多次能量弱化，我们记为颤音 (trill)。当然闪音和颤音还有发音时气流机制的区别。闪音是舌的自主行为，颤音是舌的不自主行为。根据语图的比较，偃师方言儿化中舌尖塞音声母产生的是颤音，非塞音舌尖声母产生的是闪音。



饺子[tejrau]

犊儿[tru]

图 9：左面语图是闪音，有一次能量弱化，表现为波形图有一次振幅减小，频谱图有一次浓淡相间。右面语图是颤音，有多次能量弱化，表现为波形图有多次振幅大小相间，频谱图有多次浓淡相间。

4.3 复辅音与复杂辅音

就语图来看，偃师方言儿化的闪音/颤音是元音的特征，不是一个独立的声段。但是在音系处理时，可以把这个闪音/颤音独立出来，作为元音前的一个辅音。实际上颤音完全是元音的叠加特征，不能脱离元音而存在。例如一个元音 [a] 叠加颤特征，波形图如图 10。语音样本来自北京大学合唱队一男性队员，使用语音分析软件 Praat 提取波形图。

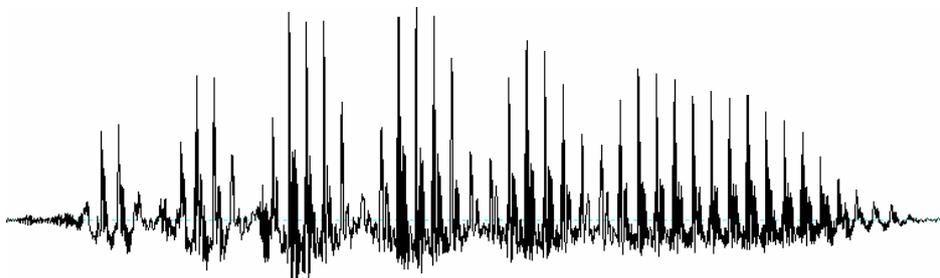


图 10：颤音[ra]。语音样本来自北京大学合唱队一男性队员。波形图表现为多次振幅减小，“颤”特征贯穿几乎整个元音。

图 10 中颤音贯穿几乎整个元音，但描写的时候，把这个颤音提取出来，放在元音前面，描写为[ra]。如果前面还有一个辅音，可以处理为复辅音，也可以处理为复杂辅音。例如“肚儿”可以记为[rʉ]，“饺子”可以记为[tɕ^hrau]，用上标符号表示次要发音（secondary articulation）。就汉语的音节结构来说，最好处理为复杂辅音。这样儿化音和单字音一样，都是 CVX 结构（端木 1990）。

4.4 关于双音节

董绍克（1985，1993）把有舌尖介音 [j] 的儿化描写为双音节。例如音节 [pian] 的儿化音节记为 [pila]。如果按照上面分析，阳谷方言、高密方言、泌阳方言和偃师方言的语音表现是一样的话，这样的描写就值得质疑。

首先是描写符号的问题。如果把介音记为 [j]，整个音节就是 [pjan]，儿化音节就是 [pjla]。这样就很难说是双音节了。

其次是中间音的语音性质的问题。如果不是一个边音，而是一个闪音，那实际上就是元音的一部分，只不过音系处理的时候提到元音之前，看起来是声母的一部分。声母可以处理为复辅音，也可以处理为复杂辅音。如果处理为复杂辅音，音节[pjan]的儿化形式就是[p^ha^h]。

最后是“音节”的确定的问题。如何判断是一个音节还是两个音节，本身就是个难题。但是我们可以从下面几个方面来讨论：

a. 音长。双音节应该比单音节长，有舌尖介音的音节儿化后出现闪音或颤音，但整个儿化音节的音长并不比原来的音节长。例如单字音“家”音长是340毫秒，儿化音“家儿”是335毫秒。

b. 一个响度峰就是一个音节？图11中“饺子”，从语图上看有两个响度峰，但不能就此认为是有两个音节。因为如果按照这个依据，图11中颤音“犊儿”至少有四个响度峰，就是至少有四个音节。这显然是荒谬的，也不符合当地人的语感。

c. 一个音节一个声调。相对于英语，汉语中的音节数量是容易判断的，因为汉语中一个音节总是对应一个声调，可以一个音节一个音节的来念。如果说“饺子”类词是双音节，就应该有两个声调；“肚儿”类词是多音节，那么就on应该有多个声调。实际上这是不可能的。根据当地人的语感，“饺子”和“肚儿”都只有一个声调。

d. 肌肉张弛一次？根据当地人的语感，“家”发音时肌肉张弛一次，“家儿”发音时肌肉张弛也是一次。

根据以上分析，我们认为，山东、河南等地有[j]介音的儿化音节，应该都是单音节，而不是双音节或者多音节。

5. 偃师儿化与北京儿化

5.1 显性与隐性

北京话儿化中，无论韵尾和声母是什么，听感上都没有中间音。根据王理嘉、贺宁基（1985）的实验结果，北京话的儿化主要表现为F3斜线式大幅度下降。但有的从声母一结束就下降几百个赫兹。什么时候是第一种情况，什么时候是第二种情况，作者没有详细的说明分布条件。

根据石峰（2008：311-324）的分类，北京话的儿化按声学表现可以分为3类：拼合型、融合型和鼻化型。拼合型儿化韵有[ɔɹ]、[aɹ]、[eɹ]三个，F3表现为斜线型下降（语图表现类似本文图5）；融合型儿化韵有[ɤɹ]、[uɹ]两个，F3表现为水平型或者略有上升（语图表现类似本文图1、2、3、4）。融合型儿化韵的主要元音都是后元音。其中鼻化型可以与拼合型共现，也可以与融合型共现。

这样看来，北京话儿化的F3走势其实也分两种，一种是斜线型，从声母一结束斜线下降，或者从韵母中间才斜线下降；一种是水平型，从声母一结束就直线下降，整体呈现水平走势。石峰（2008）显然也是根据F3的走势不同来给北京儿化分类的：如果斜线式下降，就是拼合型，从主元音的发音动作迅速向儿化韵尾发音动作过渡；如果水平下降，就是融合型，主要元音从一开始就跟卷舌韵尾同时发音。

石峰的分类是从发音角度出发，如果从特征扩展的角度，拼合型就是卷舌特征只扩展到韵母中间部分，融合型就是卷舌特征扩展到韵母开始部分。按照石峰（2008）的分类，笔者整理了北京话儿化F3的两种走势与单字音的对应关

系。见表 1。

F3	单字音			
	无韵尾		有韵尾	
	主元音	特征	韵尾	特征
水平型	ɤ u	后	əŋ、aŋ、oŋ	后
斜线型	i y ɿ ə、a、e	非后	əi、ai、an、ən	非后
			əu、au	后
			əŋ、aŋ、oŋ	后

表 1

从表 1 可以看出，在没有韵尾的情况下，F3 的走势与主元音的特征直接相关。如果主元音具有“后”特征，F3 就是水平型；如果主元音具有“非后”特征，F3 就是斜线型。有韵尾的情况下，如果韵尾具有“非后”特征，就是斜线型；如果韵尾具有“后”特征，就表现为随机性，可能是斜线型，也可能是水平型。

可见北京儿化虽然听感上没有中间音产生，但同偃师儿化一样，F3 的走势也有水平型和斜线型两种。水平型就意味着卷舌特征扩展至声母，斜线型就意味着卷舌特征扩展至韵母中间部分。同样都是卷舌特征扩展至声母，偃师方言既有 F3 走势特征，又有听感上的特征，可以称之为显性特征；北京方言只有 F3 走势特征，没有听感上的特征，可以称之为隐性特征。至于为什么有显性和隐性的差异，还需要进一步的工作来探讨。

无韵尾的情况下，F3 两种走势的分布与偃师是一致的。无韵尾是一个方便的说法，其实是韵腹元音与韵尾元音同形。元音具有“后”特征，F3 就是水平型，说明卷舌特征在韵母部分没有遇到相反特征，一直扩展到声母；元音具有“非后”特征，F3 就是斜线型，说明卷舌特征遭遇相反特征，只能删掉最右面的一个，左面的一个阻挡其左扩展。

需要解释的是，为什么在有韵尾的情况下，F3 的走势与偃师有所不同。在北京儿化中，为什么如果韵尾具有“非后”特征，F3 都是斜线型；如果韵尾具有“后”特征，F3 可能是斜线型，也可能是水平型？因为有尾韵的主元音只有 [a] 和 [ə]，我们需要考虑 [a] 和 [ə] 的语音性质和音系表现。

5.2 [a]和[ə]的舌尖特征

在北京话 5 个元音中，[a]和[ə]的定位性是最差的。通过充分赋值，可以清楚的看到[a]和[ə]的不稳定性。北京话元音的充分赋值见 (13)。

(13)		i	u	y	a	ə
	高	+	+	+	-	-
	低	-	-	-	+	-
	前	+	-	+	-	-
	圆唇	-	+	+	-	-

从 (13) 可以看到，北京话元音高度有三级对立，前后有两级对立。在高低这个维度，[a]处于低位，[ə]处于非高非低；在前后这个维度，[a]和[ə]都处于非前非后。如果有韵尾，[a]和[ə]就很容易受到韵尾性质的影响。北京话韵尾只有四个：-i、-n、-u、-ŋ。在儿化过程中，左扩展的特征是舌尖[-前]，属于前后

一维，因此四个韵尾常常按前后分组行动。[a]和[ə]的前后性质就会受到韵尾前后的影响。这种非对立性的语音性质常常影响音系活动的结果。

偃师方言的元音有 6 个，在整个元音系统中，[a]和[ə]的定位性同样也是最差的。我们仍然通过充分赋值来观察[a]和[ə]的定位性。见（14）。

(14)		i	u	y	a	ə	ɛ
	高	+	+	+	-	-	-
	低	-	-	-	+	-	-
	前	+	-	+	-	-	+
	圆唇	-	+	+	-	-	-

同北京话一样，偃师方言的韵尾也只有 -i、-n、-u、-ŋ 四个。在儿化中四个韵尾分前后两组活动。[a]和[ə]的前后性质就会受到韵尾前后的影响。

在北京话和偃师话中，[a]和[ə]都具有[-后]特征。根据 Halle (2005)，具有[-后]特征的元音的主动发音器官除了舌体（dorsal）之外，还有舌尖（coronal）。因此需要考虑[a]和[ə]舌尖的情况。舌尖动作向前还是向后，在每个方言中表现不同，在有韵尾和无韵尾情况下表现也不同。

无韵尾的情况。在偃师方言中，[a]和[ə]都是舌尖-[-前]，与左扩展的特征不矛盾，因而卷舌特征可以扩展到声母，F3 表现为水平型。在北京话中，除了[ə]的一个变体[ɤ]表现为舌尖-[-前]，F3 表现为水平型，别的变体和[a]表现为舌尖-[+向前]，与扩展特征矛盾，F3 表现为斜线型。

有韵尾的情况。在偃师方言中，在韵尾具有舌尖-[+前]特征时（-i、-n），[a]和[ə]的舌尖性表现为舌尖-[+前]，与扩展特征矛盾，F3 都表现为斜线型。在韵尾不具有舌尖-[+前]时（-u、-ŋ），[a]和[ə]的舌尖性表现为舌尖-[-前]，与扩展特征不矛盾，F3 都表现为水平型。在北京儿化中，在韵尾具有舌尖-[+前]特征时（-i、-n），[a]和[ə]的舌尖性表现为舌尖-[+前]，与扩展特征矛盾，F3 都表现为斜线型。在韵尾不具有舌尖-[+前]时（-u、-ŋ），[a]和[ə]的舌尖性表现为舌尖-[+向前]还是舌尖-[-向前]有一定的随机性，因此 F3 可能是水平型，也可能是斜线型。表 2 总结了偃师方言和北京话在无韵尾和有韵尾两种情况下儿化的声学特征（F3）和听感特征（中间音）与[a]和[ə]舌尖取值的关系：

		偃师			北京		
		[a]和[ə]舌尖取值	F3	中间音	[a]和[ə]舌尖取值	F3	中间音
无 韵尾	a	舌尖-[-前]	水平	有	舌尖-[+前]	斜线	无
	ɤ/o	舌尖-[-前]	水平	有	舌尖-[-前]	水平	无
	ɛ	舌尖-[+前]	斜线	无	舌尖-[+前]	斜线	无
有 韵尾	-i -n	舌尖-[+前]	斜线	无	舌尖-[+前]	斜线	无
	-u -ŋ	舌尖-[-前]	水平	有	舌尖-[+前]/[-前]	斜线/水平	无

表 2

从表 2 可以看到，单元音韵母[a]在偃师儿化中取值为[-前]，F3 呈水平型，在北京儿化中取值为[+前]，F3 呈斜线型。这是因为在两个方言中，[a]在高低一维取值为[+低]，定位是明确的；在前后一维为[-前，-后]，定位是不明确的。在儿化过程中，[a]前后取值影响儿化的结果，最终表现为方言间的差异。

从表 2 还可以观察到，当韵尾是 -i、-n 时，偃师儿化和北京儿化的 F3 表现是相同的，这意味着在这个条件下[a]和[ə]的前后特征取值在两个方言中是相同

的，都具有特征舌尖-[+向前]。当韵尾是-u -ŋ时，偃师方言和北京方言的 F3 表现是不同的，这意味着在这个条件下[a]和[ə]的前后特征取值在两个方言中是不同的。这里可能有两个原因。一，韵腹主元音的语音性质虽然都会受到韵尾的影响，但是这种性质是否在音系过程中表现出来，还是有一定的随机性。二，韵腹主元音的特征取值会受到韵尾的影响，但同时还有自身的独立性。

这样看来，F3 的走势是水平型还是斜线型，既与韵尾有关，又与主元音[a]和[ə]的舌尖特征取值有关。[a]和[ə]的舌尖特征取值的不同，造成方言间的差异。至于是否产生中间音，则是显性与隐性的不同。

6. 其它方言

山东阳谷、高密、即墨和河南泌阳等地儿化闪音/边音只在舌尖声母后产生，和韵尾无关。平定方言的儿化无论声母和韵尾是什么都产生闪音/边音。如果这些方言点的描写是正确的，根据以上分析，阳谷等方言和平定方言儿化闪音/边音与声母和韵尾的关系及相关的声学表现预测见表 3。

		阳谷		平定	
		F3	中间音	F3	中间音
声母	舌尖-[+向前]	水平	有	水平	有
	非舌尖	?	无	水平	有
韵尾	-i -n			水平	有
	-u -ŋ			水平	有

表 3

平定方言中可以预测任何儿化音节的 F3 都是水平型，阳谷等方言舌尖声母儿化后 F3 应该也是水平型。鉴于北京话中有的儿化音节没有闪音，但 F3 仍然是水平型，阳谷方言中非舌尖声母儿化音节虽然没有中间音产生，F3 仍然不能确定是斜线型还是水平型。另外，因为这些方言儿化的具体扩展规则和 F3 的不同走势的分布条件不明，也不能判断[a]和[ə]舌尖性取值如何。

7. 结论

本文分析了偃师方言儿化的四种模式，找到了产生中间音的韵尾条件和声母条件。偃师儿化中韵尾决定是否产生中间音，声母决定产生什么样的中间音。据此认为偃师方言的儿化是“儿”后缀特征左扩展形成，并提取了特征扩展的具体规则，预测了特征左扩展的两种程度。声学特征 F3 的两种走势证实了这个预测。因为偃师儿化是同类现象中最复杂的，对偃师儿化的分析也是对相关理论的一个检验。根据偃师儿化的分析结果，偃师、阳谷、平定等方言的儿化同北京儿化一样，应该都是特征扩展形成的。

接下来文章讨论了偃师儿化中间音的语音性质和音系处理。舌尖声母儿化后产生的中间音，各方言点语音条件相同，应该具有相同的语音性质。偃师方言的分析和处理可以适用于其它方言。

最后文章比较了偃师儿化和北京儿化 F3 两种走势分布条件的差异，认为 F3 两种走势是反映特征左扩展两种程度的重要指数，有无中间音只是显性与隐性的差异，而元音[a]和[ə]的舌尖特征取值是造成方言间儿化 F3 走势分布条件不同的重要因素。

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Conversational Repair: Where Modality and Morality Converge

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This study investigates how modal meanings such as volition, obligation, possibility or permission in Chinese are constructed through conversational repair organization. Over 40 instances of repair which involve the above mentioned lexical modal expressions are examined in terms of the type of repair, the agency of repair initiation and implementation, as well as the interactional context. While most acquisition studies on children's use of modal language have largely focused on the timing and frequency of isolated instances of usage, this study argues that it is not context-free frequency but rather the understanding of the interactional contingencies and of the range of modal meanings that indexes the learner's competence. It also suggests that modality may not be encoded in modal verbs but can be instead expressed through the sequential organization of turn taking.

1. Toward an interactional account of modality

Modality is commonly defined as "the speaker's opinion or attitude towards the proposition that the sentence expresses or the situation that the proposition describes" (Lyons 1977: 452, Willet 1988:52) or the source of information for a proposition (Bybee 1985). Chafe (1986) calls the former the "broad sense" of evidentiality and the latter the "narrow sense". Other scholars such as Givon (1982: 25) consider "evidentiary strength, evidentiary source and evidentiary justification or knowledge" as integrated aspects of the same phenomenon. Literature indicates that children's exposure to and development of modality has important implications for learning in general (Bartsch & Wellman 1995, Dittmar & Reich 1993, Guo 1994, Halliday 1993).

Specifically, Lyons (1977) further describes *epistemic modality* as relating to matters of knowledge or belief (p. 793), as in 那么阴的天, 等一会儿肯定下雨 (*It is such a cloudy day. It must rain in a little while*), and *deontic modality* as relating to the necessity or possibility of acts performed by morally responsible agents (p. 823), as in 小朋友应该互相谦让 (*Little friends should yield to each other*). Other linguists (Coates 1983; Leech 1971/1987; Palmer 1990) presented alternative, more fine-grained categorizations of modal meanings. However, all acknowledge the broad epistemic and deontic types of meaning. Epistemic modality provides children with a resource for developing the capacity to infer, predict, generalize and hypothesize; deontic modality provides a resource for children's exploration and understanding of social obligations, responsibilities, constraints, and cultural and moral values (Noveck & Sera 1996, Stephany 1986, Sweetser 1982).

As Fox (2001) points out, many studies from formal and functional linguistics have primarily looked at modality as a grammaticalized category expressed in verbal morphology. Attempts to understand modality as a resource that constructs interlocutors as social and moral beings have been relatively few (but see He & Tsoneva 1996; Schieffelin 1996). The study presented in this paper follows the interdisciplinary work spearheaded by Ochs, Schegloff and Thompson (1996). It draws upon three interrelated research traditions: functional linguistics that is concerned with the role of language in communication and cognition, linguistic anthropology that focuses on cultural underpinnings of language, and conversation analysis that examines the interactional matrix of language structure and use. Specifically, it focuses on how participants' epistemic and deontic stances emerge, unfold, shift through repair organization (Schegloff et al. 1977; Schegloff 1992, 1996) in naturally occurring interaction. It investigates how modal meanings such as volition (肯, 愿意, 要, 想), obligation (最好, 应该, (非)得, 必须), possibility ((可)能, 会, 也许, 大概, 一定/肯定) or permission (可以, 能) in Chinese are constructed through *self-initiated same turn repair*, *self-initiated repair in transition-relevant-space*, *self-initiated third turn repair*, *self-initiated third-position repair*, *other-initiated self-completed next turn repair* as well as *other-initiated other-completed repair*.

