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從優選理論分析華語擬聲詞結構

An Optimality Theory Analysis of Mandarin Onomatopoeia

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從優選理論分析華語擬聲詞結構

An OT Analysis of Mandarin Onomatopoeia

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本計畫擬於優選理論 (Prince & Smolensky 1993/2004) 框架下，探討現代華語擬聲詞在音韻上的特點與表現，並分析優選理如何論操作單音節及雙音節輸入項所衍生出的雙音節擬聲詞，進而完全或部分重疊成三音節及四音節華語擬聲詞。擬聲詞為模仿自然界中的聲音形成的詞彙，但並非隨意衍生形成，仍然需要遵循語言的構詞及音韻規律，才能衍生成為合法詞彙並順暢地使用。在華語音韻研究方面，歷來學者對於擬聲詞的討論並不豐富詳盡，因此本碩士論文便嘗試探討華語雙音節、三音節及四音節擬聲詞在音韻分析中的樣貌。

重疊在漢語擬聲詞中為極為常見的現象。如現代華語中單音節的「咕」與雙音節的「咕咕」；雙音節的「滴答」與四音節的「滴滴答答」。故擬聲詞衍生中的重疊機制為本計畫中主要討論議題，此外由於華語擬聲詞結構在音段選擇中展現一致性，故另聚焦於固定音段， 如邊音/l/及前元音/i/在現代華語擬聲詞中高度頻繁地出現，我將對其起源提出假設並分析，如現代華語「劈哩啪啦」的/l/及/i/。而華語雙音節擬聲詞的來源二分為單音節輸入項及雙音節輸入項亦為討論對象。

最後預期華語擬聲詞大致符合現代華語成詞的語法，但進行重疊時與實詞相異，語意因素不會成為衍生動機；經由優選理論分析，從音韻結構角度切入，不僅可了解華語擬聲詞衍生的制約排序，亦更加了解其音韻構詞規範，且與實詞如形容詞進行重疊時的制約排序進行比較，說明華語擬聲詞在衍生過程中傾向遵循邊緣音韻規則，與其他實詞多依據核心音韻　規則的狀況大異其趣。以此為基石去了解其他漢語方言對於擬聲成詞的標準，甚或研究日語、韓語中豐富的擬聲詞，便能構擬出擬聲成詞更具體且具有說服力的語法規則。

ABSTRACT

In this thesis, the generation of Modern Mandarin disyllabic, trisyllabic and quadrisyllabic onomatopoeia under phonological viewpoint via Optimality Theory (Prince & Smolensky 1993/2004) approach will be discussed. In my M.A. Thesis 'An OT analysis of Mandarin Onomatopoeia', four factors motivated this study. First, the different sources of Mandarin disyllabic onomatopoeia which I thought there are monosyllabic and disyllabic inputs aroused my interests. Second, there are some similarities of Mandarin onomatopoeia between Mandarin core lexicons. Third, the reduplication mechanism in Mandarin onomatopoeia will be taken as a main point in this study. For example, in Modern Mandarin 'gu' (Sound of bird sing once) will extend into 'gugu' (Sound of birdsong) under total reduplication. Finally, the issue concerning what will be the best choice when Mandarin onomatopoeia is reduplicated with fixed segmentism also plays an important role in this study. For instance, the /l/ and /i/ in Modern Mandarin's 'pilipala' (Sound of many things falling). Onomatopoeias have their special function as sound-imitating icons. They are not the words which are formed by arbitrary but by the rules. They sometimes violate phonological structures of the language in which they occur; hence they belong to the peripheral phonology rather than core one. The Mandarin onomatopoeia is different from Mandarin content words; they are not motivated by semantic factors. So the Chinese onomatopoeia generation analysis via OT approach supplies not only the morpho-phonological constraints but also the comparison of peripheral words between content words. I would like to assume that the Mandarin onomatopoeia generation follows the peripheral phonological rules. This study will provide as a basement to study on other Chinese language's onomatopoeia or even onomatopoeia in Tibetan, Japanese and Korean.

CHAPTER 1

INTRODUCTION

This thesis investigates Mandarin onomatopoeia in three patterns, disyllabic, trisyllabic and quadrisyllabic structures. It records and analyzes the different forms of the reduplication process in these patterns. The elicited data are accounted for in terms of the Optimality Theory (OT).

Onomatopoeia is special part in Modern Chinese. It imitates sounds happened in the world then generate into words so that there is direct relation between sounds and words. Ma (2002) proposed that Mandarin onomatopoeia is the sounds of things, action and changes rather than the words that refer to things, actions and changes. However, Mandarin onomatopoeia not only mimics but also obeys the rules of Mandarin Chinese. If Mandarin onomatopoeia is generated without following the rules of Mandarin Chinese, they will not be taken as grammatical items. Therefore, there must be rules in Mandarin onomatopoeia since they are very active character in daily language use.

Reduplication is a special type of morphological construction. It is generally regarded as a process which combines aspects of both phonology and morphology. It contains two parts with at least some identical segmental content. One part is called the base, which directly inherits the phonemic melodies from the input, usually the stem. The other part is the reduplicant, which copies and duplicates the phonological content from the base. Reduplication not only involves affixation, both with respect to morpho-syntactic structure and with respect to the segments in the stem, but also a process of copying both segmental and prosodic features from the base to the reduplicant. Conventionally, there are two basic types of reduplication, total and partial reduplication. Total reduplication refers to the total copying of the reduplicant

from the base; in partial reduplication, only part of the base is duplicated (Katamba, 1993).

(1)

Total reduplication:	ABCDE	→	<u>ABCDE</u>-ABCDE
Partial reduplication	ABCDE	→	<u>AB</u>-ABCED, <u>ABC</u>-ABCDE, etc.

(The underlined portion refers to the reduplicant; This notation is used throughout this thesis.)

1.1. Reduplication of Mandarin onomatopoeia

After observing Mandarin onomatopoeia we can find that many of them are generated through the process of reduplication. Most Mandarin onomatopoeia undergoes total reduplication while a limited number undergo the process of partial reduplication process. Examples are given below.

