

Alliteration and Rhyming in Mandarin Onomatopoeia

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1 Introduction

Mandarin onomatopoeia contains multiple forms, including AA, AB, ABB, ABAB, AABB, ABCD, as shown in (1). The trisyllabic and quadrisyllabic forms are generally derived from disyllabic forms through reduplication. For instance, the base of the reduplicated form *hua la la* ‘the sound of a crash’ is the disyllabic *hua la* ‘the sound of a crash’. The base of *hong long hong long* is *hong long* ‘rumbling sound’. The base of *di di da da* is *di da* ‘the sound of water dripping or clock ticking’. The base form of *pi li pa la* is *pi pa* ‘the sound of a crack, slap, clap, clatter etc.’ The derivation shows the importance of the disyllabic forms, since the formation of disyllabic onomatopoeic words must be defined before the formation of trisyllabic and quadrisyllabic onomatopoeic words.

- (1) Trisyllabic and quadrisyllabic onomatopoeia (data collected from (M.O.E. 2015))
ABB: *hua la la* [xwa.la.la] ‘the sound of a crash’ (B: *hua la*)
ABAB: *hong long hong long* [hoŋ.loŋ.hoŋ.loŋ] ‘rumbling sound’ (B: *hong long*)
AABB: *di di da da* [ti.ti.ta.ta] ‘the sound of water dripping or clock ticking’ (B: *di da*)
ABCD: *pi li pa la* [pi.li.pa.la] ‘the sound of a crack, slap, clap, clatter etc.’ (B: *pi pa*)

The present paper focuses on the formation of disyllabic onomatopoeia and gives an analysis of the AA and AB forms as in (2) under the framework of *Cophonology Theory* (Inkelas & Zoll 2007). In this view, it is proposed that there are co-existing phonological systems that generate forms with repeating syllables as well as non-repeating syllables in disyllabic onomatopoeia. One cophonology repeats the monosyllabic base—hence the AA form (e.g. *di di* ‘the sound of water dripping’). The other cophonology avoids repeating the monosyllabic input—hence the AB form (e.g. *di da* ‘the sound of water dripping or clock ticking’, *ka ca* ‘the sound of breaking or snapping’, *xi su* ‘a rustling noise’, *bi bo* ‘the sound of bursting’). Interestingly, in spite of the dominating force to avoid full copying in the AB forms, the two syllables in each AB disyllabic onomatopoeic word still preserve certain similarities with each other through alliteration (*di da*, *bi bo*) or rhyming (*ka ca*).

- (2) Disyllabic onomatopoeia (data collected from (M.O.E. 2015))
AA: *di di* [ti.ti] ‘the sound of water dripping’ (B: *di* ‘to drip/a drop’)
AB: *di da* [ti.ta] ‘the sound of water dripping or clock ticking’ (B: *di* ‘to drip/a drop’)
bi bo [pi.po] ‘the sound of bursting’ (bi-bo)
ka ca [k^ha.ts^ha] ‘the sound of breaking or snapping’ (ka-ca)
xi su [ei.su] ‘a rustling noise’ (xi-su)

2 Literature review

2.1 Introduction to Mandarin onomatopoeia Aside from its sound-symbolic function that makes it different from other vocabulary in the grammar, Mandarin onomatopoeia also constitutes a type of *lian mian ci*, which is a group of disyllabic words that have the following characteristics. According to Fang (1985), the two syllables in a *lian mian ci* only have meanings only when the two syllables are combined. The respective syllable does not have a meaning independently. Furthermore, unlike compounding, the two syllables are combined not based on their semantic function, but based on their phonological identity. The syllables share certain phonological identity, so *lian mian ci* always sound rhythmic. He classifies four kinds of *lian mian ci* based on different degrees of phonological identity, and the forms in (i) and (ii) are

the main focus of the present analysis:

- i. Alliterative but not rhyming: *di da* [ti.ta] ‘the sound of water dripping/clock ticking’
- ii. Rhyming but not alliterative: *hong long* [hoŋ.loŋ] ‘rumbling sound’
- iii. Alliterative and rhyming: *ku ku* [ku.ku] ‘sound of a dove’
- iv. Not alliterative and not rhyming: *ji ku* [tei.ku] ‘whisper’

2.2 Previous studies on Mandarin onomatopoeia Previous studies on Mandarin onomatopoeic words focused on the general patterns such as the distribution of high vowels and low vowels, as well as the fixed lateral consonant /l/, overlooking the phonological mechanisms that produce contradictory patterns (i.e. repeating syllables vs. not repeating syllables). Ran (2009) notices that in Mandarin onomatopoeia the first or former syllable(s) usually contains the high vowel /i/, and the second or latter syllable(s) usually contains low vowels such as /a/ or /u/, as in (3).