2. Data and methods

Data are drawn from 30 hours of audio- and video- recorded class meetings involving 4 teachers and 35 children (age 4.5-9) who are learning Chinese as their heritage language. Over 40 instances of repair which involve lexical modal expressions are identified, transcribed according to the conventions used in Conversation Analysis (Atkinson & Heritage 1984: ix-xvi), and examined in terms of the type of repair, the agency of repair initiation and implementation, as well as the instructional context in which the repair is embedded and to which the repair contributes.

The following modal expressions were searched in the database:

Volition	肯 <i>ken</i> (be willing to), 愿意 <i>yuanyi</i> (be willing to, 要 <i>yao</i> (want), 想 <i>xiang</i> (want, desire)
Obligation	最好 <i>zuihao</i> (had better), 应该 <i>yinggai</i> (should, ought to), (非)得 <i>dei</i> (must, have to), 必须 <i>bixu</i> (must)
Possibility (ability prediction)	(可)能 <i>keneng</i> (possible), 会 <i>hui</i> (probable), 也许 <i>yexu</i> (maybe), 大概 <i>dagai</i> (maybe, perhaps), 一定/肯定 <i>yiding/kending</i> (surely)
Permission	可以 <i>keyi</i> (may, can), 能 <i>neng</i> (can)

(Adapted from Li and Thompson 1981: 182-183; Norman 1988: 124f, 165f)

When trouble such as mishearing, misunderstanding, or misspeaking in conversation occurs, it is noticed and then corrected, either by the party whose turn contains the source of

trouble or by some other party. This sequence of trouble + initiation-of-correction + correction is known as a *repair trajectory*. Repair occurs when one party corrects his or her own talk or that of another party and can be accomplished in a number of ways (Schegloff et al. 1977). Of particular relevance to our data are the following:

- *Self-initiated same turn repair* refers to the situation when the current speaker initiates and completes the repair within his/her current turn of talk and before coming to a possible completion of a complete grammatical, lexical, intonational and pragmatic unit, also known as the turn-constructional-unit (TCU) (Ford and Thompson 1996). It is the earliest position in which repair can be undertaken. The repair is signaled by a number of speech perturbations such as cut-offs, hesitation markers, pauses, and restarts. Schegloff et al. (1977) show that this is the most frequent and the most preferred type of repair. An example of this type of repair would be as follows:

(1) A: 我妈妈说我们今天去-今天要去 rehearsal

- *Self-initiated repair in transition-relevant-space*. If the speaker of the trouble source does not perform repair during the turn in progress, he/she can repair the utterance in the transition-relevant-place, i.e., at the end of a TCU, before another speaker takes a turn. Here is an example:

(2) A: 老师 can you help me- 可以-可以帮忙(.)帮我吗?

- *Self-initiated third turn repair*. In this type of repair (Schegloff 1996), a speaker produces a turn and the hearer responds to it without producing any sign of breakdown in intersubjectivity. After the response by the hearer, the speaker uses the next turn to revise his/her previous turn, as in:

(3) A: 上次他拿了两个 sti[cker

B: [I got more yay::

A: No 上次他拿了三个(.)三个

- *Self-initiated third-position repair*. While in the third turn repair the hearer provides an appropriate response which does not prompt repair of the speaker's first turn, in third position repair (Schegloff 1992) it is precisely the hearer's response that engenders the repair. In other words, the hearer's response enables the speaker to notice a problematic understanding of his/her prior turn. The following is a case in point:

(4) A: 快点快点啊, 草字头, 草字头, 一撇一横一点

B: 怎么不像?

A: 啊? 嗷, 竹字头, 竹字头, 老师说错了

- *Other-initiated self-completed next turn repair* is when repair is initiated by a participant other than the speaker of the trouble-source. When this happens, the repair initiation usually comes in the turn immediately subsequent to the trouble-source turn (known as next-turn-repair-initiation, or NTRI). See below for an example:

HE: CONVERSATIONAL REPAIR

- (5) A: 在那个书里那个英雄=
B:=那个书?
A: 那本书里

- *Other-initiated other-completed repair* occurs when a participant other than the speaker of the trouble-source both initiates and completes the repair. In adult conversation, it is usually preceded by discourse markers such as *well* or *uhm* and often takes the form of a candidate understanding with question intonation. This type of repair theoretically can occur in any turn or any position, as in (6).

- (6) A: 下面该 su-san 了
B: Susie

Of the types of repair outlined above, the most preferred is self-initiated and self-completed in the same turn as the trouble-source. Other initiation and other completion of repair can index a stance of disaffiliation with the interlocutor; and the farther the distance between the trouble source and the completion of the repair, the greater and the longer the miscommunication.

Most existing research on modality has focused on lexical, syntactic, prosodic realizations of modal meanings. And most has used subjective introspection; machine readable corpora of natural language as common research methods. The presents study differs in that it focuses on how participants themselves ascertain and negotiate modal meanings through repair organization.

3. Data analysis

This section examines how through conversational structural mechanisms the participants navigate and negotiate various modal meanings: the varying degrees of volition, the indeterminacy between obligation and option, and the ambiguity between possibility and permissibility.

3.1. Varying degrees of volition

Data segment (7) presents a case in which a child desires to drink water during class. We can see that in order to accomplish his objective, the child resorts to a range of modal expressions both within the same turn and across speaking turns in response to the teacher's reactions.

(7) “我想喝水”

001 洋洋: 我想喝水。

Yangyang: I want to drink water.

002 老师: 等一下, 马上就- 一会儿就下课(.) 下了课再喝。

Teacher: Wait a little. Soon- Class will be over in a minute (.) Drink when class is over.

003 洋洋: 我要- 我特别渴, I'm [on FIre!

Yangyang: I want- I'm terribly thirsty. I'm [on FIre!

- 004 老师: [啊哟: 这么严重啊=
 Teacher: Wow: it's THAT bad=
 005 洋洋: =no- I'm not on fire I'm DY[ING
 Yangyang: =no- I'm not on fire I'm DY[ING
 006 老师: [那你快去快回。
 Teacher: Then you go fast and return fast.

In this case, the upgrading of the degree of volition is prompted by the teacher's rejection (002) and accomplished through (i) self repair (003), (ii) the change of modal form from modal adjunct to lexis (003, 要=> 特别=> on fire), (iii) code switch (003). Further upgrading is accomplished through a 3rd turn repair (005), resulting in the shift of Teacher's stance from rejection (002) to acceptance (006).

3.2. Obligation vs. option

Data segment (8) involves a case where self initiated same turn repair and other initiated third position repair serve to scaffold the process to ascertain moral obligation versus practical option.

(8) “孔融让梨”

- 001 老师: “孔融让梨”说的是小朋友应该互(.)相(.)谦(.)让。
 Teacher: The story of “Kong Rong Yields Pears” tells us that little friends should yield(.) to(.) each(.) other.
 002 要是你们在家跟弟弟妹妹玩,
 If you are playing with your younger brothers and sisters at home,
 003 你们(.)抢玩具(.)这样对不对啊?
 You(.) fight for toys(.) Is that right or not?
 004 不好啊
 Not good ok
 005 (.2)
 006 老师: 要把- 应该把玩具让::给弟弟妹妹
 Teacher: Should- Ought to yie::ld the toys to younger brothers and sisters
 007 Jason: 为什么要让给他? 我们 share 就可以了。
 Jason: Why yield to him? We can share.
 008 老师: Share(.) 嗽:: share 是不错
 Teacher: Share(.) uh:: share is not bad
 009 (.2)
 010 老师: 可是能让就更好
 Teacher: But being able to YIELD will be EVEN better.
 011 Jason: Oh:: no::: Do I really have to?
 Jason: Oh:: no::: Do I really have to?
 012 老师: 不是说非- 不是说必须得让

Teacher: I'm not saying you have to- not saying that you MUST yield

能让最:好啊

Being able to yield is THE BEST ok

Here, the teacher initially framing “yielding” as obligation (001-004). The modal verb 要 at the beginning of line 006 (want or should) is ambiguous (either volition or obligation); however, a same turn self repair (006) clarifies and enhances the sense of “obligation” (要把- 应该把). After the child (007) sets up contrasts between obligation (要/should) and option (可以/can), the teacher presents a better “option” (010), which is turn taken by Student to mean “obligation” (011). A consequent/subsequent 3rd position repair (012) rejects the “obligation” interpretation and reinforces the “option” interpretation. The segment shows that as the teacher modifies “obligation” with “option”, after Student introduces “option” (007) and challenges “obligation” (011), modal meanings evolve through moment-by-moment interaction.

Similarly, in (9), the indeterminacy between requirement/obligation and practical option is teased out through third position self repair.

(9) “这是英文字典”

001 老师: 这是英文字典, 拿错了, 这不能用.

Teacher: This is English dictionary. You took the wrong one. This cannot be used.

002 学生: Chinese words (.2) here! 可以用!

Student: It can be used!

003 老师: 老师要你们用中文字典. 应该带中文字典. 下次-下次注意.

Teacher: I want you to use Chinese dictionary. You should bring Chinese dictionary. Next time-next time pay attention.

When the teacher first points out the dictionary cannot used (001), the student takes the teacher to mean that the dictionary contains only English and therefore cannot be used for Chinese purposes (002). In the third position, the teacher repairs her initial statement by specifying that it is a requirement to bring a Chinese dictionary (and not a dictionary that contains Chinese words), not a practical choice.

3.3. Possibility vs. permissibility

Data segment (10) shows how modal meanings are shaped and jointly constructed through next turn repair initiation (NTRI) and other repair.

(10) “谁能读?”

001 老师: 好 (.)淑雨你来

Teacher: Good (.) Shuyu you try it

002 ((pause))

003 老师: 你能读就大声读

Teacher: If you can read, read loudly

HE: CONVERSATIONAL REPAIR

- 004 别的同学好好听
 Other students listen well
- 005 淑雨: “它又-又-又 什么前走...”
 Shuyu: “它又-又-又- **something** 前走...”
- 006 小倩: “往:: [往前走”
 Xiaoqian: “往:: [往前走”
- 007 波波: [“往”[那是“往”
 Bobo: [“往”[That’s “往”
- 008 S?: [No:: wrong:::
 S?: [No:: wrong:::
 009 Ss: [((inaudible))
- 010 老师: 安静! 大家安静!
 Teacher: **Quiet! Everyone quiet!**
- 011 (.4)
- 012 有人在读别人就不能读, OK?
 When someone is reading others can’t read, OK?
- 013 (.2)
- 014 淑雨再想想
 Shuyu think again
- 015 淑雨: 我没学过
 Shuyu: **I didn’t learn it.**
- 016 (.2)
- 017 淑雨: °我不会°
 I can’t
- 018 老师: 没学过还是学了不会呀? 谁能读?
 Teacher: **Didn’t learn or learned but can’t? Who can read?**
- 019 好, Justin=
 Good, Justin=
- 020 波波: =Me [me! 老师, 我! 我能读!
 Bobo: =Me [me! **Teacher, me! I can read!**
- 021 Justin: [“它又((inaudible))”
 Justin: [“它又((inaudible))”
- 022 老师: 安静!
 Teacher: **Quiet!**
- 023 波波: 我能! 我记得那个字!
 Bobo: **I can! I remember that word!**
- 024 老师: 等 Justin 读完
 Teacher: **Wait until Justin finishes reading**
- 025 °咱们不能影响别人 (.) 知道吧 °?
 We can’t disturb others (.) Understand?

- 026 (.2)
 027 老师: 老师知道你能读
 Teacher: Teacher knows you can read
 028 (.2)
 029 老师: 但是你等- 你得- (.2)
 Teacher: But you wait- you need to- (.2)
 030 波波: OK, 现在不能=
 Bobo: OK, I can't NOW=
 031 老师: =对了, 波波真懂道理!
 Teacher: =Right, Bobo is really sensible

This case concerns the dual function of 能/can – possibility/ability in 003 and permissibility in 012 (cf. He & Tsoneva 1998). The NTRI (018) (能=会) renders a sequential, local interpretation of “能/can” as ability. After seeing the contrast between his “possibility/ability” interpretation (020, 023) and Teacher’s “permission” interpretation (025), Bobo finally displays understanding of “能/can” in its permissibility sense through other repair (030). This segment shows how ambiguity is cleared but duality is preserved through interaction and how children/students come to understand the full range of modal meanings through interaction.

能(*can*) shows up again in data segment (11) which illustrates NTRI (next turn repair initiation) as a resource for the modulation and negotiation of epistemic possibility. (11) “肯定不是‘兄’”

- 001 学生甲: 小小礼物, 为我们带来了欢乐和兄福 ((reads))
 Student A: small small gift brings us joy and “xiong fu”
 002 老师: “兄福”? 这是什么意思呀? 可能吗?
 Teacher: “xiong fu”? what does it mean? Is it possible?
 003 学生乙: 肯定不是“兄”
 Student B: I'm sure it's not “xiong”
 004 老师: 对了, 不能是“兄”, 那是什么? 我们平常说什么? 说什么福?
 Teacher: Right. It cannot be “xiong”. Then what is it? What do we normally say? We say what “fu”?
 005 学生甲: 福倒了=
 Student A: “fu dao le”
 006 学生乙: =那个那个门上的东西
 Student B: The thing on the door [[referring to the inverted “happiness” character]]
 007 (.2)
 008 老师: 想不出来啊? 猜猜看, 会猜你就(.)学的字就(.)就多了.
 Teacher: You can't figure it out? Make a guess. If you can guess, you will learn more words.

009 (.4)

010 老师: 这是一种祝愿, 所以念”祝[福”.

Teacher: This is a wish (“zhu yuan”), so it should read “zhu fu”

011 学生乙: [祝福(.) I knew it!

Student B: “zhu fu”

A turn-by-turn analysis of (11) follows:

Turn 1 (001): trouble source (兄福)

Turn 2 (002) (NTRI): 可能-interrogative/Initiation1

Turn 3 (003) (towards a repair): 肯定-negation/Response1

Turn 4 (004): 能-negation/Evaluation1
Initiation2

Turn 5 (005): Response2

Turn 6 (006): Response2 (collaborative with Turn 5)

Turn 7 (008): Evaluation2 / Initiation3
(no uptake)

Turn 8 (010): repair of Turn 1

Turn 9 (011): collaborative completion of Turn 8

This process shows that the NTRI in line 002 launched an interactive speculation and exploration of possible readings of the word 祝, a process that involves three participants—two students and the teacher. It triggered a strong collaborative negation by Student B (肯定不, 003) and the teacher (不能, 004) of the reading presented by Student A in Turn 1. The interaction subsequently moved on to a series of initiation-response-evaluation sequences typical of teacher-centered pedagogical discourse, without further use of any modal verbs. When finally the participants come to a shared realization of the correct reading of the word, the utterances exhibit a degree of certainty (010 and 011) that requires no modals.

4. Conclusions and implications

This study has implications in several areas including language acquisition and language socialization, as well as the inherent properties of modality. While most acquisition studies on children's use of modal language have largely focused on the timing and frequency of isolated instances of usage, this study argues that it is not context-free frequency but rather the understanding of the interactional contingencies that indexes the learner's competence. It indicates that instead of a YES/NO question concerning whether a child has acquired a single, particular modal meaning, we should perhaps be asking whether a child has been socialized into a *range* of modal meanings and whether the child is able to negotiate and modulate modal meanings.

This study further suggests that modality may not be encoded in modal verbs but can be instead expressed through the sequential organization of turn taking. Take for example the interaction between a teacher and a parent below:

(12) “陈浩明天有个竞赛”

001 家长: 陈浩明天有个竞赛.

Chen Hao has a competition tomorrow

002 老师: 那他就下次吧

Then he can do it next time (“it” refers to an activity held in Chinese school)

003 家长: 其实没事, 他比赛 11 点就完了, 然后我把他直接送来. 您看呢?

Actually it is okay. He finishes the competition by 11. Then I’ll drop him off here. What do you think?

004 老师: 远不远哪? 那你辛苦了.

Is it very far or not? Then it’ll be a lot of work for you.

In this interaction, the two adult participants are clearly discussing and negotiating possibilities, obligations and options. And yet no modal verb is deployed at all. It is possible that the more linguistically and culturally advanced the student, the more likely that s/he will resort to sequential organization of talk (and thus reduce the amount of surface lexical modal forms) in projecting modality.

The above, in turn, raises the question as to what constitute evidence for language acquisition: we could be misguided if we simply use frequency of output as basis for our judgment. In other words, learners may very well have acquired the meanings of modals and yet not exhibit their competence in the form of the use of explicit modal markers.

This study also has implications for understanding modal meanings as inherently intersubjective and dynamic. It has shown that the clarification of modal meanings requires interaction between participants, and is not merely a matter of introspective grammaticality judgment held by any one single speaker. And it is conversational structural mechanisms such as repair organization that make the collaborative clarification of meaning possible.

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Encoding motion and state change in L2 Mandarin

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This paper investigates the crosslinguistic influences on the learning of encoding motion and state change in L2 Mandarin based on the linguistic typology motion and state change (Talmy 1985, 2000; Slobin 2004). We conducted an experiment of elicited descriptions of events of motion and state change with 10 adult native American-English learners of Mandarin. The results show that L2 adult Mandarin learners, similar to their L1 child counterparts (Chen, 2006, 2008), are sensitive to the Mandarin-way of encoding motion and state change. Overgeneralization errors reflect an overuse of the dominant way of lexicalizing motion and state change in the target language. The early learning of the target language pattern may be explained by Clark's (1993, 2004) principles of learning constructional regularities and the inter-typological similarities between Mandarin and English.

1. Introduction

Language acquisition essentially involves the establishment of the systematic conventional form and meaning mappings in the target language.¹ To achieve this goal, learners must discover how to unpack the relevant information – to isolate the components within a combination and identify their contribution to the meaning of the whole, and to discover the regularities in how the forms and their meanings are combined (Bowerman, 1982; Clark, 1993; Pinker, 1989; Tomasello, 1992). In the second language (L2) learning situation, this task becomes more complicated since the L2 learners have already established a full system of form-meaning mappings of their first language (L1). When the two languages differ in how semantic elements are represented and combined, how do learners come to express themselves in their L2?

This paper explores this general question by examining the encoding of events of motion and state change by American-English L2 learners of Mandarin. Encoding is defined as the systematic association of particular components of meaning with particular

¹ Form refers to the linguistic units of language, including both lexical and grammatical units (i.e., morphological and syntactic). All linguistic forms or expressions are considered to be symbolic units, consisting of the association of a phonological and a semantic representation. Meaning refers to the semantic structure of a symbolic unit, which is in turn equated with conceptualization.

morphemes or constructions (Talmy, 1985, 2000). Motion and state change are two basic types of events that human beings experience daily. A motion event is defined as a situation involving the movement of an entity or the maintenance of an entity at a stationary location (Talmy, 1985, p. 60). By “movement” is meant a “directed” or “translative” motion that results in a change of location. By “location” is meant either a static situation of being in a place or a “contained” motion that results in no overall change of location (e.g., jumping up and down). A state-change event consists of a change in, or – in the limiting case – the unchanging continuation of a certain property associated with a particular object or situation (Talmy, 2000).

2. Encoding motion and state change in English and Mandarin

Talmy (1991, 2000) proposes a two-way semantic typology of the lexicalization of motion on the basis of where languages characteristically express Path and Manner or Cause of motion.² In “satellite-framed” languages (e.g., English), Manner of motion is typically encoded in the main verb, and Path in a “satellite” to the verb. English verb particles such as *in*, *out*, and *across* are typical examples of Path satellites. In “verb-framed” languages (e.g., Spanish), Path is characteristically encoded in the main verb of the clause, an element with a meaning along the lines of ‘enter, exit, ascend, descend, insert, extract’, and so on, whereas Manner or Cause separate from the main clause. Talmy classifies Mandarin as a satellite-framed language like English on the basis of his analysis of directional verb compounds (DVCs), which are commonly used to describe motion, as shown in (1).