(2) Total reduplication

A	→	A<u>A</u>
AB	→	AB<u>B</u>
AB	→	A<u>A</u>B
AB	→	AB<u>AB</u>
AB	→	A<u>A</u>B<u>B</u>

(3) Partial reduplication

C_1V_1	→	<u>C_1i</u>C_1V_1
$C_1C_2V_1$	→	C_1<u>V_1</u>C_2V_1
$C_1V_1C_2V_2$	→	C_1V_1<u>lV_1</u>C_2V_2<u>lV_2</u>

In total reduplication in Mandarin onomatopoeia, the reduplicant syllable can be related to the base syllable completely. In addition, almost every reduplicant is next to the base undergoes rightward reduplication. The rightward reduplication copies at least one syllable of the base and the reduplicant is affixed toward the right edge of the prosodic word (Chang 1998, Adelaar 2000, etc). Nevertheless, there is one reduplicant A which in ABAB pattern does not undergo rightward reduplication. It will be discussed in a later section with an explanation.

Partial reduplication of Mandarin onomatopoeia represents a case of fixed segmentism in reduplication, where the /i/ and /l/ always emerges as the nucleus and onset of the reduplicant.

1.2. Mandarin core lexicon and Mandarin onomatopoeia reduplication

Onomatopoeia is taken as a peripheral part in Mandarin Chinese. Mandarin onomatopoeia has special characteristics compared with core lexicon such as nouns, verbs and adjectives. The characteristics can be shown in the reduplication process and are the central point in this thesis. Also, the characteristics similar to core lexicon shown in reduplication are the main issue in my analysis.

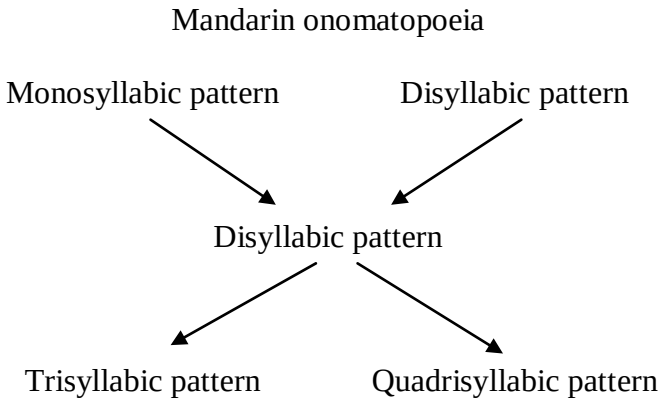
In Mandarin Chinese, reduplication takes the form of a total one, which is also one of the most common morphological operations. Reduplication may mark plurality but also has other semantic or pragmatic effects. Much previous research looked not only into the semantic, grammatical and syntactic functions in the reduplication of Mandarin verbs and adjectives, but also at the formal aspects of the reduplication of the Mandarin core lexicon. However, the formal analysis of Mandarin onomatopoeia reduplication has not been treated with the proper attention.

The principle and mechanisms proposed in previous studies for the reduplication of

Mandarin verbs and adjectives, as well as the account of Mandarin onomatopoeia formation presented below will reveal theoretically significant similarities among OT analysis. The morphological difference between the Mandarin core lexicon and Mandarin onomatopoeia also deserves special attention. Unlike adjective and verb reduplication, Mandarin onomatopoeia involves fixed segmentism during the process of reduplication. As a consequence, a fixed segmentism in the reduplication process is required to generate well-formed Mandarin onomatopoeia.

This research project will be implemented in a step-by-step manner. First I will analyze how Mandarin disyllabic onomatopoeia is generated. The input of partial Mandarin disyllabic onomatopoeias will be assumed the source of monosyllabic ones. The input for other Mandarin disyllabic onomatopoeia will be supposed as different disyllabic forms. Then the Mandarin disyllabic onomatopoeia will be taken as the input to generate trisyllabic patterns. Because there are two structures for Mandarin trisyllabic onomatopoeia, together with two distinct forms of analysis will be provided. Finally, the Mandarin quadrisyllabic onomatopoeia is also generated from disyllabic ones. There are three different patterns in Mandarin quadrisyllabic onomatopoeia, and three different explanations for generation will be given.

(4) Generation process of Mandarin onomatopoeia



This thesis consists of four chapters and is organized as follows. Chapter 2 reviews

previous works on Mandarin onomatopoeia, Mandarin reduplication and the theoretical background related to Mandarin onomatopoeia and reduplication. Chapter 3 discusses the generation of Mandarin disyllabic onomatopoeia and will provide an explanation of the various structures of the disyllabic patterns. The fixed segmentism in reduplication process will be major issue also. Moreover, how Mandarin disyllabic Mandarin extends into trisyllabic ones will be analyzed in Chapter 3 as well. Chapter 4 describes the process of the generation of Mandarin quadrisyllabic onomatopoeia. Three different structures used in the reduplication of Mandarin quadrisyllabic onomatopoeia's will be looked at. The fixed segmentism and the input form for quadrisyllabic pattern analysis will also be studied in Chapter 4. Chapter 5 sums up the phonological analysis of Mandarin onomatopoeia. This thesis also illustrates the categories and phonological structures of Mandarin onomatopoeia. Chapter 5 summarizes the similarities and difference in core lexicon and onomatopoeia in Mandarin Chinese investigated as well as the solutions under OT.

CHAPTER 2

LITERATURE REVIEW

This chapter contains three sections. Section 1 reviews the Optimality Theory (OT). Section 2 provides information from previous studies on reduplication in Mandarin Chinese and on Mandarin onomatopoeia. Section 3 discusses reduplication under OT and the constraints used.

2.1. Optimality Theory

2.1.1. Basic concept of OT

Optimality Theory, which was first introduced by Prince and Smolensky (Prince & Smolensky 1993/2004; McCarthy & Prince 1993a, 1993b, 1994, 1995, 1999), has aroused great interest in the study of phonology. OT is a development of Generative Grammar, a theory sharing its focus on the formal description and quest for universal principles on the basis of empirical research of linguistic typology and language acquisition. However, OT radically differs from the generative model and has the central idea that surface forms of language reflect resolutions of conflicts between constraints. The five basic tenets of OT are given below.

(5) Principles of Optimality Theory

a. Universality

   UG provides a set *Con* of constraints that are universal and universally present in all grammars.

b. Violability

   Constraints are violable; but violation is minimal.

c. Ranking

The constraints of Con are ranked on a language-particular basis; the notion of minimal violation is defined in terms of this ranking. A grammar is a ranking of the constraints set.

d. Inclusiveness

The constraints hierarchy evaluates a set of candidates analyzes that are admitted by very general considerations of structural well-formedness.

e. Parallelism

Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set. There is no serial derivation. (Other views are consistent with a-d, as well)

Universality is essential to the emergence of the unmarked (TETU), one of the main points in this thesis. Since structural constraints are universal and present in every grammar, even those that are obviously and commonly violated in a given language are predicted to be available to do their work under appropriate conditions. It needs to be noticed that Universality is hopeless without Violability and Ranking, in the face of the diversity of inter-linguistic variation seen in linguistic systems.