- (3) High vowel-low vowel pattern
 - a. *ji ku* [tei.ku] ‘whispering sound’
 - b. *di di da* [ti.ti.da] ‘the sound of water dripping/clock ticking’
 - c. *ping ling pang lang* [p^hiŋ.liŋ.p^haŋ.laŋ] ‘clashing sound’

Since high vowels have higher frequency than low vowels, he concludes that the high-low frequency pattern in onomatopoeic words mimics the beginning and ending of natural sounds. The beginning of natural sounds is more audible, so it is mapped to vowels of higher frequency. The ending of natural sounds is less audible, so it is mapped to vowels of lower frequency. However, this generalization does not include onomatopoeic words that begin with low vowels and end in high vowels, which amount to 30% of his collected data, as in (4).

- (4) Low vowel-high vowel pattern
 - a. *ku ji* [ku.tei] ‘whispering sound’
 - b. *ka zhi* [ka.tʂi] ‘cackling sound’

Ying (2012) points out that in the majority of AB Mandarin onomatopoeia the lateral /l/ is the onset of the second syllable. He analyzes the degree of sonority of the first and second syllables and finds that the sonority of the first syllable rarely exceeds the second syllable, because the stressed syllable, which is the second syllable in his regard, should be more sonorous. In other words, the sonority of the first syllable is either the same as the second syllable, or less than the second syllable. Therefore, the most sonorous consonant /l/ tends to occur in the onset of the second syllable. In addition, high vowels, which are less sonorous, do not occur in the second syllable most of the time; otherwise, the second syllable may be less sonorous than the first syllable. Then, there will be a mismatch between the stressed syllable and the more sonorous syllable. Similar to Ran (2009), Ying (2012) only gives a rough prediction on the common patterns of Mandarin onomatopoeia.

The first study to provide a theoretical analysis of the phonological systems of Mandarin onomatopoeia is Yeh (2011). She classifies disyllabic onomatopoeic words into three categories and presents an Optimality Theory analysis of the AB forms. Her classification is shown in (5). Based on different monosyllabic inputs, different AB forms are derived through reduplication. In the first category, the monosyllabic inputs with onset clusters are argued to originate from the onomatopoeia in ancient Chinese language. The input vowel is reduplicated, and the reduplicated form is produced. The monosyllabic inputs in the second category are grammatical words without onset clusters. The reduplicated form is produced by inserting a coronal vowel [i]. Other AB patterns that fall out of these two categories are considered to have disyllabic inputs.

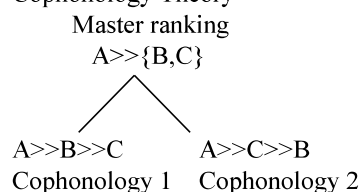
(5) Classification of AB onomatopoeia

Monosyllabic input	Consonant+/l/ onset cluster	Grammatical words
Examples	/p ^h la+RED/ [p ^h a.la] 'clashing sound'	/RED+ta/ [ti.ta] 'water dripping/clock ticking sound'

The present analysis differs from Yeh's (2011) in the following aspects. First, all the AB forms are regarded as having grammatical monosyllabic inputs, as the lateral onset of the second syllable is treated as the emergence of the unmarked (in terms of Mandarin) segment under Onset Sonority Condition, which prefers more sonority contrast between the onsets of the first and the second syllable. Second, Yeh (2011) treats [ta] in [ti.ta] as the base, and the coronal vowel /i/ emerges as the unmarked vowel in the reduplicant (RED), only because under her analysis /a/ is considered a back vowel. However, according to Lin (2007), the low vowel /a/ in Mandarin is not a back vowel. It only surfaces as the back vowel [ɑ] before the velar nasal /ŋ/. Therefore, the universal place markedness hierarchy proposed by Alderete et al. (1999) would predict /a/ to be the most unmarked vowel in the RED, rather than /i/. Therefore, the present analysis sees *ti* as the base (/ti+RED/), and the RED is suffixed just like the RED in the first category.