- (1) a. *Na ge ren pao-jin le fangzi.*
 That CLF person run-enter PFV house³
 ‘That person ran into the house.’
- b. *Na ge ren ba zhuozi tui-chu le dong.*
 That CLF person BA table push-exit PFV cave
 ‘That person pushed the table out of the cave.’⁴

² We follow Talmy’s (2000) theoretical framework of motion and adopt the following terms to refer to:

Figure = the object that undergoes a change of location

Path = trajectory or Deixis of motion

Manner = the way in which the Figure moves

Cause = the event that causes it to move

Ground = a reference with reference to which the path, site, or orientation of the Figure is characterize

³ CLF = classifier, PFV = perfective aspect marker

⁴ The morpheme *ba3* marks the well-known BA construction of Mandarin. This construction is known as the “disposal construction” (Chao, 1968; C. Li & S. A. Thompson, 1981; Wang, 1954), since it focuses on how the object is disposed of, dealt with, manipulated, or handled by the

These sentences each contain a DVC, *pao-jin* ‘run-enter’ in (1a) and *tui-chu* ‘push-exit’ in (1b). Talmy treats the first verb of these DVCs as the main verb, encoding the Manner (‘run’) and the Cause (‘push’) of the motions, respectively. He treats the second verb as a Path satellite – *jin* ‘enter’ and *chu* ‘exit’. Talmy argues that Mandarin Path verbs are satellites because they often do not function as full verbs and they form a small closed set. Slobin (2004) points out that Mandarin and other serial-verb languages differ from satellite-frame languages in that the so-called satellites, unlike English particles or Russian verb prefixes, are full verbs that can be used as predicates directly. Mandarin also does not pattern with verb-framed languages such as Spanish, since there is no distinction between finite and nonfinite forms as there is in typical verb-framed constructions such as ‘exit flying’. Slobin therefore proposes a revision of Talmy’s binary distinction, adding a third category, “equipollently-framed languages” (Slobin, 2004), in which Path and Manner are expressed by equivalent grammatical forms. Mandarin and other serial-verb languages are examples of this third type of languages.

Regarding the domain of state change, Talmy observes that the way state change is expressed is analogous to the way motion is expressed. For example, the entity that undergoes a state change is often presented as a Figure that (metaphorically) moves to a state specified by a satellite or other verb complement, e.g., *She entered (a state of) ill health, She became ill* (the static counterparts of these are expressions like *She is in ill health*) (Talmy, 2000, p. 238). Talmy suggests that this conceptual analogy motivates a syntactic and lexical analogy: to a great extent, state change is expressed in a language by the same constituent type as Path, and often by homophonous forms. Thus, in accordance with the general typology, the core schema of an event of state change appears in a satellite in satellite-framed languages, and in the main verb in verb-framed languages. The conceptual analogy between motion events and state-change events is borne out in Mandarin. Resultative verb compounds (RVCs), the typical way to encode state-change events, resemble DVCs in structure: the cause component is represented by the first verb of the compound, analogous to the cause/manner verb of a DVC, and the state-change component is represented by the second verb, analogous to the Path verb (the second verb) of a DVC. For example:

(2) a. Nonagentive

Ta1 ka-si zai yi kuai gutou shang.

He choke-die at one CLF bone on

‘He choked to death on a bone.’

b. Agentive

subject. The morpheme *ba3* originally meant ‘dispose, manipulate, hold’ in classical Chinese, but it has become grammaticalized and lost this meaning. The status of *ba3* is controversial: it has been argued to be a focus marker (Sun & Givón, 1985), a secondary topic marker (Tsao, 1996), or case assigner (Huang, 1982).

Wo tui-kai le chuanhu.
 I push-be.open PFV window
 'I opened the window by pushing at it.'

The cause is encoded in the first verb in *ka-si* 'choke-die' in (2a) and *tui-kai* 'push-be.open' in (2b), and the state change in the second verb, *si* 'die' in (2a) and *kai* 'be.open' in (2b). Both spontaneous and caused state changes can be encoded with an RVC. The combination of a verb denoting a cause and a verb denoting a result state is very productive in Mandarin.

Talmy (2000) suggests that in the domain of state change, English exhibits a mixed system of conflation characteristic of both the satellite-framed pattern and the verb-framed pattern, and both patterns are colloquial. For example, the verb-framed pattern is seen in many monomorphemic state-change verbs that encode state change directly, such as *break* in *He broke the door (by kicking it)*. Talmy treats Mandarin as a "far more a thoroughgoing exemplar of the satellite-framed type" (Talmy, 2000: 241), since state change is consistently encoded in the satellite. What Talmy calls satellites are the complement (i.e., the second) verbs of RVCs, such as *po* 'be.broken' in *ti-po* 'kick-be.broken'. Adopting Slobin's (2004) proposal, we suggest that Mandarin is actually a 'thoroughgoing exemplar' of the Equipollently-framed language in encoding both motion and state change by combining equivalent grammatical forms (i.e., free verbs) into verb compounds.

3. Motion and state-change events in first and second language acquisition

Talmy's typology of motion has spawned much research in both first and second language acquisition of the lexicalization of motion in the past decades (e.g., Berman & Slobin, 1994; Özçalışkan & Slobin, 2000; Slobin, 1993, 1996a, 1996b, 2000, 2004). These studies reveal that native speaker of typologically different languages show distinct lexicalization patterns in describing motion events. For example, speakers of satellite-framed languages (S-languages) usually provide more description of the Manner of motion by using a main verb of Manner of motion and on Path with particles or prepositional phrases. Speakers of verb-framed languages (V-languages) do not describe the Manner of motion as often as speakers of S-languages. They tend to describe the Path of the motion by using a Path verb, and provide more elaboration on Ground. Children learning S-language or V-language show language-specific way of encoding motion from an early age and approach adult patterns with the increase of age. Mandarin speakers have been found to use a mixed pattern with features of both the satellite-framed and the verb-framed patterns. Like English speakers, Mandarin speakers use a large set of verbs of Manner of motion. But like Spanish speakers, they often describe the physical settings of motion events from which this information can be deduced, and only rarely provide elaborate ground descriptions (L. Chen, 2005). Child Mandarin learners show language-specific lexicalization in encoding motion events early on (J. Chen, 2008). These findings

support Slobin's (2004) proposal of treating Mandarin and other verb serializing languages as equipollently-framed languages (E-languages).

The language-induced tuning of attention to different aspects of situations that one's language routinely encodes has been labeled "Thinking for speaking" (Slobin, 1996a), and a child learner learn particular ways of thinking for speaking when acquiring a first language. In second language learning, Slobin (1996) suggests there is "first language thinking in second language speaking", i.e., L2 learners are influenced by the typical lexicalization patterns in their L1 when speaking the L2. This view is generally supported by the findings in the second language acquisition studies of motion, which have examined the crosslinguistic influences from both the inter-typological (e.g., L1, S-language English vs. L2, V-language, Spanish) and the intra-typological perspectives (e.g., both L1 and L2 are V-languages: L1-Japanese & L2 Spanish or both L1 and L2 are S-languages: L1-English & L2-Dutch).

Tuning to Mandarin, we found no studies that have investigated the interlanguage of Mandarin in encoding motion and state change by native English speakers. One most relevant study by Yu (1996) investigated the narration of motion in L2 English by Mandarin learners and Japanese learners. Yu followed Talmy's typology and treated Mandarin and English as S-languages. He found that Mandarin learners are better than Japanese learners in producing more target motion verbs in three different tasks (elicited story-telling, translation, and picture description). He suggests that this result is due to the similarity between Mandarin and English as both being S-languages. This explanation seems inadequate since the later studies by Slobin and others have shown that Mandarin should be treated separately as an E-language.

4. Mandarin verb compounds: Composition and productivity

In order to understand how L2 learners learn the predicates of motion and state change, we present the compositional, lexical, and semantic properties of DVCs and RVCs (see also J. Chen, 2006, 2008). Mandarin verb compounds are usually composed of two or three root verbs: V1V2(V3). There are no morphological markers to indicate the relationship between the component verbs. The ordering of the component verbs is rigid and iconic, i.e., the verb encoding the change of location (in DVCs) and end result (in RVCs) is always in the second or third position of a compound. There is a tight relationship between the component verbs – no lexical phrases or aspect markers are allowed to occur between them, and aspect markers always follow the last verb.

4.1. Composition of directional verb compounds

VCs are composed of two, or maximally three, lexical verbs, for example, *zou-chu* 'walk-exit', *pao-jin-lai* 'run-enter-come'. Verbs that appear in a DVC can be categorized into two major types according to their distributional properties (Chao, 1968; Kang, 1999; C. N. Li & S. A. Thompson, 1981; Lu, 1977; Zou, 1994): an open set of

verbs indicating Manner (*gun* ‘roll’) or Cause of motion (such as *reng* ‘throw’) or Path (such as *diao* ‘fall’), and a closed set of directional verbs. Manner- or Cause-of-motion verbs include both intransitive verbs of self-initiated motion (e.g., *zou-jin* ‘walk-enter’, *fei-xia* ‘fly-descend’), and transitive verbs that inherently imply that the direct object undergoes a change of location (e.g., *chui-xia-lai* ‘blow-descend-come’, *tui-shang-qu* ‘push-ascend-go’). The directional verbs can also be divided into two types: Path verbs that denote the trajectory of a movement (e.g., *shang* ‘ascend’ (up), *xia* ‘descend’ (down), etc.), and Deictic verbs (*lai* ‘come’ and *qu* ‘go’). In a DVC with three verbs (V1V2V3), the ordering of the verbs is fixed: verb of manner or cause of motion (V1), followed by a path verb (V2), with a deictic verb at the end (V3). In a two-verb DVC (V1V2), V1 can be a manner or cause of motion verb and V2 can be either a path verb or a deictic verb (e.g., *zou-shang* ‘walk-ascend’, *zou-lai* ‘walk-come’); V1 can also be a path verb and V2 a deictic verb (e.g., *shang-lai* ‘descend-come’). Unlike the constituents of English verb-particle combinations, all the elements in a DVC (V1, V2, and V3) can be used as independent main verbs, denoting the manner or cause of a motion, the direction of the motion, and the orientation of the motion with respect to the speaker, respectively.

4.2. Composition of resultative verb compounds

RVCs are composed of two verbs, both of which may be either transitive or intransitive. V1 is an action verb indicating the Cause, and V2 a verb indicating the caused change of state or caused action. V2 indicates what result the action specified by V1 has led to (McDonald, 1995). The result may be a physical state like *kai* ‘open’, *sui* ‘be.in.pieces’; a mental state like *dong* ‘understand’, *guan* ‘be used to’; a quality like *cui* ‘be crispy’, *hong* ‘be red’; or a caused action, such as *xiao* ‘laugh’ in *dou-xiao* ‘amuse-laugh’ (laugh by amusement), *ku* ‘cry’ in *ma-ku* ‘scold-cry’ (cry due to scold). Both V1 and V2 are drawn from open sets of verbs. In general, transitives and unergatives denoting activities can act as V1, while V2 is usually a stative verb, an adjective, or an action verb, as in example (2).

4.3. Productivity and semantic constraints on verb compounding

DVCs and RVCs are very productive in Mandarin, and can be created on the spot to describe an event of motion or state change. Take the event of washing clothes, for example. Mandarin speakers can use the conventional RVC *xi-ganjing* ‘wash-be.clean’ if the clothes turn out clean after the washing, or they can create the new but perfectly acceptable RVC *xi-zang* ‘wash-be.dirty’ or *xi-po* ‘wash-be.torn’ if the clothes turn out dirty or torn. In other words, Mandarin allows the combination of ‘wash’, which implies a result state of becoming clean, with a complement verb that conflicts with this implied result (e.g., ‘be.dirty’) or that has nothing to do with cleanliness (e.g., ‘be.torn’). Combinations like these are not allowed in languages such as English and Japanese (Bowerman, 1988; Uehara, Li, & Thepkanjana, 2001), even though their structure would be fully comparable to those of acceptable constructions such as *wash the clothes clean*.

The productivity of DVCs and RVCs are also reflected in the variety of verbs that can occur in the first (V1) and second (V2) positions of a verb compound. These verbs can come from different semantic classes, including both transitive and intransitive verbs. Furthermore, a same V1 can combine with different V2s, for example, *ti-kai*, ‘kick-be.open’, *ti-po* ‘kick-be.broken’, *ti-sui* ‘kick-be.in.pieces’, *ti-dao* ‘kick-fall’, and vice versa, a same V2 can combine with different V1s, for example, *si-kai* ‘tear-be.open’, *jian-kai* ‘cut.with.scissors-be.open’, *bai-kai* ‘snap-be.open’.

Although verb compounding is productive in Mandarin, it is a constrained process that manifest partial productivity (Gu, 1992; Shen, 2003; Zou, 1994). Partial productivity means that a construction can be extended to additional (and even novel) verb forms, but it is not fully productive within any generally defined class of verbs, and novel extensions are acceptable only to the degree that they conform to the semantic (and morpho-phonological) constraints on existing clusters of strings (Goldberg, 1995). This partial productivity also reflects the collective conventional preferences which mirror current perceptions of the meaning-form relations possible and available for use in coinage (Clark, 1993).

J. Chen (2008) proposes a number of constraints on the formation of DVCs and RVCs (e.g., the Unique Path constraint, the Congruent Path constraint). We discuss two of the constraints that are relevant for the current study. One general constraint on verb compounding in Mandarin is the strict ordering of the component verbs as discussed above. The other constraint concerns the possible semantic classes of verbs that can appear in the V2 of an RVC. Gu (1992) observes that strings like *xia-tiao* ‘frighten-jump’, *xia-han* ‘frighten-scream’ with inherently agentive V2’s cannot occur as resultative verb compounds. Certain semantic classes of verbs that involve inherent agentivity are not acceptable as the second component (V2) of conventional RVCs in Mandarin. These include the verbs of the following semantic categories: posture verbs, such as *zuo* ‘sit’, *dun* ‘squat’, *zhan* ‘stand’, *li* ‘stand’, *tang*, ‘lie’; manner of motion verbs, such as *gun* ‘roll’, *tiao* ‘jump’, *beng* ‘hop’; and verbs of ceasing or closing, such as *ting* ‘stop’, *guan* ‘close’, *zhi* ‘stop’, *bi* ‘close’ (cf. Chen 2008 for more detailed semantic classes). It sounds odd to use *tui-zuo* ‘push-sit’ to describe a scene in which a man is pushed by someone and as a result he sits on the ground. Similarly, *an-dun* ‘press squat’ is not acceptable for a scene in which someone presses on another person, and causes him or her to squat; and *la-zhuan* ‘pull-spin’ for an event in which someone pulls a spinning table and it spins. J. Chen (2008) proposes that the constraint on these semantic classes of verbs in the V2 position is due to a general sensitivity across languages to the semantic distinction between internal cause and external cause in verb semantics. Verbs specifying internal cause (e.g., *zhan* ‘stand’, *dun* ‘squat’) are not allowed to be in the V2 position.

5. The study

This study addresses the following research questions: (1) How do American learners of Mandarin encoding motion and state change? (2) How do crosslinguistic

differences (S-language vs. E-language) influence the learning of encoding motion and state change in L2? More specifically, we are interested in finding out if Manner and Path are both included in the narration of motion and state change; if L2 learners are like the L1 children in learning the productivity of verb compounds from early on; and if L2 learners are sensitive to the semantic constraints on verb compounding.

5.1. Participants

Ten adult American-English learners of Mandarin participated in this study (mean age 23, age range 20 – 27). They have studied Mandarin for about 12 months (mean length of Mandarin learning is 64 weeks) in an intensive Mandarin program at the Defense Language Institute. A group of ten native Mandarin speakers also participated as a control (mean age 31).

5.2. Stimuli

The stimulus set consisted of 42 video clips: 34 target clips, 2 warm-up items, and 6 control items (the control items will be explained shortly). Each target clip depicted an actor performing a causal action that resulted in a location change or a state change, for example, a woman blowing out a burning candle. Eighteen of the events could be routinely described with a verb compound (thus termed *conventional compounds*) and sixteen could not (i.e., the use of the combination of a verb of action and a verb of result will result in ungrammatical compounds). Table 1 lists the conventional and the ungrammatical VCs studied in this experiment, classified according to the semantics of the V2. These V2s, which include posture verbs, verbs of manner of motion, verbs of ceasing, and verbs of closing, are not accepted in the V2 slot by native speakers of Mandarin. Both the conventional VCs and the odd VCs used in this experiment were chosen on the basis of my own intuitions and those of two other native speakers of Mandarin. The VCs tested in the experiment are the target compounds.

5.3. Procedure

The participants were seen individually in a quiet room in their school. They were shown the video clips one by one. For each clip, they were (a) first asked to describe what had happened; and then – if they had not used the target verb compound in their description – they were (b) asked to judge whether the target verb compound was acceptable. For conventional VCs such as *chui-mie* ‘blow-extinguish’, participants were expected to give a “yes” answer in the judgment task, whereas for odd ones such as *la-zhan* ‘pull-stand’, they were expected to give a “no” answer. To forestall a “yes” bias on the judgment task, we included 6 relatively easy control events in the stimulus set, half requiring “no” answers and half “yes” answers. For example, for a video clip depicting a man mopping the floor, the participant was expected to say “no” to the experimenter who said the man was sweeping the floor. Only participants who gave correct responses to all the control items were included in the analysis. The participants were audio-taped.

Table 1. Verb compounds tested in the study
(Note: Asterisks indicate unacceptable VCs.)

Semantic classes of V2s	VCs tested	
Path	<i>chui1-diao4</i>	'blow-fall'
	<i>reng1-chu1</i>	'throw-exit'
	<i>ju3-qi3</i>	'lift-rise'
	<i>fang4-xia4</i>	'put-descend'
Manner of motion	* <i>tui1-hua2</i>	'push-slide'
	* <i>reng1-fei1</i>	'throw-fly'
	* <i>la1-zhuan4</i>	'pull-spin'
	* <i>tui1-huang4</i>	'push-shake'
	* <i>ti1-gun3</i>	'kick-roll'
	* <i>chui1-gun3</i>	'blow-roll'
	* <i>la1-tan2</i>	'pull-jump'
Breaking	<i>ji3-po4</i>	'squeeze-break'
	<i>reng4-sui4</i>	'throw-smash'
	<i>chui1-po4</i>	'blow-break'
	<i>zhe-duan42</i>	'bend-break'
Opening	<i>ti1-kai1</i>	'kick-be.open'
	<i>tui1-kai1</i>	'push-be.open'
Closing	* <i>ti1-guan1</i>	'kick-close'
	* <i>tui1-guan1</i>	'push-close'
	* <i>la1-guan1</i>	'pull-close'
Ceasing	<i>gai4-mie4</i>	'cover-extinguish'
	* <i>zhuang4-ting2</i>	'bump-stop'
	<i>chui1-mie4</i>	'blow-extinguish'
	* <i>an4-ting2</i>	'press-stop'
Posture	* <i>la1-zhan4</i>	'pull-stand'
	* <i>tui1-zuo4</i>	'push-sit'
	* <i>tui1-tang3</i>	'push-lie'
	* <i>an4-dun1</i>	'press-squat'
Other	<i>ti1-fan1</i>	'kick-overturn'
	<i>ti1-dao3</i>	'kick-fall'
	<i>tui1-dao3</i>	'push-fall'
	<i>xi3-zang1</i>	'wash-dirty'
	<i>pai1-shi1</i>	'pat-wet'
	<i>tu2-hong2</i>	'paint-red'

5.4. Results

The audio recordings were digitized, and the relevant descriptions of each video clip were transcribed. The judgments given for each clip were also noted down for all the participants. We report the results below, addressing: (1) the overall use of verb compounds in encoding motion and state change; (2) the conscious knowledge of the combinatorial constraints on the formation of verb compounds; (3) the possible effect of

semantic subcategories of V2 on the knowledge of verb compound formation; and (4) error analysis of the learners' interlanguage.