These principles must figure in a particular conception of how grammar is organized. Universal grammar must minimally provide the following:

Con. The set of constraints out of which grammars are constructed.

Gen. A function defining for each possible input *i*, the range of candidate linguistic analyzes available to *i*.

Eval. A function that comparatively evaluate sets of forms with respect to a given constraint Γ, a ranking of Con.

The following schema sketches the way input-output pairing is accomplished using these notions. Suppose we have a grammarΓ_m, the m^{th} ranking of Con, and an input in_i — a lexical entry, if we are looking at word phonology.

(6) Schema for an OT grammar

Gen (in_i) = {$cand_1$, $cand_2$, …}

Eval (Γ_m, {$cand_1$, $cand_2$, …}) → ($cand_k$)

This grammar pairs input in_i with output $cand_k$.

The function Gen emits a set of candidate analyzes consistent with a given input. Gen consists of a very broad principle of linguistic forms, essentially limited to those that define the representational primitives and their most basic modes of combinations. Eval deals with a system of ranked constraintsΓ: a formal construction on Con that yields the grammar of an individual language. It rates the members of the candidate set in terms of their relative harmony, or degree of success with respect to the language's ranking Γ of constraints. It imposes an order on the various candidates, and a maximally harmonic candidate is optimal. Such a candidate best-satisfies or minimally violates the grammar's constraint ranking. It is output associated by the grammar with the specific input in_i. The various non-optimal candidates have no grammatical status; no direct inferences about plausible patterns of variation or historical changes can be drawn from their ordering. The constraint ranking for the Mandarin core lexicon is different from that of Mandarin onomatopoeia so that they have various phonological structures.

2.1.2. Constraint family in OT

Before coming to the discussion of actual constraints and their ranking in a specific situation, let us first find out in a general way about the five major forces embodied by constraints.

a. Faithfulness Constraint. It requires that outputs preserve the properties of their basic forms, requiring some kind of similarity between output and its input.

b. Markedness Constraint. It is a general denominator for grammatical factors that exert pressure toward unmarked types of structure. The markedness constraint

requires that the output forms meet some criterion of structural well-formedeness.

c. Generalized Alignment Constraint. It was developed in the analysis of relation between syntactic constituents and prosodic phrases (McCarthy & Prince 1993b; Kager 1999). Generalized Alignment Constraint serves the match between the edge of various linguistic constituents in prosodic category and grammatical category.

d. Anchoring Constraint (McCarthy & Prince 1993a, 1995a, b). It is member of the Faithfulness constraint family and be taken as positional faithfulness constraint. The anchoring constraint serves to ensure that a certain edge of the reduplicant will correspond to a certain edge of the base.

e. Adjacency Constraint. Kitto & de Lacy (1999) proposed the BE-ADJACENCY constraint and tried to account for the tendency of copied epenthetic segments to be near the segment form which they have copied their features. ADJACENCYBR requires the same of reduplicant segments. Thus, there potentially is a family of ADJACENCY constraints which are restricted to an output relation only, as any ADJACENCY requirement in the input-output (IO) domain would be nonsensical.

2.1.3 Cophonology

The cophonology approach, developed in Orgun (1996) and Anttila (1997), and much subsequent work, holds that within a single language there can be co-existing distinct phonological systems, indexed to such components of language as register, lexical class, morphological category, and most conspicuously in the context of this thesis, individual morphological construction. The cophonology approach's diversity is captured by associating morphological constructions or lexical classes with different phonological grammars, i.e., constraint rankings. All constraints within a given cophonology are fully general (e.g., MAX, the ban on deletion, or *COMP-ONSET, the

ban on complex onset); and morphonological differentiation of phonological patterns results from different ranking of the constraints across cophonologies.

In Mandarin onomatopoeia, several morphological constructions can occur and the same input form can generate various output forms. This phenomenon can be explained by a cophonology approach since there are many phonological grammar/constraint rankings in the generation of Mandarin onomatopoeia.

2.1.4 The emergence of the unmarked

Under the OT rubric of the emergence of the unmarked (McCarthy and Prince, 1994a), which provides a way to allow only unmarked structures in a domain like reduplicant while permitting the corresponding marked structure to occur elsewhere in the language. The idea is that non-copying of a base segment, with substitution of some fixed, default segment, decreases phonological markedness.

If a given markedness constraint M crucially dominates an appropriate faithfulness constraint F (and no constraint dominating M somehow vitiates its force), then no M-offending structure will appear in a surface form, even at the expense of imperfectly reproducing some underlying forms. If we rank constraints in the other way and faithfulness takes precedence, so that the M-offending structure can be found in surface forms. Differences in ranking give differences in activity of markedness constraints, so it is possible to say that every constraint is present in the grammar of every language, though if a constraint is crucially dominated, its activity may be limited or non-existent. The limited but nonetheless visible activity of dominated markedness constraints is essential to the theory of fixed segmentism (Alderete et al. 1999).

2.2. Mandarin Chinese reduplication and Mandarin onomatopoeia

A typical word in Chinese, including Mandarin, is not made of component parts but is

a single morpheme. Therefore, Chinese has been referred as an isolating language because of its general less complexity in word formation. Due to this simplicity in Mandarin word structure, the reduplication process, which is regarded as a kind of affixation, morphologically turns out to be a copy operation of the original morpheme as a whole. Similarly, from a phonological view point, segmental content is copied from the base form as well.

The purpose of reduplication, a common phenomenon in Mandarin Chinese, is to give a more vivid meaning to the original adjective (Chao, 1968) or else modify its degree of intensity or reduction. Mandarin lexicons increase the degree of intensity by reduplication, such as with Mandarin adjectives. On the other hand, they also reduce the degree of intensity by reduplication, such as with Mandarin verbs. Examples of reduplication in the Mandarin core lexicons, such as for total reduplication are given below (Chen, 2007).