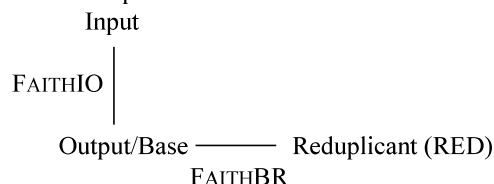
2.3 Theoretical framework The following analysis adopts Inkelas & Zoll's (2007) *Cophonology Theory* to account for the different ways to avoid repeating in Mandarin AB onomatopoeia. In this theory, different constraint rankings can be conditioned by different morphological constructions or word class in the same grammar. As shown in (6), in the master ranking $A \gg \{B, C\}$, there can be some unranked constraints $\{B, C\}$. Under the master ranking, there can be multiple cophonologies that specify the various rankings of the unranked constraints in the master ranking. Cophonologies can be suffix-specific ($A \gg B \gg C$ or $A \gg C \gg B$). The present analysis presents three cophonologies that are able to predict and describe Mandarin disyllabic onomatopoeia.

(6) Cophonology Theory



In explaining the form of the reduplicant, McCarthy & Prince's (1999) Base Reduplicant Correspondence Theory is used. In this theory, the corresponding relations between the input, output and the reduplicant is schematized as (7). FAITHIO requires everything in the input/output to have a correspondent in the output/input. FAITHBR requires everything in the base or the RED to have a correspondent in the RED or the base. When a markedness constraint is ranked between FAITHIO and FAITHBR, an unmarked element will surface in the RED. This phenomenon is called the emergence of the unmarked (TETU). In the AB forms, the fixed segments /l/ and /a/ are treated as the results of TETU ranking.

(7) BR Correspondence

**3 Analysis**

3.1 AA form The AA form falls into the alliterative and rhyming type of *lian mian ci*. Following Yeh

(2011), it is assumed that the AA form is derived through reduplication. Examples are given in (8). However, the constraints used in this analysis differ from those in Yeh (2011), because the present analysis simply treats the AA and AB forms as different degrees of phonological identity between the base and the affix. In the AA form, the reduplicant is required to repeat the phonological composition of the base, so the constraint FAITHBR must dominate *REPEAT, proposed by Yip (1995, 1998). The result is total reduplication. The definition *REPEAT is shown in (9), and the constraint ranking in (10).

- (8) AA forms
xi xi [xi.xi] ‘giggling sound’
ku ku [ku.ku] ‘dove’s sound’
di di [ti.ti] ‘the sound of water dripping’
- (9) *REPEAT (Yip 1995, 1998)
 Assign one violation mark for every pair of adjacent syllables that repeat each other.
- (10) Constraint ranking for the AA form
 FAITHBR >> *REPEAT

3.2 AB form As mentioned in 2.1, the AB forms of interest to this paper fall into two categories of *lian mian ci*: (i) alliterative but not rhyming (e.g. *di da* [ti.ta] ‘the sound of water dripping/clock ticking’), (ii) rhyming but not alliterative (e.g. *hong long* [hoŋ.loŋ] ‘rumbling sound’). In the AB form, it is obvious that the RED may not repeat the base, so the constraint *REPEAT dominates FAITHBR. It is also observed that although the affix may not repeat the base, there is always some phonological identity kept between the RED and the base. In type (i) the onset of each syllable must be identical. In type (ii), the rhyme of each syllable must be identical. Therefore, two constraints are needed to describe the different aspects of phonological identity, as in (11). In the following, analysis of the RED that rhymes with the base is given first, followed by that of the RED alliterating with the base.

- (11) Output identity constraints
 ALLITERATE (Yip 1999)
 Output must contain at least one pair of adjacent syllables with identical onsets.
 RHYME (Yip 1999)
 Output must contain at least one pair of adjacent syllables with identical rhymes.