5.4.1. Overall use of verb compounds

The L2 learners, similar to their native counterparts, used dominantly verb compounds to describe most of the events of motion and state change and only a small number of single verbs were used for some clips. Figure 1 summarizes the token frequencies of verb compounds produced by the L2 learner group and the native L1 group, and the breaking-down of the token frequencies of verb compounds by event types (VC events vs. Odd VC events).⁵ Strikingly the L2 learners tended to 'overuse' verb compounds – as indicated in Figure 1, L2 learner group produced almost twice as many verb compounds to describe the Odd VC events. Some of these verb compounds are odd VCs that never occurred in adults' descriptions, containing verbs of posture, manner of motion, ceasing, and closing in the V₂ slot.

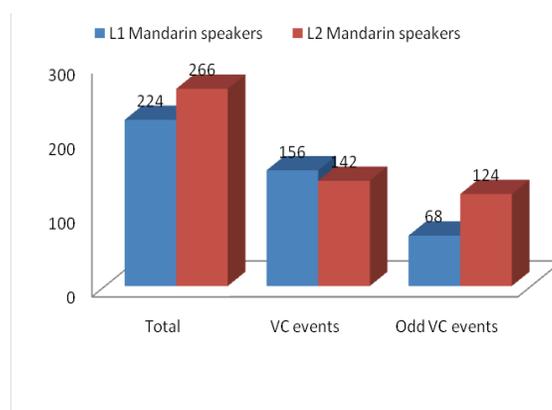


Figure 1. Token frequencies of VCs produced by the L2 learner group and the native speaker group

5.4.2. Knowledge of constraints on verb compounds

The L2 learners, similar to their L1 counterparts, accepted the conventional verb compounds at almost 100% rate (see Figure 2 below). However, in sharp contrast, they accepted almost all the odd verb compounds such as *la-zhan* 'pull-stand', whereas the native speakers generally rejected them.

⁵ *VC events* are those typically described with verb compounds and *Odd VC events* are those that are not typically described with verb compounds (those marked with an asterisk in Table 1).

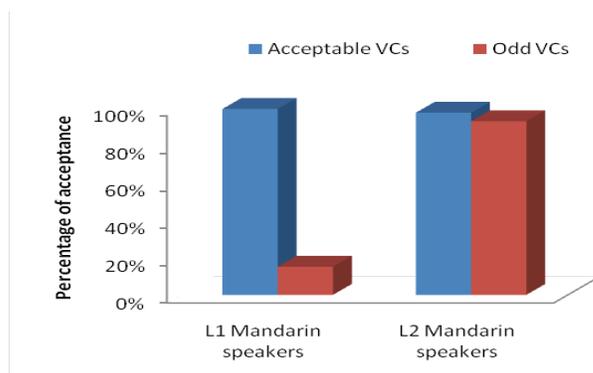


Figure 2. Percentages of the acceptance of the conventional VCs and odd VCs by L2 learner group and the native speaker group

5.4.3. Effects of the semantic subcategories of V2s

Figure 3 shows the percentages of acceptance of the verb compounds with a V2 from three different semantic classes: verbs meaning stop or closure, verbs of Manner of motion, and posture verbs. Surprisingly even though the native speakers overall rejected verb compounds with a V2 from these three categories, they showed different rate of acceptance: verbs of stop or closure > verbs of Manner of motion > verbs of posture. Similar trend is seen in the L2 learner group as well, although the L2 learner group obviously accepted most of the odd verb compounds. It seems that when the V2 is a posture verb, the verb compound is more likely to be rejected by both the native speakers and the L2 learners; but when the V2 is a verb of Manner of motion or a verb meaning stop or closure, the verb compound might be more likely to be accepted as appropriate.

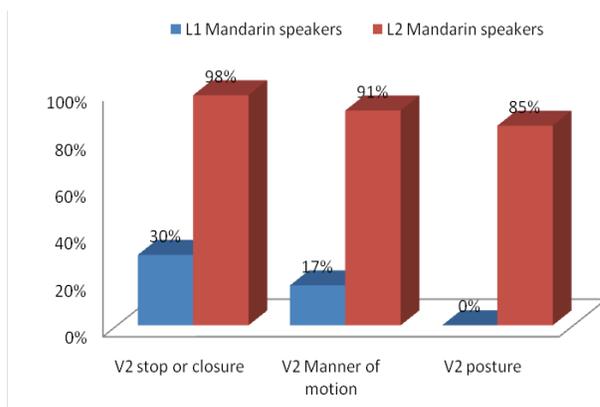


Figure 3. Percentages of the acceptance of verb compounds by different semantic categories of V2 by L2 learner group and the native speaker group

5.4.4. Error analysis

Qualitative analysis was conducted to the innovative uses of verb compounds (or ‘erroneous’ verb compounds). We found three major types of errors in the data. First, the L2 learners produced verb compounds with a V2 from the semantic classes such as verbs of posture, verbs of stop or closure, verbs of Manner of motion, and verbs of action. Second, they made errors of ‘over-combining’ verbs, i.e., they created verb compounds with more than 3 verbs. Mandarin allows the concatenation of maximally 3 verbs in a compound. For example, *tui-hua-xia-lai* ‘push-slide-descend-come’, *chui-diao-xia-lai* ‘blow-fall-descend-come’, and *zhuang-man-qi-lai* ‘pour-fill-rise-come’. This type of errors thus suggests that L2 learners are not yet aware of the combinatorial constraints on the number of possible verbs. The third type of errors involves semantic overgeneralization of the component verbs, which indicates inadequate knowledge of the semantics of the component verbs. For example, the verb *po* ‘be.broken’ is used to describe the breaking of a stick as in the compounds *zhe-po* ‘bend-be.broken’ and *tui-po* ‘push-be.broken’. Semantically *po* applies only to nonlinear objects and when the affected object is longish such as a stick, a different verb *duan* ‘be.broken’ has to be used instead. Similar semantic errors are found with V1. For example, *tui* ‘push’ was used to describe the action of bending a stick.

6. Discussion and conclusions

Our study focuses on the use of motion and state-change predicates in the interlanguage of English learners of Mandarin. We find that L2 adult learners of Mandarin are sensitive to the Mandarin-way of encoding motion and state change as reflected in their extensive use of DVCs and RVCs. The wide use of DVCs and RVCs suggests both Manner/Cause and Path/state-change information are included for motion and state change. This learning pattern is therefore in line with the features of the E-languages. Errors in creating verb compounds reflect an overgeneralization of the dominant way of lexicalizing motion and state change in Mandarin. L2 learners have difficulty figuring out the partial productivity of verb compounding in Mandarin. The overall learning process is very similar to the L1 child counterparts in learning the productivity of verb compounding early on and the learning of the constraints on verb compounding is probably a long process (cf. J. Chen, 2006, 2008).

Why do L2 English learners of Mandarin tune into the Mandarin-way of encoding motion and state change so quickly? Why isn’t there a strong ‘first language thinking in second language speaking’ effect in the learning of motion and state-change predicates in L2 Mandarin? We propose that this may be due to the linguistic properties of DVCs and RVCs and their frequent uses in natural speech. Such effects can be explained by Clark’s (1993, 2004) proposal of three very general principles that affect the process of learning constructional regularities on the basis of the input: Transparency of Meaning, Simplicity of Form, and Productivity in Use. The principle of Transparency of Meaning states that words or constructions that are based on known roots and affixes are learned earlier than

those that depend on forms that are opaque to a learner. For example, the noun compound *pain-killer* is composed of two familiar roots, *pain* and *kill*, along with the relatively early-learned agentive or instrumental suffix *-er*. Recall that in Mandarin, the component verbs of RVCs and DVCs all occur as independent simple verbs as well as in compounds. So the principle of Transparency of Meaning points to a factor that learners of Mandarin could use in analyzing the composition of verb compounds.

The principle of Simplicity of Form states that the simpler a construction is – e.g., the less its root components change in its construction – the easier it is to learn. This means, for example, that English nominals derived from adjectives by adding *-ness*, such as *happiness*, are easier than those derived by adding *-ity*, such as *curiosity*, since *-ity*, but not *-ness*, often causes a stress change in the root adjective. This principle may also contribute to the early productivity of verb compounding. In Mandarin there is no overt morphological marking indicating the relationship between the component verbs in an RVC or a DVC; to create a verb compound, all the learner needs to do is to simply combine two or three bare verbs.

The principle of Productivity in Use states that in forming new words, speakers rely on the most productive option in the language with the appropriate meaning. Productivity reflects the conventional collective preferences of speakers of the language, which in turn draws on speakers' knowledge of structurally possible and available options in that language. The patterns to which learner receive the most exposure are those that are the most frequent in adult speech. In Mandarin, DVCs and RVCs are the most frequent constructions for encoding motion and state-change events, as shown by the high token frequency in native speakers' descriptions. So transparency of meaning, simplicity of form, and high productivity in adult speech all seem to contribute to early productivity in the use of VCs by L2 learners of Mandarin.

We suggest that another possible contributing factor is the inter-typological structural similarities between English motion or state-change predicates (verb particle constructions) and Mandarin verb compounds. English particles differ from complement verbs of compounds, but once the learner discovers the systematic mapping of using a verb in Mandarin to represent the meaning expressed by particles in English, they are in a position of creating DVCs and RVCs that they have never heard in the input to describe any new events of motion and state change. This leads to the overproduction of verb compounds as seen in our data. The influence of the intertypological similarities supports Slobin's (2004) suggestion that languages are better to be treated as on a cline of Manner salience (or Path salience) in motion typology, rather than a dichotomized or trichotomized distinctions. Mandarin is probably closer to English than Japanese on this cline and that may explain the better performance of Mandarin learners of English than Japanese learners of English reported in Yu (1996) study. It remains a question how L2 learners cut back on productivity if they have gone too far. Our data indicates that both L1 and L2 Mandarin speakers seem to be sensitive to some extent to the semantic constraints on the V2. They show varied degree of acceptance to verb compounds with

the second verb from the semantic classes such as posture or Manner of motion. Future research needs to look into why certain constraints are learned earlier than others.

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Topic and Topic-Comment Structures in First Language Acquisition of Mandarin Chinese

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The prevalence of topic-comment structures is one of the most distinctive features of Mandarin Chinese. It has been shown that young children in the early stages of syntax acquisition have the ability to distinguish between the notions of subject and topic; however, the production frequency and the types of topic-comment structures produced by young children in spontaneous speech have yet to be determined. This study examines the production of topic-comment structures in Chinese children between ages 2;2 and 6;0. The result shows that children begin producing topic-comment structures as early as 2;2 and reach adult like production by age 4;0. However, the production of topic-comment structures is infrequent in child speech and this is partly attributed to children's preference of canonical word order schemas.

1. Introduction

Mandarin Chinese has a canonical SVO word order, and is typologically a topic-prominent language given the significant role of topic and the prevalence of the topic-comment structure (Li & Thompson, 1981). Unlike languages such as Korean or Japanese, topics in Chinese are not overtly marked with morphological markers in the syntax; the identification is dependent on the linear word order and the semantic relationship between the topic and comment. Experimental studies have shown that Chinese-speaking children in the early stages of syntax acquisition are capable of distinguishing the concepts of topic and subject (Chien, 1983). However, it is not clear how frequently topic-comment structures are produced by Chinese-speaking children in spontaneous speech. The goal of this study is to examine the production frequency of topic and topic-comment structures in children acquiring Chinese as their first language and to determine if there is a specific type of topic-comment structure that is used the most by children. The data will primarily be a comparison of four age groups: 2;2, 2;8, 4;0 and 6;0 to determine the developmental differences in the acquisition of topic-comment structures. The goal is to determine the production frequency and variety of topic-comment structures and to detect the age of which topic-comment structures emerge.

1.1. Definition of Topic-Comment Structures

Topic-comment structure is a universal phenomenon; this relationship is encoded with various formal linguistic devices in the grammar, namely, morphological markers, syntactic structures and intonation (Gundel, 1988, p. 216). The use of syntactic structures is the most frequently used device to code a topic-comment structure universally (Gundel, 1988, p.223), which is also the most common device in Chinese.

Chao (1968:69) is one of the first scholars to make the claim that Chinese should be considered a topic-oriented language given the pervasiveness and importance of the topic-comment structure, ‘the grammatical meaning of subject and predicate in a Chinese sentence is topic and comment, rather than actor and action.’ In Chinese, the topic is typically the sentence-initial noun phrase of which the immediately following predicate is about.

The function of topic¹ is that ‘the topic sets a spatial, temporal or individual framework within which the main predication holds’ (Chafe, 1976). This is the ‘aboutness’ relationship agreed among Chinese linguists (among them Li & Thompson, 1981; Shi, 2000; Tsao, 1979), which states that the topic must be related to the comment semantically, not necessarily syntactically. The major distinction between a topic and subject is such that, the subject has a grammatical relation with the predicate, while this is not required for a topic. The topic is related to the comment semantically, and may or may not be grammatically related. The semantic dependency of the topic-comment relation means that ~~it~~ it is insufficient to infer a topic-comment sentence’s meaning solely by its syntactic structure.

The sentence-initial position of the topic has been identified as one of the two properties of topic (Li & Thompson, 1981). The other important property of a topic is that it can be separated from the rest of the sentence with a pause or a topic marking particle such as *ne*, *a*, *ya* and *ba*. These particles have no semantic meaning and are interchangeable. An NP with these two properties is not automatically designated as topic; restrictions apply as to what type of NP can be a topic. The syntactic manifestation of a topic-comment relationship will be discussed in the following section.

Chien (1983), along with Xu & Langendoen (1985), propose the following phrase structure rule for Chinese, where S is a subject-predication construction:

$$(4) \overline{S} \rightarrow (\text{TOP}) S$$

¹ In this study, no attempt is made to distinguish or discuss the difference between chain and syntactic topics, as proposed by Tan (1991). A chain topic serves as the topic of the greater discourse frame and is usually mentioned at the beginning of the discourse; it can correspond to the subject or object of the following sentences. It is syntactic topics that are of interest in this study. The notion of topic will be discussed as the topic at the clausal level, not the greater discourse unit, where the topic is the referent outside of the clause that contains it.

As the rule indicates, the presence of a topic is optional in Chinese, and it is sentence-initial when present.

In summary, a topic is the sentence-initial NP, but in a SVO sentence, the preverbal NP will be treated as a subject, not topic. Topics are not determined by the syntactic structure, but instead by its semantic relation with the predicate, and the context that decides whether or not a NP is a topic.

1.2. Types of Topic-Comment Structures

There are four types of topic-comment structures to be discussed in this section. The first type is a topic with a resumptive pronoun in the comment clause. The topic is the antecedent of a resumptive pronoun² in the comment clause (Xu & Langendoen 1985). The topic and the resumptive pronoun have a coreferential referent. The resumptive pronoun in the comment clause can occupy the subject (1a)³, direct object (1b) or indirect object (1c) positions.

- (1) a. Li xiansheng ta renshi wo
Li Mr. he know I
'Mr. Li, he knows me.'
- b. Li xiansheng wo renshi ta
Li Mr. I know he
'Mr. Li, I know him.'
- c. Li xiansheng wo gei le ta wu ge pingguo
Li Mr. I give PFV he five CL apple
'(to) Mr. Li, I gave him five apples.'

The second type of topic-comment structure is a topicalized clause. For this type of construction, the topic can be viewed as having been extracted from its original post-verbal object position, leaving a gap in its original extraction site. This gap is coreferential with the topic. The comment clause may appear incomplete, but because it forms part of the topic-comment structure with the topic, it is nevertheless grammatical. This type of topic-comment construction has an OSV word order that can all be reordered into a SVO sentence.

- (2) Li xiansheng, wo renshi _____
Li Mr. I know
'Mr. Li, I know.'

The third type of topic-comment structure is double nominatives construction. A double-nominative construction in Chinese is where two adjacent NPs precede the

² Or less frequently, a full NP.

³ The underlined NP is the topic.

predicate. The most typical types of semantic relationship between the two initial NPs in a double nominative construction are domain-subset (Kroeger, 2004) or possessor-possessed. In (3) the subject of the comment clause is considered to be a subset of the domain of the topic NP, and the object of the comment clause in (4) is a subset of the topic domain. Note that these sentences become ungrammatical if the subject or object is not a member of the domain. An example of a possessor-possessed relationship is exemplified in (5).

- (3) zhexie ren san ge shi wo de xuesheng
 these people three CL be I POSS student
 ‘(among) these people, three are my students.’
- (4) shuiguo wo zui xihuan yingtao
 fruit I most like cherry
 ‘(among all) fruits, I like cherries best’
- (5) chang jing lu bozi chang
 giraffe neck long
 ‘As for giraffes, their necks are long.’

The fourth type of comment structure is an adverbial phrase. Adverbial phrases are less common as topics, but they nevertheless serve as the semantic frame and provide background information for the comment clause. The purpose of a frame topic is to set the temporal or location frame for the comment clause, as in (6) and (7) respectively. Adverbial fronting is regarded as ‘a special case of topicalization’ (Xu & Langendoen, 1985). Under Chao’s (1968, p. 73) analysis, a sentence-initial locative phrase can represent the subject/topic of the predicate, since ‘the subject needs not represent the actor, it can, among other things, represent the place at, place to, object for.’ Li & Thompson (1981) also suggest that temporal and spatial adverbial phrases are topics for having the properties that are required, namely, they set the frame and they may be optionally followed by a pause or a particle.

- (6) zuotian wanshang wo mei shuijiao
 yesterday evening I no sleep
 ‘Last night, I did not sleep.’
- (7) zai Taiwan ni keyi chidao hen duo zhong shuiguo
 at Taiwan you can eat very manykinds fruit
 ‘In Taiwan, you can eat many kinds of fruit.’

1.3. Acquisition of topics in Chinese

In her study, Chien (1983) examined the comprehension of subject and topic by children acquiring Chinese as their first language. The results were obtained through an experimental setting, where children were required to make judgments on the

grammaticality of sentences based on their knowledge of subject and topic. The results indicate that children are sensitive to the distinction between the notions of subject and topic at their early stages of syntax acquisition.

In Erbaugh's (1992) longitudinal study of four Chinese-speaking children from the age of 1;10 through 3;10, she found that these children adhere strictly to canonical SVO word order. She concurs with Slobin & Bever (1982) that the canonical word order schema appears to be accessible and plays a crucial role in children's early sentence comprehension and production. Chinese-speaking children begin to produce strictly canonical SVO order sentences at an early stage with little word order deviations and few errors until they have good control of the basic sentential relations (Erbaugh, 1992, p. 416). Erbaugh suggests that Chinese children's word order is more conservative than that of adults' due to their processing capacities and desire for consistency (Erbaugh, 1992, pp. 416-417). This could explain why non-canonical word orders are not productive, at least not in the early stages of syntax acquisition, although they are available and common in Chinese. On the other hand, word order is considered in the literature the most important syntactic device in Chinese for sentence interpretation (e.g. Chang, 1992), given the lack of morphological markers to mark agreement, number, gender or case.

Topic-comment structures require a more sophisticated syntactic competence, and this has been pointed out in Erbaugh (1992) that 'choosing a pre-sentential topic, setting it off with a particle, then commenting on it over a number of sentences developed very slowly after the child turned 3;0' (p. 441). Chinese-speaking children start to gain a good control of full-sentence predicates after about age 3;2 (Erbaugh, 1992, p. 404), where they start to produce more complex sentences such as three-term sentences with agent, action, and patient, the use of modals, serial verbs and incorporating several events into a single sentence. However, topicalization remains difficult and rare at this stage. Erbaugh (1992) suggests that topicalization is a difficult aspect of Mandarin despite 'its high input frequency and importance' (p. 441). In fact, it is a structure that children avoid producing before four years of age (Erbaugh, 1983, p. 49).