(7) Reduplication of nouns (kinship terms)

ba-ba	爸爸	'father'	ma-ma	媽媽	'mother'
ge-ge	哥哥	'elder brother'	di-di	弟弟	'younger brother'
ye-ye	爺爺	'paternal grandpa'	nai-nai	奶奶	'paternal grandma'

(8) Reduplication of measure words

jian-jian yifu	件件衣服	'every dress'
zuo-zuo shan	座座山	'every mountain'
zhang-zhang zhi	張張紙	'every sheet of paper'
ke-ke shu	棵棵樹	'every tree'

(9) Reduplication of verbs

shou-shou	說說	‘say a little’
zou-zou	走走	‘walk a little’
piping-piping	批評批評	‘criticize a little’
zhuyi-zhuyi	注意注意	‘pay a little attention’

(10) Reduplication of adjectives

hong de	紅的	‘red’	hong-hong de	紅紅的	‘very red’
chengshi	誠實	‘honest’	cheng-cheng-shi-shi	誠誠實實	‘very honest’

To take the reduplication of Mandarin adjectives as an example, it may occur as disyllabic, trisyllabic and quadrisyllabic compounds— may seen to be highly diverse. The generalization for Mandarin disyllabic reduplication made by Lien (1989) and Tang (1988) is that co-ordinate compounds are the most productive types. However, Chiang (1992) pointed out that there are more Mandarin words than co-ordinated compounds can be productively reduplicated to the same extent. Chiang also claimed that all affixes in Mandarin adjective reduplication as suffixes which are attached to the prosodic base, in contrary to the traditional assumption that affixes can be taken as infixes and prefixes under the model of prosodic morphology.

The previous researches on Mandarin onomatopoeia focused on rhetoric, lexical category and syntactic structure, such as Wang (1985) who studied Mandarin onomatopoeia in a rhetorical degree and did not take it as a lexical category. Only recently have some researchers, such as Zhu (1995) and Li (2007), mentioned the phonological character of Mandarin onomatopoeia. Zhu noticed the large numbers of /l/ as onset in Mandarin onomatopoeia and other Chinese dialects. Except for the traditional statement, Li proposed statistics for Mandarin onomatopoeia. She provided

the information that there are many stops in Mandarin onomatopoeia as well as numerous laterals shown as onset in the even syllable. However, there needs to be an analysis to explain these special phonological structures.

Chiang(1992) proposed that onomatopoeia sometimes violate phonological structure of the language in which they occur due to their special function as sound-imitating icons, hence they belong to the peripheral rather than core phonology. The formation of Mandarin onomatopoeia is identical to that of the Mandarin core lexicons. Nevertheless, Mandarin onomatopoeias involve fixed material at the segment level. As s consequence, a replacement process is required to generate well-formed onomatopoetic words. That process is assumed to be Melodic Overwriting here (McCarthy and Prince, 1990). When Melodic Overwriting happens, the Recoverability Principle and the Strong Domain Hypothesis also work in the reduplication process as well so that Mandarin onomatopoeia follows Universal Grammar rather than Mandarin-specific rules.

2.3. Reduplication in Optimality Theory

From a purely morphological point of view, reduplication is simply a kind of affixation, both in its morpho-syntactic contribution (it forms morphological categories, such as plural), and in its linear position with respect to the stem (preceding it, as a prefix, or following it, as a suffix). But from a phonological viewpoint, the special property of reduplication is that the reduplication affix is not fully specified for segment content. Its segment content is copied from the stem that undergoes reduplication. Reduplication is therefore by its very nature a phenomenon involving the phonological identity between the reduplicant and the base to which it adjoins.

The Correspondence Theory of reduplication, which was put forward by McCarthy

and Prince (McCarthy & Prince 1994a, b, 1995a,b), claims that reduplication patterns arise from the interaction of three constraint types.

a. Well-formedness constraints, encoding markednss principles

b. Faithfulness constraints, requiring lexical forms and surface forms to be identical

c. Base-reduplicant-identity constraints, requiring identity between the reduplicant and its base.

In ranking these three types of constraints, Correspondence Theory aims to explain the broad typological difference and similarities among patterns of reduplication in world languages, as well as the specific patterns of individual languages. Correspondence Theory tries to manifest the interaction of well-formedness, faithfulness and base-reduplicant identity underlying the patterns of reduplication in some languages.

This model, as depicted in Figure (1), has an input and output level. The input of the reduplication consists of a segmentally empty reduplicative affix, which is abbreviated as *Af* RED or RED, plus the stem to which the affix adjoins. Input faithfulness constraints require that the input specifications of the stem be preserved in the output— the 'base' of the base-reduplicant combination. Base-reduplicant identity constraints require that both parts of this output base-reduplicant combination be identical in some respect.

(11) The Basic Model

Input: /*Af* RED +Stem/

⇕ *IO-Faithfulness*

Output: R ⟺ B

Not shown in this model are that two remaining constraint types which come into play in reduplication. Well-formedness constraints require that the output (base reduplicant) meet certain unmarked structures. Alignment constraints require that base and

reduplicant be ‘glued’ together along the edge of specific prosodic constituents.

In this thesis there are two general categories of constraints— Faithfulness and Markedness constraints. There are three sub-categories of Faithfulness constraints. The first one is the Maxmality (MAX) constraint, which asks that the content of every input must correspond to the content of every output without deletion. The second one is the Dependency (DEP) constraint, which requires that the content of every input must correspond to the content of every output without insertion. The third one is the Identity (IDENT) constraint, which asks that every feature or value in content of the input and of the output must be identical without change (Prince & Smolemsky 1995, 1999).

In this thesis I will analyze Mandarin disyllabic onomatopoeia first, and then discuss Mandarin trisyllabic onomatopoeia, and then Mandarin quadrisyllabic onomatopoeia. The reduplication data of Mandarin disyllabic, trisyllabic and quadrisyllabic onomatopoeia are collected from Li’s research (2007) and The Online Mandarin Dictionary of the Ministry of Education. The selected Mandarin onomatopoeia will be serach on Google for their official and non-official use in Modern Mandarin-speaking world and the numbers of results are shown in tables in later chapters. Those Mandarin onomatopoeias are as welll taken as items for analysis and discussed under OT grammar.