The rhyming AB forms have the consonant [l] as the onset of the second syllable. Some examples are given in (12). The first syllable is assumed to be the base and the second syllable, the RED.

- (12) Input: /Base+RED/
ku lu [ku.lu] ‘the sound of drinking’
ga la [ka.la] ‘loud sounds’
ding ling [tiŋ.liŋ] ‘the sound of a bell or metal objects clashing’

To explain the existence of the fixed [l], we need to refer to the sonority scale, which is shown in (13). The most sonorous segments are ranked on the left, and the least on the right. It is found that rhyming reduplicants contain the most sonority difference from the base onset. This is expressed through a set of constraints called Onset Sonority Condition, as proposed in (14). The letter O in the constraints denotes obstruent. *O_{Ons1}O_{Ons2} forbids any pair of obstruent-obstruent onsets. *O_{Ons1}N_{Ons2} forbids obstruent-nasal onsets. *O_{Ons1}L_{Ons2} forbids obstruent-lateral onsets. *O_{Ons1}G_{Ons2} forbids obstruent-glide onsets. The set of constraints means that the more contrast in sonority between the first and second onset, the better. However, to keep the glides /w, ʋ, j/ in the Mandarin phonemic inventory from surfacing in the reduplicant, we need the constraints in (15). In this ranking, labial (e.g. /w, ʋ/) and dorsal sounds (e.g. /j/) are more marked than the coronal /l/. Through the ranking in (15), these glides can ruled out despite that they differ more from the consonantal onset of the first syllable in terms of sonority than the coronal /l/. The constraint ranking in (16) is represented by a cover term ‘MARKEDNESS’ in the rest of the paper. Tableaux illustrations are given in

(17-18).

- (13) Sonority scale
Vowel>>Approximant (liquids & glides)>>Nasal>>Fricative>>Affricate>>Stop
- (14) Onset Sonority Condition (OSC)
*O_{Ons1}O_{Ons2}>>*O_{Ons1}N_{Ons2}>>*O_{Ons1}L_{Ons2}>>*O_{Ons1}G_{Ons2}
- (15) Universal place markedness hierarchy (Alderete et al., 1999)
*PL/LABIAL, *PL/DORSAL>>*PL/CORONAL>>*PL/PHARYNGEAL
- (16) Markedness constraint ranking (MARKEDNESS)
*PL/LABIAL, *PL/DORSAL>>OSC>>*PL/CORONAL>>*PL/PHARYNGEAL

Tableau (17) illustrates how the rhyming reduplicant [-lu] is selected. Candidate (17b), which has the unmarked onset and the unmarked vowel, violates the highest ranked constraint RHYME. Candidate (17c), which has an alliterating reduplicant with the unmarked vowel, violates RHYME as well. Candidate (17d), which has a rhyming reduplicant but a labial glide as the onset, is ruled out by *PL/LABIAL, so the winning candidate is (17a). Tableau (18) shows that the reduplicant with a palatal glide [j] in candidate (18b) is ruled out by *PL/DORSAL, so the constraint *O_{Ons1}L_{Ons2} is not active.

(17) *ku lu* [ku.lu] ‘the sound of drinking’

ku+RED	RHYME	ALLITERATE	*PL/LABIAL	*PL/DORSAL	OSC
→a. ku.lu		*	** u,u	* k	*
b. ku.la	*!	*	* u	* k	*
c. ku.ka	*!		* u	** k,k	*
d. ku.wu		*	***! u,u,w	* k	*

(18) *xi li* [ei.li] ‘patter of rain’

ei+RED	ALLITERATE	*PL/LABIAL	*PL/DORSAL	*O _{Ons1} L _{Ons2}	*O _{Ons1} G _{Ons2}
→a. ei.li	*		* ɕ	*	
b. ei.ji	*		***! ɕ,j		*