1.4. Children's use of canonical word order structures

It is suggested that cross-linguistically, children acquire a schema of canonical sentence forms at the early stage of their syntax acquisition (Slobin & Bever, 1982). This schema then forms the basis for processing non-canonical constructions and sentence forms (Slobin & Bever, 1982). They pointed out that because canonical forms have such a strong influence on language processing for children, this may hinder their understanding of non-canonical forms. This leads to the question of how do children approach non-canonical sentence structures, namely the topic-comment structure in Chinese. Children could potentially have no difficulties if they are exposed to sufficient input of topic-comment structures. A complex syntactic construction can be acquired if it is central to the grammar of the language and produced frequently in child directed speech, as has been shown for the passive construction in Sesotho. Passives are often

conceived as having a complex syntactic structure, but nonetheless, Sesotho-children are capable of comprehending and producing passives as early as age 2;8 (Demuth, 1990).

2. Method

This section introduces the data that is used for analysis, coding criteria, as well as the method for data selection.

2.1. Data

The data used in this study were obtained from the transcripts from the Zhou1 corpus for children ages 2;2 and 2;8, and the Chang corpus for children ages 4;0 and 6;0, all from the CHILDES database (MacWhinney, 2000). There are ten transcripts in both the 2;2 and 2;8 age groups, with equal number of male and female children in each group. The Chang corpus consists of 24 transcripts, with equal number of children in both age groups and six female and six male children in each age group. The total number of transcripts examined was 44. All the children are native speakers of Mandarin Chinese.

2.2. Coding

When identifying a topic-comment structure among all the utterances produced by children, two criteria are considered.

The first is the position in the clause. Topics have been identified as always being in the sentence initial position because they set the frame for the comment. The data for this study involve story narrating, hence there are many utterances of adverbial connectives such as *ranhou* 'then,' *keshi* 'but' and *yinwei* 'because' before a complete sentence emerges. These types of adverbial connectives⁴ will be overlooked when identifying topics. Li & Thompson (1981) point out that a topic does not always need to be in sentence-initial position, such as when it follows a connector that links it with the preceding sentence. Although adverbial connectives appear in the preverbal slot that is typically occupied by topics, they are not considered topics. In general, only NPs can be topics and the only cases where adverbials have topical status are when they appear as temporal or spatial phrases.

The second involves topic characteristics. A topic phrase can be separated from the comment by a pause or a topic particle such as *a*, *ne*, *ma* and *ya*. These particles do not contribute any semantic meaning to the topic phrase; they can be used interchangeably and are not mandatory. In contrast, a subject cannot be separated from the rest of the sentence by a pause or one of the topic particles.

Topic-comment clauses are then categorized into the four categories discussed in the previous section: (1) topic with a resumptive pronoun in the comment clause (2) topicalized clause (3) double nominatives and (4) adverbial phrases.

⁴ They are referred to as 'sentence-linking adverbs' in Li & Thompson (1981).

2.3. Data Selection

The scope of this study is children's sentence production, and the following types of short utterances were ignored in determining the total number of utterances produced by each child: (1) single phrase utterances: this type of utterances include answers to yes-no questions; utterances with only a noun, verb, adjective, adverb or question word; and utterances with only an adverbial-adjective phrase; (2) non-speech utterances; and (3) unintelligible utterances: where the utterance is unintelligible and the meaning cannot be determined.

3. Results

3.1. An overview

The frequency of topic-comment clauses was calculated by determining the percentage of the occurrence of this structure among all the clauses produced. The mean number of total clauses produced is lower for children in the 2;2 and 2;8 age groups and higher for 4;0 and 6;0 children. However, as presented in Table 1, the mean number of topic-comment clauses produced is low among all four age groups, ranging from 0.5 to 2.92 clauses. Only 13 tokens of topic-comment clauses were identified between the younger age groups of 2;2 and 2;8, and 69 tokens were identified in the older age groups of 4;0 and 6;0. The average percentage of topic-comment clauses produced per child ranges from 1.20% to 3.55% in the four age groups. Although there is some increase in this percentage between ages 2;2 and 2;8, this increase is not significant, $t(18) = -1.3$, $p > .05$. Overall, there is no significant difference in the average percentage of topic-comment clauses produced by children among the four age groups, $F(3, 40) = 1.31$, $p > .05$.

Table 1. Total number of clauses and topic-comment clauses produced by children of four age groups

	Age 2;2	Age 2;8	Age 4;0	Age 6;0
Number of children	10	10	12	12
Total number of clauses	387	227	875	1009
Mean number of total clauses	38.7 (<i>SD</i> = 31.0)	22.7 (<i>SD</i> = 14.7)	72.92 (<i>SD</i> = 59.28)	84.08 (<i>SD</i> = 47.99)
Total number of topic-comment clauses	5	8	34	35
Mean number of topic-comment clauses	0.5 (<i>SD</i> = 0.71)	0.8 (<i>SD</i> = 0.92)	2.83 (<i>SD</i> = 3.76)	2.92 (<i>SD</i> = 3.00)
Average percentage of topic-comment clauses produced per child	1.20% (<i>SD</i> = 1.84)	2.89% (<i>SD</i> = 3.69)	3.55% (<i>SD</i> = 2.85)	3.38% (<i>SD</i> = 3.41)

3.2. Results broken down by age and types of topic-comment structures

There is little variation in the type of topic-comment structure produced by the children in the 2;2 and 2;8 age groups, as shown in table 2. For these two age groups, the majority of the topic-comment structures produced are topicalized clauses. There are no tokens of topic-comment structures produced in the resumptive pronoun and double nominative categories. There appears to be a sharp numerical decline in the production of topicalized clauses between ages 2;2 and 4;0. However, this discrepancy is not a true decline in production frequency; only 5 topic-comment clauses were found in the 2;2 age group and all of them are topicalized clauses. On the other hand, there are 5 tokens of topicalized clauses in the 4;0 age group, but the emergence of other types of topic-comment clauses at age 4;0 caused the decline in percentage of topicalized clauses at age 4;0 and 6;0.

For the 4;0 and 6;0 age groups, the resumptive and double nominatives types of topic-comment structures together account for most of the topic-comment structures produced, with the topicalized structure being the most infrequent. Within the resumptive pronoun category, the majority clauses have a topic NP and a resumptive pronoun in the comment clause (25/27, 92.59%), whereas clauses with a topic pronoun and a resumptive NP in the comment clause is less frequent (2/27, 7.41%). For all the 27 clauses with a resumptive pronoun or NP, 26 of the clauses have a topic that is co-referential with the subject NP or pronoun in the comment. There is only one clause where the topic is co-referential with the object in the comment. As for the double nominatives, 17 tokens were identified, among which, 12 have a possessor-possessed relationship, one has a domain-

subset relationship, and the other 4 are semantically related. Within the adverbial phrases category, temporal adverbials account for 80% (12/15), while spatial adverbials account for 20% (3/15).

Although Table 2 suggests that four year old children are producing significantly more double nominatives than six year old children, the actual token figures suggest otherwise. A total of 13 tokens were found among four year olds, and among these eight were found in the same child. Thus this cannot be taken as an indication that younger children have the tendency to produce this type of topic-comment structure over the others. Statistic test shows that the production difference between the two age groups is not significant, $t(22) = 1.033$, $p = > .05$.

The actual number of tokens produced by children in the two age groups does not show much difference in other three types of topic-comment structures. Statistic tests confirm that the differences are not significant for resumptive type of topic-comment structures, $t(22) = -.844$, $p = > .05$, topicalized topic-comment structures, $t(22) = .001$, $p = > .05$, and adverbial topic-comment structures, $t(22) = -1.055$, $p = > .05$. This shows that the production of the four types of topic-comment structures are not different for four and six year old children.

There is some increase in the types of topic-comment structures produced between ages 2;2 and 2;8, but not all four types were produced. By age 4;0, all four types of topic-comment structures can be identified in child speech. However, the frequency in production does not differ statistically between ages 4;0 and 6;0, and thus could not suggest further development after age 4;0.

Table 2. Breakdown of types of and age group and topic-comment structures

Age	Types of Topic-Comment Structures				
	Frequency	Resumptive	Topicalized	Double Nominatives	Adverbial
2;2	5	0	100% (5)	0	0
2;8	8	0	87.5% (7)	0	12.5% (1)
4;0	35	32.4% (11)	14.7% (5)	38.2% (13)	14.3% (5)
6;0	34	45.7% (16)	11.4% (5)	14.3% (4)	28.6% (10)

3.3. Adult Data

The data sets from the previous sections show that the production of topic-comment structures is low among children ranging from ages 2;2 to 6;0. Given that Mandarin is a topic-prominent language, why is the production frequency so low in child speech? Have they or have they not acquired topic-comment structures? To put the data in perspective, it is necessary to compare the results to that of adult data.

A small sample of adult to adult speech data is collected and analyzed for the frequency of topic-comment constructions produced. Four sets of data were collected

from a variety of TV talk shows in Taiwan, which were broadcasted in 2008. For each show, approximately ten minutes were recorded and transcribed.

The first talk show is a political one, where the host discusses the latest political event with six guests, including political figures and scholars. The second talk show is a show where hosts present and sample local cuisine with several guests. The third talk show targets women audience, discussing fashion trends and beauty products. The last talk show is an informal interview, where public figures and celebrities are invited to discuss various topics. All of the shows are broadcasted in the popular evening slots. The findings on topic-comment constructions are presented in table 3 below.

Table 3. Production of topic-comment constructions in adult to adult speech

Type of TV show	Percentage of Topic-comment clauses (%)
1. Political	5.17
2. Leisure (food)	4.69
3. Fashion	4.27
4. Entertainment	2.02

As shown in table 3 above, the percentage of topic-comment structures used in adult to adult speech varies across the four talk shows, ranging from 2.02% to 5.17%. This figure is not much higher than the percentage of children's production. However, with the exception of the topicalized object topic-comment construction, all the other four types are identified across all talk shows. In the data sets of children in the age 2;2 and 2;8 groups, the variety of topic-comment constructions is more limited than those in the 4;0 and 6;0 groups. This suggests that children's production of the types of topic-comment constructions begins to parallel that of adults' by approximately age four.

3.4. Summary of results

In the age four and six groups together, only 69 tokens of topic-comment clauses were identified, among all the utterances produced by the 24 children. Moreover, there is no difference in the production frequency between the two age groups. Overall, the resumptive and semantic types of topic-comment structure were the most common, whereas the topic-comment structure with a topicalized object is produced the least frequently among children in the age 4;0 and 6;0 groups, although this is the dominant type for children ages 2;2 and 2;8. Children use less object topicalization at ages 4 and 6 compared to 2;2 and 2;8. Children committed few errors when producing various types of

topic-comment structures. It can be seen that when children begin producing topic-comment structures, the topicalized clause is the most prevalent type. Children do not start producing all four different topic-comment structures until age four, despite being infrequent. The production frequency shows no increase between ages 4;0 and 6;0. However, the percentage of topic-comment structures produced at 4;0 and 6;0 could parallel to the percentages of adult speech.

4. Discussion

Chinese children begin producing topic-comment structures as early as at age 2;2. There is some increase in frequency between 2;2 and 2;8, but the results did not provide evidence to show that there is significant growth in production beyond 2;8. The types of topic-comment structures produced were initially limited, but children reached adult-like competence by age four. However, the production frequency at age 4;0 is not significantly different from that of age 2;8. On the other hand, the lack of production errors suggests that children may have already acquired topic-comment structures at an early age.

Topic-comment constructions have non-canonical word orders, which may pose production difficulties for children. In the study of Slobin & Bever (1982), they found that children will avoid producing structures that deviate from the canonical word order. As suggested by Erbaugh (1992), Chinese children adhere strictly to SVO word order, which could explain the low production of topic-comment structures. Also, the use of topic-comment structures is usually not mandatory in Chinese, which could also contribute to the low frequency in production.

As mentioned previously, Erbaugh's study (1983, 1992) has shown that children at 3 are already producing topicalized clauses, a type of topic-comment structures. She further suggests that this development is actually slow, because topicalized clauses are a more sophisticated syntactic structure. She also attributes the results to the fact that Chinese children avoid non-canonical word order until the age of four (Erbaugh, 1983). This is in line with the findings of this study, where it is found that by age four children are producing all four types of topic-comment structures. Few topic-comment structures were produced at ages 2;2 and 2;8 and the types were limited.

About the collected data, the role of context in data collection could have affected the type of data elicited. For the younger age groups (2;2 and 2;8), the data were collected in a semi-structured experimental settings where children were given topics and interacted with their caregiver. For the older age groups (4;0 and 6;0), children were given toys and interacted with an experimenter in an experimental setting. All the data used in this study were obtained from experimental settings where children were encouraged to talk to their mothers or an experimenter. Although the data can be considered a form of spontaneous production, children were nevertheless restricted with the contents they could produce, which as a result may not fully reflect their linguistic competence. It would also be beneficial to consider data obtained in settings where children are interacting with other

children or adults. This kind of interaction was lacking in the experimental setting in which data for four and six years old children was collected as the investigator was only responsible for eliciting a narration from children that involved asking questions which did not show great variation across the transcripts. If longitudinal data obtained from a different context and longitudinal data also yield similar results to this study, then it would provide stronger evidence that topic-comment structures are not produced frequently among Chinese-speaking children between the ages of 2;2 and 6;0.

The low frequency in production is in line with the adult data analyzed for this study. The percentages of topic-comment structures produced in adult speech are not much higher than that found in child speech. Also, by the age of four, children are producing all four types of topic-comment structures. The result seem to be surprising, given that Mandarin Chinese is generally assumed to be a topic-prominent language and has been suggested that a high number of spoken sentences can be characterized as topic-comment structures (Chao, 1968).

5. Conclusion

Contrary to expectations, the results show that topic-comment structures are not produced frequently in Chinese children's spontaneous speech. There is some development in the production of topic-comment structures in Chinese-speaking children between ages 2;2 and 2;8, but there is so far insufficient evidence to suggest further development between 2;8 through 6;0. The overall low production frequency of topic-comment structures found in Chinese-speaking children's spontaneous speech between ages 2;2 and 6;0 does not reflect the topic-prominent characteristic of Chinese. However, the few errors in children's production suggests that this structure is acquired at approximately 2;2 and is either not manifested in the production, due to the context in which the data was collected, or since the structure is not being used frequently in spontaneous speech by children. The findings should not be taken as an indication that young children have not yet acquired topic-comment structures since adult data shows comparable production frequencies. Children did not produce all four types of topic-comment structures until age 4;0 which suggests that they prefer to adhere to canonical SVO sentences until they have reached a higher level of syntactic competency. This supports Slobin & Bever's (1982) claim that children have a preference for canonical sentences. It would also be of interest to examine children's production patterns of topic-comment structures in other topic-prominent languages to determine whether topic-comment structures are prevalent in child speech and if these children also adhere to the canonical word order of their language.

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Roles of pictures and native language in lexical processing for elementary American learners

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This study investigated the effects of pictures and native language (L1) on processing second language (L2) words for elementary American learners of Mandarin. The primary goal was to examine whether beginning L2 learners must revert to their L1 to process L2 words, or whether pictures representing pre-existing concepts facilitate processing. The second focus was to compare the participants' responses to two elements of Chinese, pinyin and characters. This study supports the idea that an initial-stage adult language learner uses L1 as a medium to connect a concept with L2, predicted by the word association model (Potter et al, 1984). Moreover, the different orthography in the writing systems is shown as a determinant for the speed of processing words.

1. Introduction

The majority of the people in the world are able to speak two or more languages. Among these bilinguals, a fair amount learn their second language (L2) as an adult, in a classroom setting. How do these adult second-language learners process their L2? What is the representation and connection between the two languages? Do these beginning learners tend to use their native language (L1) as an intermediate tool, or can they process L2 independently of their L1? To reveal the answers to these questions, we need to examine two fundamental representations. First, does a bilingual have one shared conceptual system for both languages or two separate systems? Second, words are the basic units of a language; hence, how and at what level are lexical and conceptual systems of a bilingual interconnected?

1.1. The Representation of Conceptual and Lexical Systems

Starting from a half century ago, Weinreich (1953) proposed a three-manner hypothesis about the organization of a bilingual's word and world knowledge. According to his framework, there are three bilingual types: coordinate, compound and subordinate. A coordinate bilingual is a person with separate conceptual representations for translation equivalents. A compound bilingual is a person with one conceptual representation shared by both languages. Lastly, a subordinate bilingual associates L2 to the conceptual representations through L1, which is a characteristic of low-level L2 proficiency. These three different types of connections provide a framework of bilingual lexical processing.

Ervin and Osgood (1954) later focused on the differences between coordinate and compound bilinguals, implying that the differences lie in the acquisition context. Soon afterwards, Lambert and Fillenbaum (1959) proposed a compound-coordinate distinction substrate in terms of neuropsychological viewpoints. They tested the distinction hypothesis on polyglot aphasics and found that the data were generally compatible with the compound-coordinate distinction: coordinate bilinguals contain more functionally separate neural structures underlying their languages than compound bilinguals. Kolers (1963) recast the issue in terms of shared or separate bilingual memory systems. The shared-store hypothesis says that two languages share a single storage with access to each language; the separate-store hypothesis, on the other hand, indicated that the representations of words in two languages mapped onto two discrete memory storages.

1.2. The Bilingual Processing Models

1.2.1. Word Association Model and Concept Mediation Model.

In 1984, Potter, Von Eckardt, and Feldman published a key paper, returning to Weinreich's original distinctions of the organization of bilingual knowledge by postulating two alternative models and testing them explicitly. The first model, the word association model, shown in figure 1, assumes that L1 is the medium for L2 to access the concepts. The second model, the concept mediation model, shown in figure 2, predicts that L2 can access the concepts without any intermediate. Using word translation and picture naming tasks, Potter et al. (1984) tested these alternatives on fluent and less-fluent bilinguals. They found the same pattern across the two groups of subjects: both fluent and less-fluent bilinguals used approximately the same amount of time in the word translation and picture naming tasks (which is believed to necessarily involve concept retrieval) in

L2. Their result supported the conceptual mediation model; that is, both fluent and less-fluent bilinguals showed the connection between concepts and their L2.

Subsequent studies either replicated or extended Potter et al. (1984), finding that subjects who were of even lower L2 proficiency than the subjects in the less-fluent group in Potter et al.'s study performed in the pattern predicted by the word association model: naming pictures in L2 took longer than translating words into L2 (Kroll & Curley, 1988; Chen & Leung, 1989). On the other hand, there has been evidence to support the idea that fluent bilinguals build a direct link between the concepts and their L2, which more likely resembles the concept mediation model. Semantic priming tasks were applied to test fluent bilinguals. If they use a shared conceptual system, and if they are able to activate a concept directly from L2, then supposedly there would be semantic priming within each language and across languages. Cross-linguistic semantic priming has been found in fluent bilinguals in many studies, which has been taken as additional support that fluent bilinguals directly access the concepts via their L2 (e.g., Kirsner et al 1984; De Groot & Nas, 1991; Altarriba, 1992).

More evidence has supported the claim that there is a difference in lexical mediation between fluent and less-fluent bilinguals. Talamas, Kroll and Dufour (1999) used a translation recognition task to test fluent and less-fluent bilinguals in Spanish and English. What is of interest lay in the non-translation-equivalents pairs, which included form-similar, semantic-similar, or unrelated pairs. Talamas et al. (1999) found interference, such as longer response latencies, for both form-related and meaning-related pairs relative to unrelated controls. Moreover, the magnitude of the interference pattern reversed for the two groups: the more fluent group suffered more interference from meaning-related than form-related pairs while the less fluent group was disrupted more by form-related than meaning-related pairs. The result was taken as evidence for the shift of lexical mediation from form connection to meaning connection as the L2 proficiency increases.