CHAPTER 3

MANDARIN DISYLLABIC AND TRISYLLABIC ONOMATOPOEIA

3.1 Mandarin Disyllabic Onomatopoeia

3.1.1 Some background information

Mandarin onomatopoeia can be separated into four categories— monosyllabic, disyllabic, trisyllabic and quadrisyllabic patterns. According to Li (2007: 114-115), the disyllabic ones are the largest group[1]. The reason for this disyllabic tendency is that the basic prosodic unit (i.e., foot) in Modern Chinese is formatted by two syllables (Feng 2005: 61). Wang (2008:124) and Duanmu (2000, 2007) also take the disyllable as the basic metrical unit in Modern Chinese. When the disyllable is the most unmarked choice in Mandarin lexicon, this preference is also found in peripheral lexicons such as onomatopoeia.

The rest of this chapter is organized as follows. Section 3.1.2 overviews Mandarin disyllabic onomatopoeia and manifests its phonological character. Section 3.1.3 will show the category information of Mandarin disyllabic onomatopoeia. Section 3.1.4 will propose an OT analysis of Mandarin disyllabic onomatopoeia with monosyllabic input. Then, Section 3.1.5 begins an analysis of how disyllabic inputs generate Mandarin disyllabic onomatopoeia. Finally, Section 3.1.6 gives a summary.

3.1.2 The description of reduplication data of Mandarin disyllabic onomatopoeia

There are two major patterns in Mandarin disyllabic onomatopoeia— AA and AB styles.

3.1.2.1 AA Mandarin onomatopoeia

Half of disyllabic Mandarin onomatopoeia is AA patterns. Li (2007: 117) and Ma

[1] In Li's investigation, disyllabic onomatopoeias comprise nearly 40% of all Mandarin onomatopoeia while monosyllabic, trisyllabic and quadrisyllabic ones comprise under 20% each, respectively.

(2002:244) both state that the AA pattern is the duplicating way Mandarin monosyllabic onomatopoeia to express the richer sound. AA pattern Mandarin onomatopoeia will state its general use on Google and its historical source in this table.

(12) AA Mandarin Onomatopoeia

AA	Input	English Gloss
bobo(啵啵/剝剝) About 529,000 results	bo About 488,000 results, from Tang Dynasty (A.D 618-907).	sound of bubbles popping/knocking/pecking woods naboboshengjiuxiangduishuimianchuiqifachudeshengyin。'That sounf just like the water blowed on the surface'
baba(叭叭) About 929,000 results	ba About 661,000 results	honk of automobiles damalushang changtingdao labadebabasheng。 'Sounds of honks are usually heard on the road'
papa(啪啪) About 5,000,000 results	pa About 2,210,000 results	sound of flapping houmenchuanlai papadepaimensheng。 'There is sound of knocking on the back door'
pengpeng(砰砰) About 3,900,000 results	peng About 1,850,000 results, from Western Jin Dynasty (A.D 265-317).	bang youtingdaopengpenghaojishengqiangsheng。 'Several gun shots can be heard again'
pupu(噗噗) About 2,810,000 results	pu About 2,270,000 results, from Ming Dynasty (AD 1368-1644)	sound of air going out paiqiguan paiqishifachude pupusheng。 'The sound of exhaust pipe'
mimi(咪咪) About 14,000,000 results	mi	meow xiaomaomimijiao。'Little kitty meowing'
miemie(咩	mie About 2,040,000	baa

咩) About 3,940,000 results	results	xiaoyangmiemiedejiao。‘Lambs are baaing’
miaomiao(喵喵) About 7,320,000 results	miao About 1,730,000 results	meow maomi duizhe jingzi miaomiaojiao。 ‘Kitty meows at the mirror’
moumou(哞哞) About 515,000 results	mou About 129,000 results, from Tang Dynasty (A.D 618-907.).	moo langanlideniu duiwomoumoujiao。 ‘Cows in fence moo at me’
dingding(叮叮) About 3,080,000 results	ding About 1,520,000 results, from Tang Dynasty (A.D 618-907.).	sound of a little bell ringing diancheqidongshi lingdangfachudedingdingsheng。 ‘The sound of tram’s bell’
dongdong(咚咚) About 5,490,000 results	dong About 1,550,000 results, fromYuan Dynasty (A.D 1271-1368).	sound of knocking/drumming tingdaodongdongdegusheng。 ‘The sounds of drumming are heard’
dudu(嘟嘟) About 8,680,000 results	du About 1,750,000 results,, fromYuan Dynasty (A.D 1271-1368).	honk/ Sound of monotone laidiandalingbuzhishichuantongdedudusheng。 ‘The telephone back tone is more than the old monotone’
dada(答答) About 8,870,000 results	da About 11,200,000 results, fromYuan Dynasty (A.D 1271-1368.)	sound of water dropping/ticking tingdaodadadeluoyusheng。 ‘I heard the sound of rainning’
dede(得得) About 407,000 results	dede From Song dynasty (A.D 960-1279.)	sound of clip-clop tatingdaobeihouxiangqidededematisheng。 ‘He heard the clip-clop sounds from his back’
lingling(鈴	ling About 218,000	sound of a phone ringing

鈴) About 3,070,000 results	results, from Han Dynasty (206 BC-AD 195)	shoujikaishilinglingxiang。‘The cell phone start ringing’
longlong(隆隆) About 874,000 results	long About 12,300 results, from Han Dynasty (206 BC-AD 195)	sound of thunder or very loud sound xiatiandewuhouleishenglonglong，bujiuhoujiuhuixiayu。‘There are sounds of thundering at the summer aftertoon and it will raining afterwards’
langlang(琅琅) About 286,000 results	langlang From Han Dynasty (206 BC-AD 195)	sound of reading books/ metals or rocks crashing togetther zaoshangdejiaoshichuanlailanglangdedushusheng。‘The sounds of studying come from classroom in the morning’
zhizhi(吱吱) About 18,300,000 results	zhi About 2,150,000 results	sound of bird/squeak xiaoniaozaishushangzhizhidejiao。‘A bird sounds on the tree’
zhazha(喳喳) About 6,120,000 results	zhazha FromJin Dynasty (A.D 1115– 1234)	twitter xiaoniaozhaichuangwaizhazhadejiao。 ‘The bird twittering out of the window’
gugu(咕咕) About 13,400,000 results	gu About 2,060,000 results, from Ming Dynasty (AD 1368-1644)	sound of bird sounding/stomach rumbling duziedeshihouhuifachugugusheng。 ‘When feeling hungry I will hear my stomach rumbling’
guagua(呱呱) About 7,170,000 results	gua About 330,000 results, from Han Dynasty (206 BC-AD 195)	croak/sound of crying/ laughing qingwazaichitangliguaguajiao。 ‘Frogs croaking in the pond’
jiujiu(啾啾)	jiu About 658,000	chirp