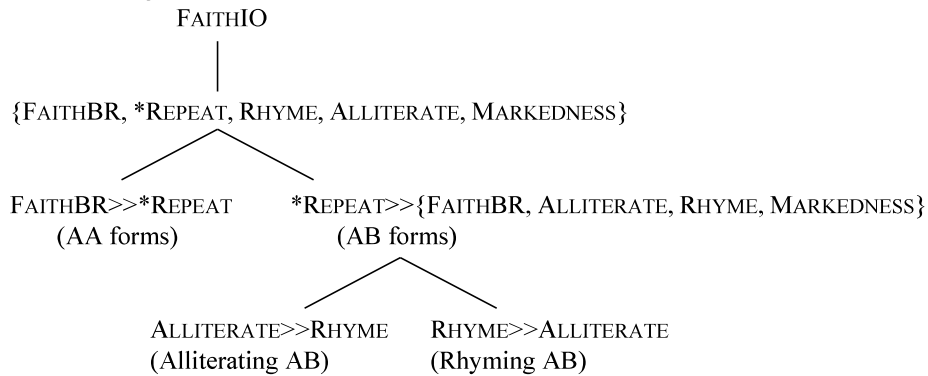
For the alliterating reduplicants, the ranking of ALLITERATE is above RHYME, so all candidates that do not alliterate are eliminated. The vowel of the reduplicant [a] is selected via the universal place markedness ranking in (15) because of its neutral place in the oral cavity compared to other vowels in the Mandarin inventory. In the case of *pi pa* ‘clashing sound’, candidates (19b-d) are ruled out due to violation of ALLITERATE. Candidate (19e) violates *PL/DORSAL, so (19a) wins. The final ranking for the AA and alliterating and rhyming AB forms is given in (20).

(19) *pi pa* [p^hi.p^ha] ‘clashing sound’

p ^h i +RED	ALLITERATE	RHYME	*PL/LABIAL	*PL/DORSAL	OSC
→a. p ^h i. p ^h a		*	** p ^h . p ^h		*
b. p ^h i.la	*!	*	* p ^h		*
c. p ^h i.li	*!		*p ^h		*
d. p ^h i.ja	*!		* p ^h	* j	*
e. p ^h i.p ^h a			** p ^h . p ^h	*! a	*

The final ranking contains three cophonologies, representing the co-existing systems that produce the AA, alliterating AB and the rhyming AB onomatopoeic forms. In the cophonology of AA forms, FAITHBR dominates *REPEAT, RHYME, ALLITERATE and MARKEDNESS, so that the reduplicant is identical to the base. In the cophonology of alliterating AB forms, *REPEAT dominates ALLITERATE, which then dominates RHYME and MARKEDNESS, so that the reduplicant is not identical to the base, but still alliterates with it. In the cophonology of rhyming AB forms, *REPEAT dominates RHYME, which dominates ALLITERATE and MARKEDNESS, so that the reduplicant is not identical to the base, but still rhymes with it. Onomatopoeic words following these three patterns are considered to be more well-formed and natural than those that do not. When new onomatopoeic words are added to the lexicon, they are conditioned by any one of these cophonologies. Although there are still words that do not belong to any of the patterns, they are considered less natural and used less frequently in natural speech, and that they are more often seen in written contexts. Examples are given in (21).

(20) Final ranking



(21) Residual onomatopoeia

- xi su* [ɕi.su] ‘a rustling noise’
- keng qiang* [k^həŋ.te^hiaŋ] ‘the echoing sound of musical instrument’
- ku dong* [ku.təŋ] ‘a splash/the sound of heavy things falling down’

4 Conclusion

This study gives an optimality theoretic analysis of mandarin disyllabic onomatopoeia, which is produced by co-existing phonological systems. The AA forms are selected by the ranking of FAITHBR over *REPEAT. The AB forms, on the other hand, are selected by the opposite ranking of these two constraints. Furthermore, the alliterating and rhyming AB patterns are derived from reverse rankings of ALLITERATE

and RHYME. The constraints ALLITERATE and RHYME also reflect the catchiness of the onomatopoeic words. The fixed segments (i.e. [l] and [a]) of the partially reduplicated AB forms are attributed to place markedness constraints and Onset Sonority Condition. The opposing rankings of constraints are the co-existing systems in the grammar. They are represented under Cophonology Theory. The residual onomatopoeic words are considered less natural and more often observed in written contexts.

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