Other evidence came from laboratory training on L2 acquisition. Chen (1990) did lexical processing studies using word translation and picture naming tasks. One of the studies involved training native Chinese speakers with a new language, French, by associating the French words with their Chinese translation equivalents. Subjects were divided into two groups, which received different amounts of training. The results showed that for the low-training group, the response time of translating Chinese words to French was significantly faster than that from pictures to French words. For the high-

training group, however, there was no such difference. In another study, native Chinese speakers were trained to acquire French in different ways; one group was trained by using Chinese words and their French translation equivalents, and the other group was trained by using pictures and the corresponding French reference words. The subjects' performance was initially in accordance with their training modality: those who received word-association training did better in word translation tasks while those who received picture-association training did better in picture naming tasks. Yet in the later phase, after receiving more training in French, neither group was found to have a significant difference between word translation and picture naming tasks. Together these studies indicated that the amount of exposure to the learned language as well as the learning strategy could be part of the contributors to bilingual's lexical processing.

These studies showed that less-fluent bilinguals performed word association modality while relatively fluent bilinguals did concept mediation modality.

1.2.2. The bilingual interactive activation model (BIA model).

The bilingual interactive activation (BIA) model (Grainger & Dijkstra, 1992), explains recognition and distinction of words between two languages, shown in figure 3. The BIA model simulates lexical competition results found from both within- and between-languages. According to the model, the input of a string of letters will activate words with similar letters (neighborhood effect) irrespective of the language. During the competition of the activated words, facilitation and inhibition are involved; however in the end, the target word surpasses the activation threshold and then is recognized. The model predicts the asymmetries observed in unbalanced bilinguals as well. For less-fluent bilinguals, words in L2 are of lower subjective frequency than those in their L1. Thus, words in L2 with a higher activation threshold are activated slower than L1 words. It is the extent of the similarity to the input letters that determines the activated competitors. Therefore, words in languages which have similar orthographic systems may be activated by an input letter string of either language. Logically it is assumed that if two languages have no orthographical similarity, word candidates cannot be activated across languages. Chinese characters, a logographic system, and English words, an alphabetic system, thus would not have cross-linguistic activation effects in terms of form similarity. Nevertheless, such language pairs may still have the effects of phonological similarity (Dijkstra & Van Heuven, 2002).

The BIA model provides an alternative viewpoint especially in terms of cognate status and orthographical similarities for processing two languages.

1.3. Lexical Processing of Chinese-English Bilinguals

Studies (Potter et al. 1984; Chen & Leung 1989; Chen 1990; Cheung & Chen 1998) have been done with fluent Chinese-English bilinguals or Chinese-speaking children in the beginning stage of learning English. These studies were based on Potter et al.'s (1984) work and then were extended to bilinguals with different L2 proficiency levels or those who acquired their L2 at different ages. All the studies employed picture naming in L1 and L2, word naming in L1, and word translation from L1 to L2. Their findings showed that for adult L2 beginners, translating L1 into L2 was faster than picture naming in L2, as predicted by the word association model. For proficient adult bilingual subjects, picture naming in L2 and translating L1 words into L2 were equally efficient, as presumed by the concept mediation model.

There are two writing systems involved in the process of learning Mandarin Chinese: one is *pinyin*, an alphabetic system used to represent Chinese sounds, in which the letters used are the same as those used in English. For example, the letters REN, pronounced /rɛn/, means “person/people”. The other writing system is Chinese characters, a logographic system in which a symbol usually stands for its individual meaning with no indication of the sound. For example, “人” means “person/people”. *Pinyin* is a supplementary tool for learning Chinese. Once native speakers of Chinese are able to recognize the sounds of individual character, *pinyin* is no longer used.

2. The Present Study

The research mentioned above was mostly performed on adult fluent Chinese-English bilinguals. The present study uses a quite different group of participants, native English-speaking adults in a beginning stage of learning Chinese, to examine lexical processing and extent of applicability of the word association model (Potter et al, 1984). In addition, in light of the BIA model (Grainger & Dijkstra, 1992), the similarities or differences of two orthographic systems of the two languages would activate or deactivate each other. The present study looked at the influence of the different orthographical features within Mandarin Chinese for these speakers.

Another group of native speakers of Mandarin Chinese who were relatively fluent in English were also recruited to serve as a control group to see how Chinese process

their L1 as opposed to how Americans process Chinese as L2. Moreover, they could also serve as a contrasting group to see the effect of the different proficiency in L2 performed in the language-processing task.

A translation-recognition task (De Groot, 1992, Experiment 2; Talamas et al., 1999) was used in this study, in which participants see a word in one language and then a second word in another language, and determine whether the second word is the translation equivalent of the first word. Along with translation recognition, this study included a picture-recognition task in order to compare the reaction times (RTs) of L1-L2 and picture-L2. There are two main reasons for employing the translation-recognition task in the present study. First, elementary L2 learners are not very familiar with L2, and they may still feel uncomfortable speaking it out loud. The translation-recognition task avoids having them miss responses due to the unfamiliarity with L2 or the discomfort or embarrassment of speaking out loud. Secondly, De Groot (1992) indicated that translation recognition bypasses the translation-retrieval process that occurs in translation production, and can eliminate the possible confusion of the locus of the observed effects as opposed to translation production.

There are five hypotheses of the present study. For the English group, since they were beginning learners of Chinese, the word association model predicts that reaction times of picture-L2 will be longer than that of L1-L2. Secondly, the word association model would also predict that L1-L2 character RTs is shorter than picture-L2 character RTs. Third, English and *pinyin* both use Roman letters, while English and Chinese characters use different orthographic systems. Based on the BIA model, it is easier for American learners of Chinese to access *pinyin* than characters. Thus, L1/picture-L2 *pinyin* would be faster than L1/picture-L2 characters. For the Chinese group, their relatively fluent English results in approximately the same RTs of L2-L1 character and picture-L1 character, predicted by concept mediation model. Furthermore, according to the BIA model, English shares the same orthographical form as *pinyin*; therefore L2-L1 *pinyin* would be faster than picture-L1 *pinyin*.

2.1. Participants.

Nine native speakers of American English, participated in the study. They were all students of Mandarin Chinese enrolled in a second-semester Chinese class at the University at Buffalo at the time of the study. Their proficiency at the point of

participation was quite comparable. Their Chinese class was one hour a day, five days a week. Other than from their class, they did not have much exposure to Mandarin Chinese.

The second group of participants was fourteen native speakers of Mandarin Chinese from mainland China, enrolled in the graduate school at the University at Buffalo at the time of study. They started learning English in high school. Each of them had studied English for more than ten years, with the average studying span being 14.2 years. Each had been in the United States for at least eight months, with the average length of time being 1.71 years.

2.2. Materials.

The test materials consisted of 84 pairs, with the first word or picture serving as the stimulus and the second as the target. The 84 pairs were divided into six blocks, 14 pairs in each block, the presentation order of which was counterbalanced across subjects. The six blocks were as follows: (1) English-English, (2) pictures-English, (3) English-Chinese characters, (4) English-Chinese *pinyin*, (5) picture-Chinese characters, and (6) picture-Chinese *pinyin*. For non-translation equivalents, semantically or orthographically unrelated word pairs were designed for the experiment. The first block is a synonym test block. The reasons to utilize synonyms were to ascertain that the subjects would access the words' meaning. Secondly, the synonyms task is paralleled with the remaining translation-recognition task in a way that translation equivalents of two languages were also synonyms to some extent.

All English words were from three to eight letters in length, while all *pinyin* words were composed of four to eight letters. The Chinese targets all consisted of two characters, and the *pinyin* were always two syllables. The pictures were all line drawings. The Chinese words were all chosen from the Chinese textbooks which the participants had been using in their classes. Since the stimuli were from the beginning-level textbooks, they were all of high frequency and with relatively low difficulty. All of the stimuli were concrete nouns except for four pairs consisting of an action picture followed by a Chinese verbal noun, chosen due to the limitation of the participants' useable vocabulary. The English synonyms were judged by three native speakers of English and were examined on the WordNet website, version 1.7.1 by Princeton University. They were also concrete nouns with high frequency.

Prior to the test stimuli, there was an additional block of 18 practice pairs presented, including a combination of all six conditions, with three practice trials in each condition. None of the practice items were used for the real task.

2.3. Design and procedure

All subjects passed through a familiarization stage, in which each of the critical stimuli was presented by a picture and its English and Chinese equivalent, including *pinyin* and character, on a single sheet. Familiarizing the subjects with the items in the upcoming experiment ensured that these elementary learners would avoid missing too many responses, and ascertained that all subjects were at the same baseline of picture recognition. This was another way to control for the frequency of the stimuli as well, given that the available vocabulary pool was not very large. The testing date was different from the training date to avoid the potential effects of long-term priming or psychological training association.

The subjects were tested individually in a normally lit room in the Linguistic Department, at the University at Buffalo. The experiment was run using E-Prime software, an experiment generation and testing software developed by Psychology Software Tool, Inc. The responses and RTs were recorded automatically by the software.

The stimuli were presented in black color against a light-gray background on a 14-inch computer screen, with the English words in lowercase letters, Chinese characters in standard simplified version, and *pinyin* in the same font as the English lowercase letters. The type of pairs presented in each block was counterbalanced across subjects. The order of the trials within each block was randomized. No stimulus was ever repeated in any form for any given participant. For instance, if a participant saw “spring-春天” (English-character), then a different participant would see “spring-*chuntian*” (English-*pinyin*).

The first word or picture was presented in the middle of the computer screen for one second, followed by a fixation point, a plus sign, for one second, and then by a second word for a maximum of five seconds. The participants were instructed to make a decision as to whether or not the second word was the correct translation of the first word or picture, or a correct synonym if it was an English-English block. They were told to respond as quickly and accurately as possible. Response latencies were recorded automatically by the computer from the onset of the second word until the participant pushed the yes/no button on the computer.

3. Results

3.1. Accuracy

Table 1. Percent accuracy of the American and Chinese groups in the six conditions.

	E-E	Pic-E	E- <i>pinyin</i>	E-character	Pic- <i>pinyin</i>	Pic-char
American	98.4	98.4	95.2	91.3	89.7	84.9
Chinese	88.3	99.0	96.9	98.0	96.9	99.0

Table 1 shows the percent accuracy of both groups in the six blocks. Mean percent accuracy to the target word was subjected to a three-factor analysis of variance (ANOVA) with one between-group factor, native language (English and Chinese), and two within-group factors, type of critical stimuli (English and pictures) and type of target word (English, *pinyin*, and characters). The analysis showed that for the American group, the only significant contrast was the target language difference: L1-L1 and picture-L1 had a higher percent accuracy ($M=98.4\%$) than L1-L2 and picture-L2 ($M=90.3\%$), [$F(1, 52)=11.3, p<.001$]. For the Chinese group, one significant difference occurred when the stimuli type was L2, English, with a higher accuracy of L2-L1 ($M=97.5\%$) than L2-L2 ($M=88.3\%$), [$F(1, 40)=22.3, p<.001$].

3.2. Latencies

Mean correct response latencies to the target word were subjected to three-factor ANOVA, with one between-group factor, native language (English and Chinese), and two within-group factors, type of critical stimuli (English and pictures) and type of target word (English, *pinyin*, and characters). The mean response times for the six blocks of the two groups are shown in Table 2.

Table 2. Mean response latencies (in milliseconds) of the American group and the Chinese group in the six conditions.

	E-E	Pic-E	E- <i>pinyin</i>	E-character	Pic- <i>pinyin</i>	Pic-char
American	887	734	1332	1392	1344	1721
Chinese	1220	804	1329	796	1556	842

3.2.1. The American group

When the target language was L2 (including *pinyin* and character), there was a significant effect of stimuli type, with L1-L2 ($M=1361$ ms) faster than picture-L2 ($M=1528$ ms), as shown in figure 4, [$F(1, 453)=6.39, p<.012$]. This supports our first

hypothesis that for L2 novices, L1-L2 is faster than picture-L2 due to the direct connection between L1 and L2, according to the word association model.

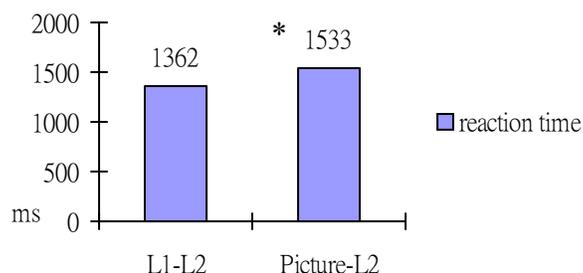


Figure 4. For American group, L1-L2 was significantly faster than picture-L2.

* There is a significant difference between these two measures.

ANOVA analysis showed that when the target was a character, there was a main effect of stimuli type, with L1-L2 character being faster than picture-L2 character, [$F(1, 220)=12.8, p<.001$], which is predicted by the word association model.

In figure 5, one-way ANOVA indicated that there was a main effect of the target type, L2 *pinyin* and L2 character, showing that L1/picture- L2 *pinyin* ($M=1338$ ms) was faster than L1/picture-L2 characters ($M=1550$ ms), [$F(1, 453)=10.5, p<.001$]. This also supported the hypothesis: due to the same orthographical form shared by Americans' L1 (English), and L2 (*pinyin*), they would respond faster to *pinyin* than to characters.

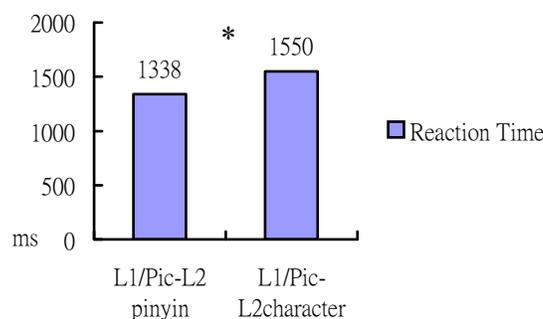


Figure 5. The American group responded significantly to L1/Pic-L2 *pinyin* than to L1/Pic-L2 character

* There is a significant difference between these two measures.

3.2.2. The Chinese group

For the Chinese group, L1 was Chinese while L2 was English. One-way ANOVA showed that when the target was L1 character, there was no difference between stimuli types (L2 and picture), [$F(1, 390)=1.4, p>.232$]. This supported our first hypothesis for the Chinese group that picture-L1 character RTs would be approximately equal as L2-L1 character RTs. Second, with an L1 *pinyin* target, there was a significant effect of the

stimuli types (L2 and picture); L2-L1 *pinyin* was faster than picture-L1 *pinyin*, as shown in figure 6, [$F(1, 390)=9.7, p<.002$]. This is predicted by the BIA model.

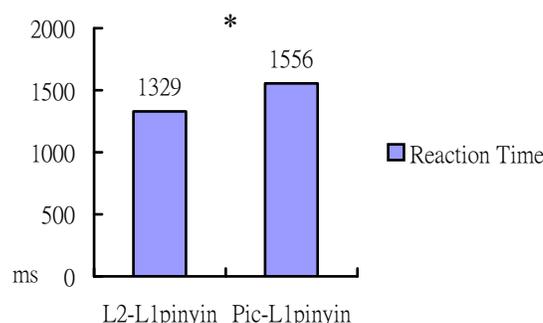


Figure 6. The Chinese group responded significantly faster to L2-L1 *pinyin* than to picture-L1 *pinyin*.

* There is a significant difference between these two measures.

3.2.3. The interaction between the two groups

The two-way ANOVA showed that when the condition was picture-L1 for both groups (picture-English for the American group and picture-Chinese, including *pinyin* and character, for the Chinese group), there was a reliable effect of the native language: picture-L1 for the American group was faster ($M=734$ ms) than picture-L1 for the Chinese group ($M=1199$ ms), [$F(1, 514)=55.4, p<.001$]. Upon detailed inspection of the two types of targets within Chinese, picture-L1 for the American group ($M=734$ ms) was quicker than picture-L1 character ($M=842$ ms), [$F(1, 318)=9.9, p<.002$], and quicker than picture-L1 *pinyin* for the Chinese group ($M=1556$ ms), [$F(1, 318)=136.7, p<.001$].

Next, the results of the two groups for picture-L2 were examined. Picture-L2 for the American group ($M=1528$ ms) was slower than the Chinese group ($M=804$ ms), [$F(1, 414)=160.9, p<.001$]. Consistently, detailed analyses with *pinyin* and characters as separate targets also showed that picture-L2 *pinyin* for the American group ($M=1344$ ms) was slower than picture-L2 English for the Chinese group ($M=804$ ms), [$F(1, 307)=96.1, p<.001$]. Similarly, picture-L2 character ($M=1721$ ms) in the American group was slower than picture-English ($M=804$ ms) in the Chinese group, [$F(1, 301)=215.7, p<.001$].

Figure 7 shows that for both groups, there is a main effect on English/picture-*pinyin*, and English/picture-character. Figure 8 shows that the American group responded significantly faster than the Chinese group in picture-L1 (including *pinyin* and characters for the Chinese group). As for picture-L2, the American group was slower than the Chinese group, because the Chinese group is relatively more fluent bilinguals than the American group. This can be explained by the word association model and concept

mediation model (Potter et al., 1984), that beginning second language learners do not yet build a direct link between concepts and L2 while fluent bilinguals do.

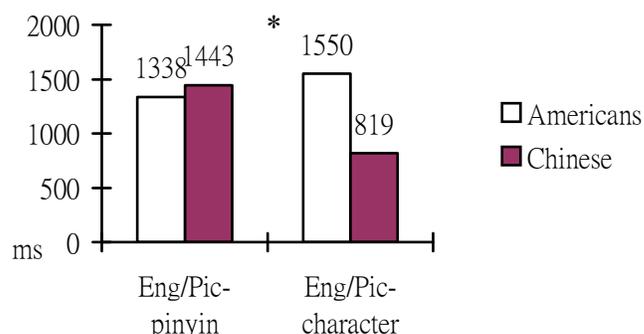


Figure 7. Comparisons of RTs of the two groups of target types as *pinyin* and character. (Eng/Pic-*pinyin*: English- and picture-*pinyin*, Eng/Pic-character: English- and picture-character)
* There is a significant difference between these two measures.

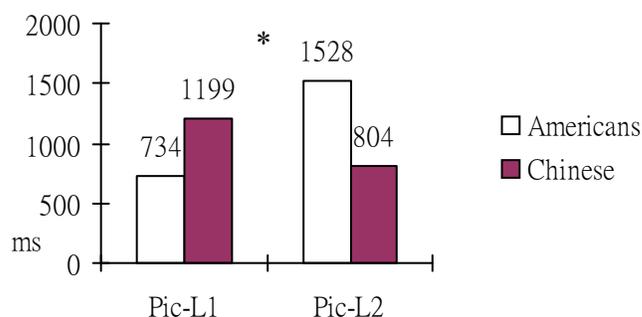


Figure 8. Comparisons of RTs of the two groups of target types as L1 and L2. (L1 includes *pinyin* and characters for Chinese; L2 includes *pinyin* and characters for Americans)
* There is a significant difference between these two measures.

The main findings in this study are summarized as three parts. First, stimuli type L1 and pictures made a difference for the response latencies for the American group, showing that L1-L2 was faster than picture-L2, which was predicted by the word association model. Next, L2-L1 characters RTs were not significantly different from picture-L1 characters RTs for the Chinese group, which supported the concept mediation model. Finally, a response to *pinyin* was faster than to characters for the American group, as can be explained by the BIA model.