About 1,020,000 results	results, from Han Dynasty (206 BC-AD 195)	xiaoniaojiujiudejiaoshenghenqingcui。 ‘Chirps from birds are very liightful’
jianjian(濺濺) About 52,600 results	jianjian From Nan Dynasty (AD 420-581)	sound of brook jianjiandeshuishengtinglaihenqingliang。 ‘The sounds of brook cooling people’
koukou(叩叩) About 1,490,000 results	kou About 1,730,000 results	sound of knocking takoukoudeqiaomen，danwurenhuiying。 ‘He knocked on the door with the sound but nobody responsed’
honghong(轟轟) About 1,510,000 results	hong About 4,870,000 results, from Song dynasty (A.D 960-1279.)	sound of thunder/very loud sound paoshenghonghongdexiangqilaile。 ‘There are sound of artillery occurs’
huohuo (霍霍) About 284,000 results	huohuo From Nan Dynasty (AD 420-581)	sound of sharp knives hurantingjianhuohuosheng， yuanlaishiyourenzaimoudao。 ‘Suddenly I hear the sound of rubbing and there is someone sharpping his knife’
chichi(嗤嗤) About 715,000 results	chi About 398,000 results, from Qing Dynasty (A.D 1644-1911.)	sound of tittering tingjiantachichidexiaosheng。‘I heard his laughing’
chanchan(潺潺) About 8,280,000 results	chanchan From Wei Dynasty (AD 220-265)	sound of brook tazuozhelingtingxiaoxichanchandeliushuisheng。 ‘He sit by brook and listen to the sound of water flowing’

shasha(沙沙) About 3,310,000 results	shasha FromYuan Dynasty (A.D 1271-1368.)	very low sound such as wind blowing leaves fengchuiguolinzi，shuyefachuleshashasheng。‘A breeze blow over the woods and there are sound of leaves occur’
caocao(嘈嘈) About 180,000 results	caocao From Nan Dynasty (AD 420-581)	many sounds occur at the same time lengqifachudecaocaoshengjiaorenxinfan。 ‘The sounds of air conditioning are annoying’
congcong(淙淙) About 264,000 results	congcong From Tang Dynasty (A.D 618-907.).	sound of water flowing tazhuanxintingzhecongcongliushuisheng。 ‘He listen to the sound of water flowing very carefully’
sisi(嘶嘶) About 411,000 results	si About 1,830,000 results, from Tang Dynasty (A.D 618-907.).	neigh／sound of (air) leaking louqideqiqiufachulesisisisheng。 ‘The punctured ballon has the sound ofbleaking air’
sese(瑟瑟) About 608,000 results	sese From Wei Dynasty (AD 220-265)	sound of wind blowing tingdaofengshengsese，zhidaoqiutianyijinglailin。 ‘I heard the sound of wind and knew autum already came’
sasa(颯颯) About 279,000 results	sasa From Warring States Period (475 BC - 221 BC)	sound of blast kuangfengzaishulinlisasazuoxiang。 ‘The blast blow over the woods and had loud sound’
susu(簌簌) About 433,000 results	susu From Ming Dynasty (AD 1368-1644)	very low sound shuyepiaodongfachuleqingweidesususheng。 ‘Leaves floating in the wind and have very low sound’
wengweng(嗡嗡) About	weng About 87,200 results, from Qing Dynasty	buzz/ sound in very low tone mifengpaichishihuifachuwengwengsheng。

1,330,000 results	(A.D 1644-1911.)	‘When bees flapping there will be buzzing’
wangwang(汪汪) About 20,600,000 results	wang About 1,960,000 results, fromYuan Dynasty (A.D 1271-1368	barking nazhiheigouwangwangdejiaoleqilai。 ‘That black dod start barking’

The Mandarin disyllabic onomatopoeias follow a certain pattern of reduplication.. However, Mandarin disyllabic onomatopoeias can be separated into two different groups by their input structure, and it is the most special character can be found in AA Mandarin onomatopoeia. Some AA onomatopoeia derives from the monosyllabic input A and others have disyllabic sources. Monosyllabic and dyllabic input of AA Mandarin onomatopoeia which hold ancient example in this table will illustrate its evidence in the note part after this thesis.

3.1.2.2 AB Mandarin onomatopoeia

There are nearly 50% AB patterns in Mandarin disyllabic onomatopoeia[2] (Li, 2007:114). Compared with AA Mandarin onomatopoeia, AB ones are combination of two different sounds very closely (Li, 2007), there is no stop between two syllables and it can be taken as a union of two sounds (Ma, 2002:238). The data of AB Mandarin onomatopoeia are given below. AB pattern Mandarin onomatopoeia will state its general use on google and its historical source in this table.

(13) AB Mandarin Onomatopoeia

AB	Input	English Gloss
pipa	pa About 4,530,000	sound of snap or crack

[2] In Li’s investigation, AB Mandarin onomatopoeia comprises 53% of the disyllabic category.

(劈啪) About 327,000 results	results	dang tuoxia maoyi shi huifachu xiaoxiaode pipasheng。 'When taking off sweater we can hear low cracks.'
pala (啪啦) About 1,590,000 results	pa About 4,530,000 results	sound of something falling hardly chuanghu diao zai dishang pala yisheng。 'Window falls on the floor with a snap.'
pulu (噗嚕) About 38,900 results	pu About 4,580,000 results, from Song dynasty (A.D 960-1279.)	bloop bloop shuimian de paopao fachu pulusheng。 'The bubble of water surface bubbling.'
pingpang (乒乓) About 8,460,000 results	pang About 196,000 results, from Qing Dynasty (A.D 1644-1911.)	sound of things crashing together zadongxishi de pingpangsheng。 'Crashing things with loud sound'
bibo(嗶剝)About 200,000 results	bo About 545,000 results, from Ming Dynasty (AD 1368-1644)	sound of firing/knocking/cracking wanzhengchengxianqipaopodiaodebibosheng。 'It shows the cracking sound of bubbles compeletely'
bada (巴答) About 15,900,000 results	bada	snap batayisheng jingjia dogei laduanle。 ' The glasses snapped'
pada (啪答) About 4,970,000 results	pada	sound of thing falling yijia patayisheng diaoxialai。 'Hanger fell with a sound'
paca	paca	sound of shooting picture

(啪擦) About 6,750,000 results		anyixia kuaimen jiu paca yisheng。 'Press the shutter there is a sound'
puchi (噗哧) About 4,030,000 results	puchi From Qing Dynasty (A.D 1644-1911.)	tittering ta renbuzhu puchiyisheng xiaochulai。 'She can't help but tittered'
putong (撲通) About 6,540,000 results	putong From Yuan Dynasty (A.D 1271-1368)	sound of thing fall on the floor or in the water putongyisheng diaojin hezhongyang。 'Fell into river with a sound'
dingling (叮鈴) About 1,200,000 results	ding About 1,500,000 results, from Tang Dynasty (A.D 618-907.).	sound of a bell ringing fengling beifeng chuide dingling xiang。 'Wind chimes ringing because of wind flows'
dulu (嘟嚕) About 1,990,000 results	du About 1,760,000 results, from Qing Dynasty (A.D 1644-1911.)	phone back tone/ sound of monotone dengduifang jie dianhuaqian de dulusheng lingrenbunai。 'It makes people inpatient listen to the phone back tone when calling someone'
danglang (噹啷) About 3,230,000 results	dang About 11,200,000 results	sound of something metal falling danglingyisheng，dishang chuanlai qingcuide jinshusheng。 'There is sound sharp and loud by metal things fell'
donglong (咚隆) About 1,520,000 results	dong About 1,510,000 results, from Song dynasty (A.D 960-1279.)	sound of things rolling/drumming chao fanmaiji yian，yiguan kele donglong diaoxia。 'When press the buttom of vending machine there is coke falling with rolling sound'
dida	da About 10,500,000	sound of water dropping/ticking

(滴答) About 3,490,000 results	results	didayisheng，zhizhenchaoxiayimiaoyidong。‘The second hand move forward with the sound of ticking’ shuizhu huanhuan luoxia，dida xiangleyisheng。 ‘Drops of water flow with little sound’
tida (踢達) About 15,000,000 results	da About 10,500,000 results	sound of walking menwai chuanlai gaogenxie de tida sheng。 ‘There is sound of someone walking on heels from outside of door’
dingdang (叮噹)	dang About 11,200,000 results, from Yuan Dynasty (A.D 1271-1368)	sound of bell ringing maomi bozishang de lingdang dingdang zuoxiang。 ‘The bell on cat ringing’
dingdong (叮咚) About 3,970,000 results	dong About 1,510,000 results, from Qing Dynasty (A.D 1644-1911.)	sound of doorbell ringing menling haizai dingdong xiang。 ‘The door bell ringing now’
jili (嘰哩) About 212,000 results	ji About 754,000 results	screeching chehou chuanlai yizhen jianrui de jilisheng。 ‘There is a sound of screeching comes from the back of car’
jizha (嘰喳) About 204,000 results	jiza From Yuan Dynasty (A.D 1271-1368)	sound of talking/tweeting banzhe niaoerde jizhasheng。 ‘Accomapmied with the tweeting of the birds’
xili (淅瀝) About	xi About 1,060,000 results, from Nan	sound of a little raining mianmichixude xiaoyuxilisheng。

1,160,000 results	Dynasty (AD 420-581)	'The sound of little raining continually and densely'
shuala (刷啦) About 20,800,000 results	shua About 13,100,000 results, from Qing Dynasty (A.D 1644-1911.)	sound of something passing by very fast shualayisheng，chuanghubeidakaile。 'With a very loud and fast sound, the window is opened'
gulu (咕嚕) About 5,280,000 results	gu About 1,210,000 results	sound of drinking/stomach rumbling ta heshuishi fachulegulusheng。'When he drinking water there are sound of swallow occur' duzieshi duzigulujiao henzhengchang。 'When people hungry it is very normal that their stomach growling'
gala (嘎啦) About 512,000 results	ga About 1,380,000 results, from Qing Dynasty (A.D 1644-1911.)	sound of loud noice galayisheng，loutai daoxialaile。 'The building fell with very loud sound'
kazhi (喀吱) About 602,000 results	kəzi	sound of squeezing mubanyumuban jiechushi suofachudekazhisheng。 'The squeezed sound occurs when two boards put together'
kengqiang (鏗鏘) About 5,420,000 results	qiang About 588,000 results, from Western Jin Dynasty (A.D 265-317).	sound of metal things crashing together bangqiudajishi huifachu kengqiangqingcuideshengyin。 'When playing baseball there are sounds of bat hit on ball'
gudu (咕嘟) About 781,000 results	gudu From Qing Dynasty (A.D 1644-1911.)	sound of drinking fast/sound of boiling water talike guduyisheng tunxia zuilidecha。 'He gulp down the tea right away with sound'

guji (咕唧) About 115,000 results	guzi	sound of water flow by squeeze tazai jishuiwadi zouzhe，jiaodixia gujidixiang。 ‘He walk on the water-filled depression in the ground with the sound of water squeezed’
gudong (咕咚) About 1,670,000 results	gudong From Qing Dynasty (A.D 1644-1911.)	sound of one thing falling gudongyisheng congchuangshang dielexialai。 ‘Fell form the bed with sound’
kuanglang (匡啷) About 119,000 results	kuang About 40,800 results	sound of breaking tianhuaban dedengzhao wuyujing diaoluo，kuanglangyisheng。 ‘The lampshade on the celine fell by accident with loud sound’
gazhi (嘎吱) About 995,000 results	gazi	sound of squeeze to break caiguobanbodejiabanshi，gazhishengqingqiaoermo。 ‘When waik on an old deck, we can hear the sound of squeezed boards’
kaca (喀擦) About 1,590,000 results	kaca	sound of press camera shutter xiangjikuaimen dekacasheng yinqi bieren dezhuyi。 ‘The sound of shutter get attention from others’
honglong (轟隆) About 9,040,000 results	hong About 5,810,000 results	thundering honglongyisheng，yizhenmenlei。‘It thundered loud with a thunderclap’
huala (嘩啦) About	hua About 1,390,000 results	sound of water or fragile item falling/collasping hualayisheng shuiguan liuchu shuilai。

937,000 results		‘Water flow from the tube with sounds’ boli hualayisheng suile。 ‘The glass shattered to pieces with loud sound’
haqiu (哈啾) About 134,000 results	xaziow	sound of sneezing taganmaole，haqiusheng henda。 ‘He got cold and sneezed very loud’

In Table (13) we can see that the formation of AB Mandarin onomatopoeia is identical to that of Mandarin adjective derivation (Chiang). However, as a peripheral part in Mandarin Chinese, onomatopoeia has their special structure and generation than core ones, such as the fixed material in the generation process and the vowel reduplication which will be discussed in section 3.1.4. Monosyllabic and dyllabic input of AA Mandarin onomatopoeia which hold ancient example in this table will illustrate its evidence in the note part after the analysis.