3.3. Results supporting the Word Association Model and Concept Mediation Model

The American group showed that L1-L2 was faster than picture-L2, while the results showed the reverse patterns in the two control blocks, with picture-L1 being faster than L1-L1, the synonym-decision task. As beginning learners of L2, the American

students might have a direct link between L1 and L2, rather than concepts-L2. Meanwhile, these Americans should possess a direct connection between L1 and concepts. The Chinese group showed no difference in processing the picture-L2, L2-L1 character, and picture-L1 character tasks. Picture-L2 was rather fast for the Chinese group, yet given that the studying period of L2 for the Chinese participants was long, and they had been exposed to L2 environment for some time, this result would not be surprising.

Together these results demonstrated that novices of an L2 might tend to use their L1 as a medium to process L2 words, as shown by the American group's longer response latencies in the picture-L2 than in the L1-L2 conditions, but not in picture-L1 than in L1-L1. This indicated that L1 and picture play a different role when these L2 elementary learners process their L1 and L2. Nevertheless, as L2 proficiency increases, the link between concepts and L2 gradually builds, as shown by the performance of the Chinese group where the processing of L2-L1 character, picture-L1 character, and picture-L2 were quite comparable. This was consistent with previous findings that for less fluent adult bilinguals, translating L1 into L2 was faster than picture naming in L2, while more fluent bilinguals performed L1-L2 translation and picture naming in L2 equally efficiently (Kroll & Curley, 1988; Chen & Leung, 1989; Chen 1990; Cheung & Chen, 1998). It demonstrated that less fluent bilinguals use L1 as an intermedium to process their L2; picture-L2 is thus slower than L1-L2. More fluent bilinguals, on the other hand, use the direct link between L2 and concepts to process their L2; picture-L2 is thus not processed longer than L1-L2.

3.4. Results Supporting the BIA Model

The American group responded faster in general to *pinyin* than to characters, regardless of the type of stimuli. The Chinese group performed significantly faster to English-L1 *pinyin* than to picture-L1 *pinyin* but English-L1 character and picture-L1 character were not significantly different. In terms of the BIA model, these convergent results were due to the advantage of the orthographical form shared by English and *pinyin*. Both the American and Chinese participants thus could activate the reciprocal orthography more easily. Previous research has also found that languages such as English and Dutch which have the same orthography would facilitate each other as well (van Heuven, Dijkstra, & Grainger, 1998).

3.5. Combination of the Above Three Models

One note of special interest is that the RTs of L1-L2 *pinyin* and picture-L2 *pinyin* for the American group were not significantly different. Only when the target was an L2 character did the stimulus type have a reliable effect, with L1 being faster than a picture. This was possibly due to the common orthography of English and *pinyin* that allows the American students to be more familiar with and have higher access to *pinyin* than to characters. This helps them to make the connection between L2 *pinyin* and concepts, but not between an L2 character and concepts at this stage. They may still need to process L2 characters through either *pinyin* or their L1, so possibly the phonetics is involved in the L2 process as well. *Pinyin* and English letters are both phonetically alphabetic symbols, and this shared feature may facilitate English learners of Chinese, especially in the beginning stage.

3.6. Other Results

First of all, both groups showed relative difficulty (significantly longer response latencies) in processing the English-English task versus the picture-English task. For the Chinese group, this difficulty was not only shown by the longer RTs, but by relatively higher error rates (11.7 %) than in the other five blocks. This reflected the fact that these Chinese-English bilinguals were not as fluent in English as in Chinese. Secondly, it was found that the Chinese group was not as familiar with *pinyin* as with characters, so that picture-L2 was faster than picture-L1 *pinyin*. This was also shown by the response times of the Chinese processing picture-L1 *pinyin* being significantly longer than those of the Americans. Considering that Chinese characters is a logographic system, in which each individual symbol does not entail its respective sound, the process of *pinyin* and characters for Chinese people might not be the same. In addition, the Chinese speakers do not use *pinyin* as frequently as they use characters, which may also trigger their poorer *pinyin* performance. On the other hand, the English writing system that involves the sound by each individual letter helped to boost the activation of *pinyin* not only for the American group, but for the Chinese group, proved by their quicker response to L2-L1 *pinyin* than to picture-L1 *pinyin*.

Both the American group and the Chinese group showed a significant effect from different target languages, as shown by the error rates. For the American group, the highest error rates lay in the longest RTs block, picture-L2 characters. For the Chinese

group, there were relatively higher error rates and longer response latencies in L2-L2 (the synonymous test) block.

4. Conclusion

Most of the previous studies focus on fluent or less fluent bilinguals employed either groups with the same native language background and different L2 proficiency (Chen & Leung, 1989; Chen 1990), or two groups with completely distinctive languages (Potter et al. 1984). This study contributes to the literature by using two groups, while one (the Chinese group) served as another's (the American group) control, to examine how the American participants process Chinese *pinyin* and characters as compared to the Chinese participants. In addition, the Chinese group also served as a contrasting group, to compare language processing in terms of different L2 fluency. Perhaps more crucially, the contribution of this study was the inclusion of an orthographical differences factor, between English and Chinese and especially between *pinyin* and characters.

The major findings were as follows. First, for less fluent bilinguals or novices of an L2, L1-L2 was processed faster than picture-L2. This indicated that they processed their L2 through their L1 or other source (in this case, *pinyin*) before they can eventually access L2 directly. This was compatible with the hypothesis based on the word association model. Next, the shared orthographical form (English and *pinyin*) helped English as well as Chinese speakers to process *pinyin*. As a result, English-*pinyin* was significantly faster than picture-*pinyin* for both groups. This was in accord with the BIA model that claims that form similarity in the two languages facilitates each other's activation.

Figure 1. The Word Association Model

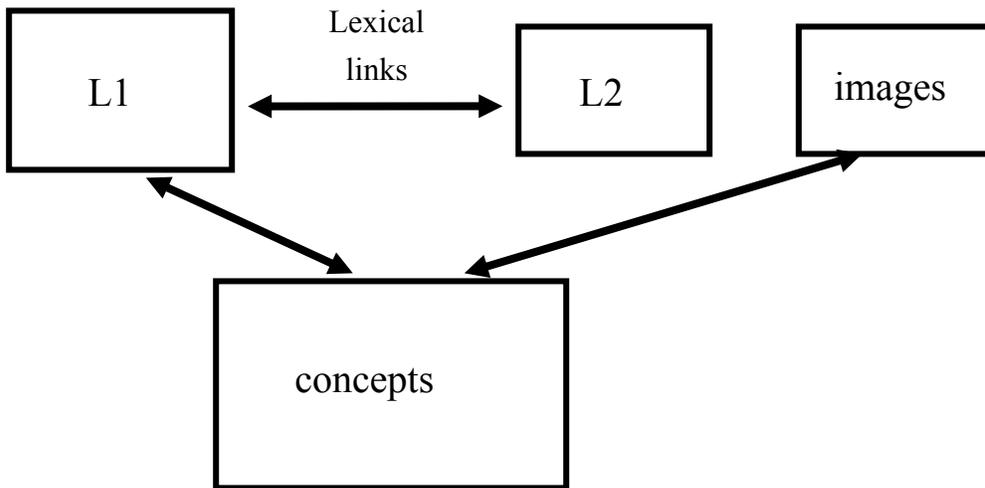


Figure 2. The Concept Mediation Model

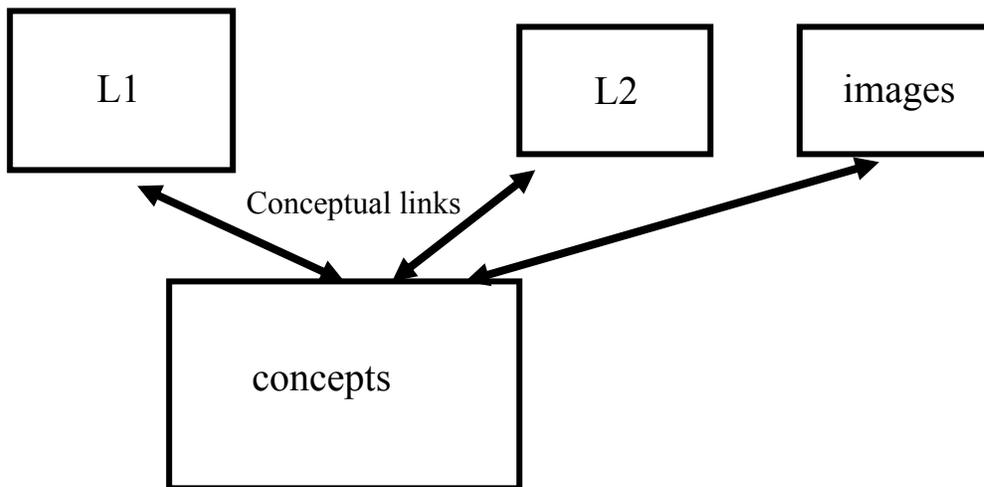
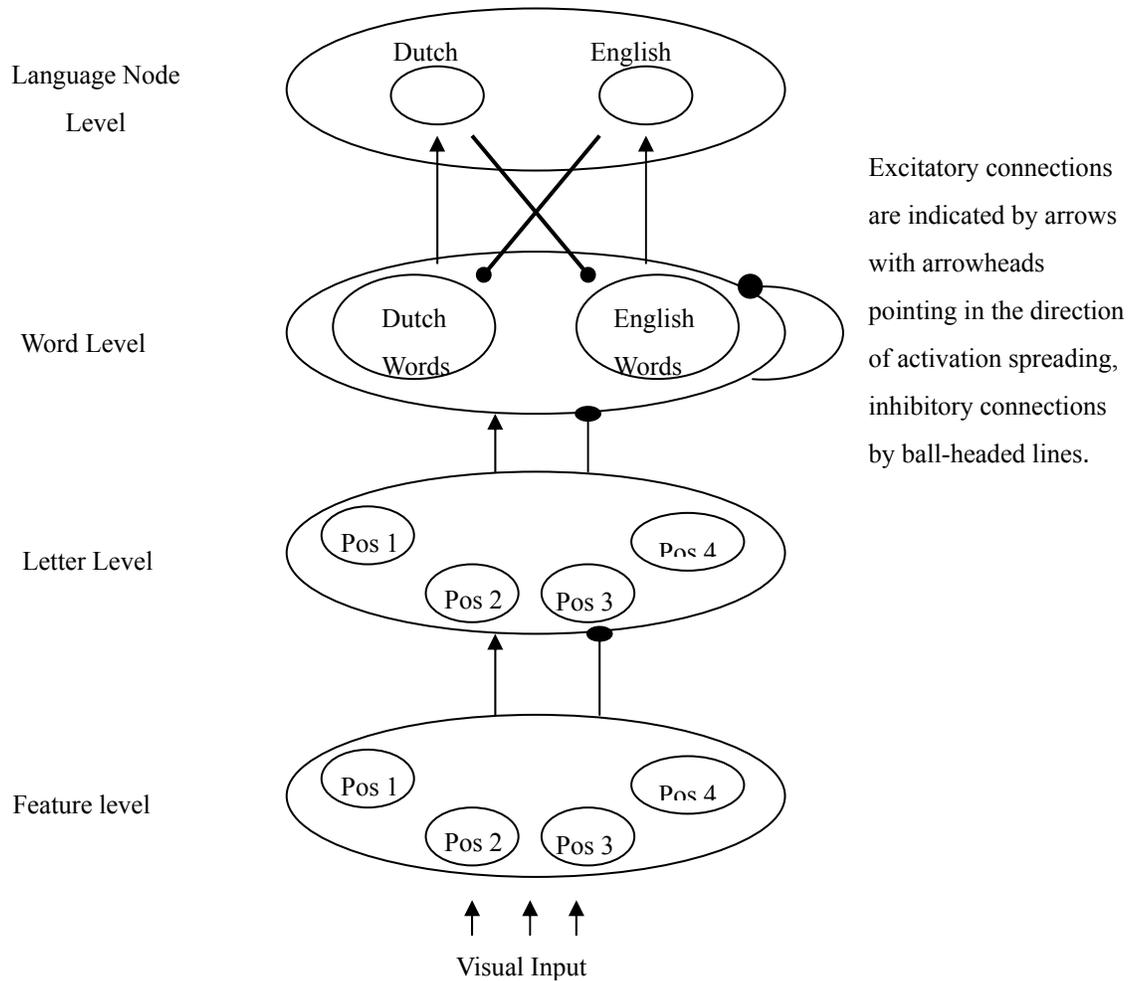


Figure 3. The bilingual interactive activation model (BIA) model



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**Grammatical Changes Reflected in the Chapters
“Yaodian” 堯典 and “Gaoyao mo” 皋陶謨 in *Shangshu* 尚書
and Relevant Chapters in *Shiji* 史記**

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It is not very clear when “Yaodian” and “Gaoyao mo” were compiled. Qu Wanli (1983: 4-6) claimed that “Yaodian” was compiled during the Warring States period (475-221 BC). To be more precise, he argued that it was compiled after Confucius’ time (551-479 BC) and before Mencius (372-289 BC) was flourishing based on ten pieces of evidence.¹ He also argued that “Gaoyao mo” was compiled around the same time or slightly later than “Yaodian”. The *Shiji*

¹ The ten pieces of evidence proposed by Qu are the following: 1. This chapter begins with “曰若稽古” (it is said that in antiquity), which proves that “Yaodian” is a compilation of past events by later people; 2. This chapter is easy to read and is quite different from the Bronze Inscriptions of the Western Zhou; 3. In this chapter, the emperor refers himself as *Di* 帝. In the Oracle Bone inscriptions (OBI) and Bronze inscriptions (BI), 帝 refers to a deceased king. It is after the mid Spring and Autumn period that 帝 means a current king; 4. In OBI and BI before the Spring and Autumn period, as well as in the *Zhouyi* 周易 and *Shijing* 詩經, a deceased father and mother are called *zubi* 祖妣. It is from the Warring States period that *kaobi* 考妣 substituted for *zubi* 祖妣. “Yaodian” uses 考妣 which implies that “Yaodian” was compiled in the Warring States period; 5. The idea of *wuxing* 五行 (five elements) emerged in Eastern Zhou times. Correlating five elements with four directions (*sifang* 四方) and four seasons (*sishi* 四時) is an even later development. This chapter co-relates four directions and four seasons which implies that the idea of “Five elements” was very popular when this chapter was compiled. Therefore, it could not have been compiled earlier than the Warring States period; 6. Based on the constellation, this chapter can be dated to around 300 BC; 7. From 克明俊德 to 協和萬邦 in this chapter is closely related to Confucius’ idea of 修身, 齊家, 治國, 平天下. Therefore, this chapter cannot predate Confucius; 8. In this chapter, there is a line that reads “百姓如喪考妣, 三載, 四海遏密八音.” Mourning for three years was proposed by Confucius, and mentioned by Mencius. Therefore, this chapter was influenced by Confucius’ idea and it cannot predate Confucius; 9. *Mengzi* 孟子 “Wanzhang shang” 萬章上 quoted some parts of the “Yaodian” which proves that “Yaodian” predates *Mengzi*; 10. Some lines in *Chuci* 楚辭 “Tianwen” 天問 are parallel to a part of “Yaodian,” which implies that “Yaodian” existed during Qu Yuan 屈原’s (ca. 340 BC – ca. 278 BC) time. Therefore, we can presume that “Yaodian” was compiled after Confucius’ time (551-479 BC) and before Mencius was flourishing.

was compiled during Western Han times by Sima Tan 司馬談 (180 BC – ca. 110 BC) and Sima Qian 司馬遷 (145 BC – ca. 86 BC). If we follow Qu's dating of "Yaodian" and "Gaoyao mo", there is a gap of several hundred years between "Yaodian"/ "Gaoyao mo" and the *Shiji*. By comparing "Yaodian"/ "Gaoyao mo" and parallel passages in the *Shiji*, the differences between Warring States period grammar and Western Han grammar will emerge. In this paper, the following three differences between "Yaodian"/ "Gaoyao mo" and the *Shiji* will be pointed out:

1. The usages of personal pronouns in the *Shangshu* and the *Shiji*
2. Specifying subjects and objects in the *Shiji*
3. The emergence of 者 in the *Shiji*

1. The Usages of Personal Pronouns in the *Shangshu* and the *Shiji*

1.1. First Person

1.1.1. 朕

朕 appears in both the *Shangshu* and the *Shiji*. It can be used as a first person nominative or possessive:

- 1a. 帝曰：“咨！四岳。朕[nom]在位七十載，汝能庸命。異朕[pos]位。”（尚書/堯典 2.12）²
The emperor said: “Oh, you Si Yue, I have been in the high position (on the throne) for seventy years. (If) you can (use=) execute (Heaven's) mandate I shall (withdraw from, yield=) cede my high position.”³
- 1b. 堯曰：“嗟！四嶽。朕在位七十載，汝能庸命，踐朕位？”（史記/五帝本記 1.21）⁴

朕 is known as referring to the emperor. “Qinshihuang benji” 秦始皇本紀 in the *Shiji* explicitly indicated “天子自稱曰‘朕’。” However, there is one case in “Gaoyao mo” where it does not refer to the emperor. In the parallel passage in the *Shiji*, it is replaced by 吾:

- 2a. 皋陶曰：“朕言惠，可底行。”（尚書/皋陶謨 10.8）
Kao Yao said: “My words are reasonable. They can be accomplished and practiced.”
- 2b. 皋陶曰：“吾言底，可行乎？”（史記/夏本紀 2.77）

² The page number and sentence number in parenthesis refer to those in Karlgren (1950).

³ The English translation of *Shangshu* is from Karlgren (1950).

⁴ The volume number and page number in parenthesis refers to those in the *Zhonghua shuju* (1959) version.

1.1.2. 予

予 appears both in the *Shangshu* and in the *Shiji*. It is used as a first person nominative or possessive:

3a. 夔曰：“於. 予 [nom] 擊石拊石, 百獸率舞.” (尙書/堯典 6.35)

Kui said: “Oh, when I strike the stone, when I knock on the stone, (the hundred animals=) all the animals follow (it) and dance.”

3b. 夔曰：“於. 予擊石拊石, 百獸率舞. (史記/五帝本記 1.39)

4a. 師錫帝曰：“有鰥在下, 曰虞舜.” 帝曰：“俞. 予 [nom] 聞, 如何?” (尙書/堯典 2.12)

All (giving=) to the emperor said: “There is an unmarried man (below=) in a low position, called Shun of Yu.” The emperor said: Yes, I have heard (of him); what is he like?

The parallel line in *Shiji* has 朕 instead of 予 :

4b. 皆言於堯曰：“有矜在民間, 曰虞舜.” “然, 朕聞之. 其何如?” (史記/五帝本記 1.21)

5a. 帝曰：“疇若予 [pos]工?” (尙書/堯典 6.32)

The emperor said: “Who will (conform himself to=) carefully attend to my works?”

5b. 舜曰：“誰能馴予工?” (史記/五帝本記 1.39)

There are two examples in “Gaoyao mo” where 予 is used as a first person accusative. In the parallel line in *Shangshu*, the object is omitted:

6b. 予即辟, 女匡拂予. 女無面諛, 退而謗予. (史記/夏本紀 2.80)

6a. 予違, 汝弼[]. 汝無面從, 退有後言[]. (尙書/皋陶謨 11.3)

When I (transgress=) error, you shall assistingly correct me; you shall not to my face accord with me, and, having retired, have (other) words afterword.

Compared to the *Shangshu*, in the *Shiji* it is often the case that omitted subjects and objects are supplemented to make the grammatical relationship clearer. This will be discussed in greater detail in Part 2.

The distinction between 朕 and 予 is not clear-cut. Although 朕 is known as an emperor referring to himself, there are examples in the *Shangshu* in which it refers to someone who is not an emperor (See #2a). Also, there are many examples where 予 refers to the emperor as in 4a, 5a, and 5b above.

1.1.3. 余

余 appears twice in the *Shiji*. In the *Shangshu*, 予 is used instead. 予 and 余 are

graphic variants:

7b. 余欲觀古人之象。(史記/夏本紀 2.79)

7a. 予欲觀古人之象。(尚書/皋陶謨 10.12)

I desire to see the symbol (emblems) of the ancient men.

1.1.4. 我

我 appears only once in the *Shangshu*. It does not appear in the *Shiji*:

8a. 帝曰：“我其試哉!”(尚書/堯典 2.12)

The emperor said: “I will try him.”

The parallel line in the *Shiji* has 吾 instead of 我:

8b. 堯曰：“吾其試哉!”(史記/五帝本紀 1.21)

1.1.5. 吾

吾 appears only in the *Shiji*. There is one example where it is used as first person nominative and two examples where it is used as a first person possessive:

9b. 堯曰：“吾[nom]其試哉。”(史記/五帝本紀 1.21)

9a. 帝曰：“我其試哉。”(尚書/堯典 2.12)

The emperor said: “I will try him.”

10b. 帝曰：“道吾[pos]德，乃女功序之也。”(史記/夏本紀 2.80)

10a. 帝曰：“迪朕德，時乃功惟敘。”(尚書/皋陶謨 10.17)

The emperor said: “That they pursue the course of my virtue – it is your meritorious work that has arranged it.”

1.2. Second Person

1.2.1. 汝/女

汝 appears in the *Shangshu*. In the *Shiji*, 女, which is a graphic variant of 汝, also appears. They are used as second person nominatives or accusatives. They can also be used as second person possessives. However, usually 乃 is used as the second person possessive especially in the *Shangshu*.⁵

⁵ It will be discussed more in detail in 1.2.2.

- 11a. 帝曰：“咨四岳！朕在位七十載，汝 [nom]能庸命，巽朕位。”（尚書/堯典 2.12）
 The emperor said: “Oh, you Si Yue, I have been in the high position (on the throne) for seventy years. (If) you can (use) execute (Heaven’s) mandate I shall (withdraw from, yield=) cede my high position.”
- 11b. 堯曰：“嗟！四嶽：朕在位七十載，汝能庸命，踐朕位？”（史記/五帝本記 1.21）

- 12a. 帝曰：“汝 [nom] 二十有二人，欽哉。惟時亮天功。”（尚書/堯典 6.37）
 The emperor said: “Oh, you twenty-two men, be respectful, now you shall assist me in the great works (assigned by) Heaven.”
- 12b. 舜曰：“嗟！女二十有二人，敬哉，惟時相天事。”（史記/五帝本記 1.39）

Note that in the parallel passage in the *Shiji*, 女 appears instead of 汝.

- 13a. 帝曰：“夔，命汝 [acc]典樂，教胄子，直而溫，寬而栗，剛而無虐，簡而無傲。”（尚書/堯典 6.35）
 The emperor said: “Kui, I charge you to be director of music, to teach the descendant sons, (to be) straight and yet mild, large-minded and yet (apprehensive=) careful, (hard=) firm and yet not tyrannical, great and yet not arrogant.”
 [No parallel line in the *Shiji*]

1.2.2. 乃

In the *Shangshu* and *Shiji*, 乃 is used as a second person possessive as well as a conjunction. However, by the time of the *Shiji*, the usage of 乃 as a second person possessive was already obsolete and it was mainly used as a conjunction. The following table summarizes the usages of 乃 in the *Shangshu* and *Shiji*:

Table 1. The usages of 乃 in the *Shangshu* and *Shiji* and the number of occurrences

	<i>Shangshu</i>	<i>Shiji</i>
Second Person Possessive	6	2 (in two cases, 女 used instead) (in two cases, no parallel line)
Conjunction	10	11

- 14a. 禹曰：“都，帝！慎乃在位，安汝止。”（尚書/皋陶謨 10.10）
 Yu said: “Oh, emperor, be careful about your being in the (high) position.”

14b. 禹曰：“於，帝！慎乃在位，安爾止。”(史記/夏本紀 2.79)

15a. 念哉。率作興事，慎乃憲，欽哉！屢省乃成，欽哉！(尚書/皋陶謨 13.20)

Oh, think! In all actions and works initiated, carefully attend to your laws, be reverent!

15b. 念哉。率爲興事，慎乃憲，敬哉！[no parallel line](史記/夏本紀 2.82)

16a. 禹曰：“俞，乃言底可績。”(尚書/皋陶謨 10.8)

Yu said: “Yes, your words have been accomplished and have been capable of yielding fine results.

16b. 禹曰：“女言致可績行。”(史記/夏本紀 2.77)

1.3. Third Person⁶

1.3.1. 其

There are two cases in the *Shiji* where 其 is used as a third person nominative. However, in the parallel lines in the *Shangshu*, the subject is omitted or 其人 is used instead of 其:

17a. 帝曰：“俞。予聞[]。[]如何？”(尚書/堯典 2.12)

The emperor said: “Yes, I have heard (of him); how is he like?”

17b. 堯曰：“然，朕聞之。其何如？”(史記/五帝本紀 1.21)

18a. 皋陶曰：“都。亦行有九德，亦言其人有德，乃言曰：‘載采采’。”(尚書/皋陶謨 6.3)

Gao Yao said: “Oh, in the actions there are nine virtues; when (we) say that this man has virtue, (we) (say=) mean that he initiates the various works (sc. It shows in his actions).

18b. 皋陶曰：“然，於！亦行有九德，亦言其有德，乃言曰：‘始事事……’。”(史記/夏本紀 2.77)

Zhou Fagao (1972: 108) pointed out that 其 is occasionally used as a third person nominative in a main clause after the Liang dynasty. However, as it is shown above, there are occasional cases where 其 is used as a third person nominative as early as Western Han times.

1.3.2. 之

⁶ Strictly speaking, the term “third person pronoun” is rather misleading. In classical Chinese, there are no real third person pronouns. Instead, demonstratives are used as third person pronouns. All third person pronouns that will be discussed in this section (其, 之, as well as 厥) were originally demonstratives.

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之 is used as a third person accusative. It appears only in the *Shiji* (six times):

19b. 帝堯者, 放勳. 其仁如天, 其知如神. 就之如日, 望之如雲. (史記/五帝本記 1.15)
Emperor Yao is called Fang Xun. His benevolence was like the Heavens and his wisdom was like God's. When one approached him, he was like the sun. When one looked up at him, he was like a cloud.

The parallel passage in the *Shangshu* reads:

19a. 帝堯曰放勳. 欽, 明, 文, 思, 安安. (尚書/堯典 2.1)
Emperor Yao was called Fang Xun. He was reverent, enlightened, accomplished, and sincere and peaceful (mild).

20b. 堯曰: “然, 朕聞之, 其何如?” (史記/五帝本記 1.21)
Yao said: “It is so. I have heard of him. What is he like?”

In the parallel passage in the *Shiji*, 之 does not appear:

20a. 帝曰: “予聞[]. 如何?” (尚書/堯典 2.12)
The emperor said: “Yes, I have heard (of him); how is he like?”

21b. 於是堯妻之二女, 觀其德於二女. (史記/五帝本記 1.21)
Therefore, Yao gave him his two daughters in marriage and observed his virtue toward them.

In the parallel line in the *Shangshu*, 時 is used instead:

21a. 女于時, 觀厥刑于二女. (尚書/堯典 2.12)

22b. 堯善之, 乃使舜慎和五典. (史記/五帝本記 1.21)
Yao considered him good, thereupon made Shun sincerely regulate five norms.
[No parallel line in the *Shangshu*]

23b. 舜年二十以孝聞, 年三十堯舉之. (史記/五帝本記 1.21)
Shun was renowned for his filial piety at the age of twenty. At the age of thirty, Yao hired him.
[No parallel line in the *Shangshu*]

It is noteworthy that 之, the third person accusative, only appears in the *Shiji* and not the “Yaodian”/ “Gaoyao mo”. As will be pointed out in Part 2, the “Yaodian” often

omit subjects and objects when they are obvious, whereas the *Shiji* often specifies them for clarification. When the omitted object is specified in the *Shiji*, 之 is often used.

1.3.3. 厥/ 其

For the third person possessive in the *Shangshu*, 厥 appears ten times, whereas 其 only appears twice. On the other hand, in the *Shiji*, 其 appears thirteen times, while 厥 does not appear at all:

24a. 日中, 星鳥, 以殷仲春, 厥民析, 鳥獸孳尾. (尚書/堯典 2.4)

The day being of medium length and the asterism being Niao, he thereby determined mid-spring. The people disperse, the birds and beasts breed and (tail=) copulate.

24b. 日中, 星鳥, 以殷中春, 其民析, 鳥獸字微. (史記/五帝本紀 1.16)

25a. 女于時, 觀厥刑于二女. (尚書/堯典 2.12)

I will wive him, and observe his behavior towards my two daughters.

25b. 於是堯妻之二女, 觀其德於二女. (史記/五帝本紀 1.21)

Tang (1990) explained that in Zhouyuan 周原 OBI and early Western Zhou BI, 其 is only used as a modal particle and 厥 is used as a third person possessive. 其 started to substitute for 厥 and be used as a third person possessive from mid-Western Zhou times. In the Bronze Inscriptions cast in mid-Western Zhou times, 其 is used as a third person possessive in eleven out of one hundred cases. In the BI of late Western Zhou times, the percentage of 其 surged up to 49 percent. In the BI of Eastern Zhou times, the percentage of 其 is as high as 95 percent. In the manuscripts (on bamboo strips and silk) in Qin and Han times, 其 completely overtook 厥.

He further argued that the ratio of 其 and 厥 can be used as one of the criteria to date a certain text. In “Yaodian”, 其 does not appear at all. If we use the ratio of 其 and 厥 as the only criterion of dating, “Yaodian” can be dated earlier than mid-Western Zhou times, which is several hundred years earlier than Qu’s dating. Also, although 其 does not appear at all in “Yaodian” as a third person possessive, it appears in some other chapters of the *Shangshu*. Overall, it replaced 20.5 percent of occurrences of 厥 in the entire *Shangshu*. This shows that dating the *Shangshu* as well as dating individual chapters of *Shangshu* is still very controversial.

Table 2 summarizes the usages of personal pronouns in “Yaodian”/ “Gaoyao mo” in the *Shangshu* and in relevant chapters of the *Shiji* :

Table 2. Personal Pronouns in the *Shangshu* and *Shiji*

	First Person			Second Person			Third Person		
	[nom]	[acc]	[pos]	[nom]	[acc]	[pos]	[nom]	[acc]	[pos]
尚書	朕予我		朕予我	汝	汝	乃 6 ⁷ 汝 2			厥 其 2
史記	朕予/余 ⁸ 吾	予	朕予吾	汝/女	汝/女	乃 2 女 2 爾 1	其 2	之	其

2. Specifying Subject and Object in the *Shiji*

In the *Shangshu*, subjects and objects are often omitted when they are understood by the context. In the parallel lines in the *Shiji*, they are often specified in order to make the grammatical relationships clearer:

26a. 師錫帝曰：“有鰥在下，曰虞舜。”帝曰：“俞，予聞 [obj], [subj] 如何？”（尚書/堯典 2.12）

All (giving=) to the emperor said: there is an unmarried man (below=) in a low position, called Shun of Yu. The emperor said: Yes, I have heard (of him); what is he like?

26b. 眾皆言於堯曰：“有矜在民間，曰虞舜。”堯曰：“然，朕聞之。其何如？”（史記/五帝本記 1.21）

In the *Shangshu*, the object of 聞 and the subject of 如何 do not appear. In the *Shiji*, they are supplemented.

27a. 帝曰：“欽哉！” [subj] 慎徽五典，五典可從。（尚書/堯典 2.13）

The emperor said: Be reverent! He Shun carefully (signalized=) displayed the five rules, the five rules (then) could be followed.

27b. 堯善之，乃使舜慎和五典，五典能從。（史記/五帝本記 1.21）

In the *Shangshu*, the subject of 慎徽五典 does not appear, whereas it is specified in the *Shiji*. The *Shiji* clearly shows a switch of the subject from 堯 to 舜.

⁷ The number indicates the total number of occurrences.

⁸ 予/余 indicates they are graphic variants.

28a. 帝曰：“臣作朕股肱耳目。予欲左右有民，汝翼[.]” (尚書/皋陶謨 10.11)

The emperor said: “My ministers (make=) are my legs and arms, ears and eyes. I desire to succor my people, do you assist (me)!”

28b. 臣作朕股肱耳目。予欲左右有民，女輔之。 (史記/夏本紀 2.79)

29a. 予違，汝弼[.] (尚書/皋陶謨 10.13)

When I (transgress=) err, you shall assistingly correct me.

29b. 予即辟，女匡拂予。 (史記/夏本紀 2.80)

In Part 1, it is pointed out that there are two cases in the *Shiji* where 其 was used as a third person nominative. Also, 之 (third person accusative), which did not appear in the *Shangshu* appeared six times in the parallel passages in the *Shiji*. The appearance of 其 and 之 in the *Shiji* is closely related to specifying subjects and objects.

In addition to specifying subjects and objects, the *Shiji* uses many other methods to make the grammatical relationship clearer and make the passage smoother. The appearance of 者 (which will be discussed in Part 3) is another device: it clearly marks nominalization. Other devices include using conjunctions (such as 乃, 於是), sentence final particles (such as 也, 矣), and so on. It is the direction of syntactic change in classical Chinese and literary Chinese (from OBI, BI to the *Shangshu* and from the *Shangshu* to the *Shiji*) to make sentences more elaborate and make the grammatical relationships more explicit.

3. The Appearance of 者 in the *Shiji*

者 is a nominalization marker. As Zhu (1983) pointed out, nominalization can be subdivided into two categories: self-referential (*zizhi* 自指) and transfer-referential (*zhuanzhi* 轉指). In self-reference, the meaning does not change after nominalization (e.g. kind vs. kindness), whereas in transfer-reference, the meaning changes after nominalization (e.g. write vs. writer).

者 is not found in “Yaodian” or “Gaoyao mo”. However, it appears seven times in the corresponding chapters of the *Shiji*. It is used as self-referential twice and transfer-referential five times:

Self-referential (*zizhi* 自指): 2 occurrences

30a. 帝堯曰放勳。 (尚書/堯典 2.1)

The emperor Yao was called Fangxun.

30b. 帝堯者，放勳。 (史記/五帝本紀 1.15)

31a. [No corresponding line in the *Shangshu*]

31b. 文祖者, 堯大祖也. (史記/五帝本紀 1.22)

Wenzu refers to the Great Ancestor Yao.

Transfer-referential (*zhuanzhi* 轉指): 5 occurrences

32a. 帝曰: “咨! 四岳. 湯湯洪水方割, 蕩蕩懷山襄陵, 浩浩滔天, 下民其咨, 有[能俾乂]NP?” (尚書/堯典 2.11)

The emperor said: “Oh, you Si Yue, voluminously the great waters everywhere are injurious, extensively they embrace the mountains and rise above the hills, vastly they swell up to heaven. The lower people groan. Is there anybody whom I could let regulate it?”

32b. 堯又曰: “嗟! 四嶽. 湯湯洪水滔天, 浩浩懷山襄陵, 下民其憂, 有[能使治者]NP?” (史記/五帝本紀 1.20)

33a. 曰: “明[明]NP揚[側陋]NP”. (尚書/堯典 2.12)

(The emperor) said: “(Make brought=) promote one (already) (brought=) illustrious, or raise one (side-placed=) humble and mean.

33b. 堯曰: “悉舉[貴戚及疏遠隱匿者]NP”. (史記/五帝本紀 1.21)

34a. 帝曰: “疇咨若予采?” 驩兜曰: “都! 共工方鳩僝功.” (尚書/堯典 2.10)

The emperor said: Who will (conform himself to=) carefully attend to my affairs? Huan Dou said: Oh, Gong Gong (to all sides =) has accumulated and exhibited his merit everywhere.

34b. 堯又曰: “誰[可者]NP?” 驩兜曰: “共工旁聚布功, 可用.” (史記/五帝本紀 1.20)

35a. 岳曰: “[瞽]NP子. 父頑, 母嚚, 象傲, 克諧, 以孝烝烝, 又不格姦.” (尚書/堯典 2.12)

(Si) Yue said: He is the son of a blind man; his father was stupid, his mother was deceitful, (his brother) Xiang was arrogant; but he has been able to be concordant and grandly filial, he has controlled himself and not come to wickedness.

35b. 嶽曰: “[盲者]NP子. 父頑, 母嚚, 弟傲, 能和以孝, 烝烝治. 不至姦.” (史記/五帝本紀 1.21)

36a. 舜曰: “咨! 四岳! 有[能奮庸熙帝之載]NP, 使宅百揆亮采惠疇? (尚書/堯典

6.28)

Shun said: Oh, you Si Yue! Is there anyone who can start achievements and make resplendent the emperor's undertakings? I shall make him occupy (the hundred disposals=) the general management, to assist in the affairs and be kind to his (equals=) colleagues.

36b. 舜謂四嶽曰：“有[能奮庸美堯之事者]_{NP}, 使居官相事?” (史記/五帝本記 1.38)

As mentioned above, 者 did not appear at all in “Yaodian” and “Gaoyao mo”. Then, what is the reason for its emergence in the *Shiji*? It is for emphasis or clarification of grammatical relationships. The function of the self-referential 者 is to emphasize and focus a new topic. When a new topic is introduced and defined in the *Shiji*, the form “A 者, B(也)” is often used. For instance, in example #30b 帝堯者, 放勳, 帝堯 is first introduced here and focused by adding self-referential 者. The same reasoning applies to example #31b 文祖者, 堯大祖也.

The function of the transfer-referential 者 is to make grammatical relationship clearer. Compare the way that a verb phrase is nominalized in the *Shangshu* and in the *Shiji* in example #32. In 有[能俾乂]_{NP} in the *Shangshu*, no marker is used for nominalization, whereas in *Shiji*, 者 is used (有[能使治者]_{NP}). By adding 者, it is clearly expressed that the verb phrase is nominalized. The same reasoning applies to examples #33b, 34b, 35b, and 36b.

4. Conclusion

By comparing grammatical features of “Yaodian”/ “Gaoyao mo” and parallel passages in the *Shiji*, the differences between pre-Qin grammar and Western Han grammar emerge.

First of all, differences in the usages of personal pronouns were observed: (1) In the *Shangshu*, 朕 does not necessarily refer to the emperor. However, the *Shiji* explicitly mentioned that 朕 means the emperor referring to himself. (2) 我 in the *Shangshu* is replaced by 吾 in the *Shiji*. (3) The occurrences of 乃 [2nd][pos] are fewer in the *Shiji*; it is replaced by 汝/ 女. 乃 is mainly used as a conjunction in the *Shiji*. (4) It is noteworthy that in the *Shiji*, there are two examples where 其 is used as a third person nominative. It is believed that 其 [3rd][nom] occurred as late as the Six Dynasty period. However, it occurred as early as Western Han times. (5) In “Yaodian” 厥 is used as a third person possessive, whereas it is completely replaced by 其 in the relevant chapter of the *Shiji*.

The *Shiji* tends to specify subjects and objects that were omitted in “Yaodian”/ “Gaoyao mo”. The emergence of 其 (third person nominative) and 之 (third person accusative) in the *Shiji* is due to this specification.

者 does not appear in “Yaodian”/ “Gaoyao mo” at all, while it appears seven times in the corresponding lines in the *Shiji*. Its function is either self-referential or transfer-

referential. The function of self-referential 者 is to focus and emphasis a new topic (it often appears in the form of “A 者, B 也”), whereas the function of transfer-referential 者 is to make a grammatical relationship clearer. In other words, it clearly marks that a verb or verb phrase is nominalized.

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