3.1.3 Categories of Disyllabic Mandarin Onomatopoeia

I will separate disyllabic Mandarin onomatopoeia into two categories. One has monosyllabic input, and the other has disyllabic input. Mandarin Disyllabic onomatopoeia which has a monosyllabic input can be further divided into three groups, one kind of AA Mandarin onomatopoeia and two kinds of AB Mandarin onomatopoeia. Mandarin disyllabic onomatopoeia with disyllabic input can be described as four groups, one kind of AA Mandarin onomatopoeia and three kinds of AB Mandarin onomatopoeia.

The first group under Monosyllabic Input is AA, in which A is the input and undergoes the Total Reduplication then generates AA. Following ones are two kinds of AB. While one is Consonant + /l/ group such as ‘pala’, ‘dingling’ (sound of a bell

ringing), the other one is Same Onset Collocation group such as ‘dida’, ‘pingpang’ (sound of small and hollow things crashing).

When Mandarin Disyllabic onomatopoeia’s input is disyllabic ones, there is one category called Original Disyllable AA, which is Mandarin disyllabic onomatopoeia at the very beginning rather than undergoes any kinds of reduplication. For instance, ‘shasha’, ‘congcong’ (sound of water flowing) are the typical Original Disyllable AA. Moreover, there are one AB subcategories which are combination of two sounds such as ‘hajiu’, ‘gudu’ and ‘guji’.

(14) Disyllabic Mandarin Onomatopoeia Categories

<table>
<tr><th></th><th>Monosyllabic Input</th><th>Disyllabic Input</th></tr>
<tr><td>AA</td><td>1. Total Reduplication:
gu→gugu
(Sound of bird song)</td><td>1. Original Disyllable : shashaa→shasha[3]
(Sound of wind blowing)</td></tr>
<tr><td rowspan="2">AB</td><td>2. Consonant+/l/ :
pa → pala
(Sound of something falling)</td><td rowspan="2">2. Sound combination:
gudu → gudu
(Sound of drinking)
guci → guji
(Sound of whispering)</td></tr>
<tr><td>3. Same Onset Collocation:
da → dida
(Sound of water dropping)</td></tr>
</table>

3.1.4 Analysis of Monosyllabic Input

Disyllabic Mandarin onomatopoeias which are generated from monosyllabic input undergo Total Reduplication or Partial Reduplication. The most important constraint

[3] If disyllabic Mandarin onomatopoeia cannot express the onomatopoeia content in one single syllable it will be taken as Original Disyllable AA.

families to be used when analyzing the data of the reduplications are General Alignment Constraints, Anchoring constraints and Adjacency Constraints. Therefore I set the constraints in the General Alignment Constraints, Anchoring constraints and Adjacency Constraints families.

3.1.4.1. Generalized alignment constraint

The edge-based theory of the syntax-phonology interface was adopted into OT by McCarthy and Prince (1993a), who claim that the prosody-morphology interface should be defined exclusively in terms of alignment constraints.

Alignment constraints not only serve to match the edges of morphological and prosodic categories, but also the edges of phonological constituents like syllable, foot, prosodic word. Alignment has a very general format in order to fulfill all the diverse functions which McCarthy and Prince (1993a) named 'Generalized Alignment'. This constraint format has following characteristics. In the first place, is categories may appear in alignment constraints. Next, is the choice of the edges. The third one is the order in which the categories appear in the constraint. The fourth one is how to evaluate violation of alignment constraints. Due to the need to predict the right form of quadrisyllabic Mandarin onomatopoeia, we set two alignment constraints below.

(15) ALIGN (RED, PRWD)-LEFT (McCarthy, John & Alan Prince, 1993a)

Assign one violation mark for every syllable intervening between the left edge of the reduplicant and the left edge of the prosodic word.

(16) ALIGN (RED, PRWD)-RIGHT (McCarthy, John & Alan Prince, 1993a)

Assign one violation mark for every syllable intervening between the right edge of the reduplicant and the right edge of the prosodic word.

The Alignment constraint will rule out candidates which undergo certain direction of reduplication.

3.1.4.2. Anchoring constraint

The Anchoring constraints ask for the correspondence between certain edge of base and reduplicant. The domain of Anchoring constraint in this section is segment size, however the size of domain will change because of the size of the posodic word.

(17) ANCHORBR-LEFT (SEG). (McCarthy & Prince 1993a, 1995a, b)

Assign one violation mark for every segment at the left edge of the base that does not correspond to the segment at the left edge of the reduplicant.

(18) ANCHORBR-RIGHT (SEG). (McCarthy & Prince 1993a, 1995a, b)

Assign one violation mark for every segment at the right edge of the base that does not correspond to the segment at the right edge of the reduplicant.

When generating Mandarin disyllabic onomatopoeia by partial reduplication, the edge size of the reduplicant is segment-sized, so that the optimal Mandarin disyllabic onomatopoeia can be chosen.

3.1.4.3. Adjacnecy constraint

Marantz claimed Marantz's generalization (1982) and noted several tendencies of reduplication. Except for the statement of directionality, the second component is locality, and gives rise to the Locality Generalization: Reduplications tend to be adjacent to their correspondence. To this tendency, Lunden (2004) proposed the AdjacencyBR constraint family. These constraints motivate and predict locality generalization. Due to the need to predict the right form of quadrisyllabic Mandarin onomatopoeia, we give two adjacency constraints below.

(19) ADJACENCYBR-BY-σ (Lunden, 2004)

Assign one violation mark for every syllable in the reduplicant that is not next to its correspondent base.

(20) ADJACENCYBR-BY-SEGMENT (Lunden, 2004)

Assign one violation mark for every segment in **t**he reduplicant that is not next to its

correspondent base.

3.1.4.4 Total Reduplication of AA

As AA Mandarin onomatopoeia, its monosyllabic input is a successful monosyllabic Mandarin onomatopoeia. When the monosyllabic input undergoes total reduplication then the disyllabic output will be generated. And the reduplicant size is syllable-sized, I will assume that ANCHORBR-L(SEG) and ANCHORBR-R(SEG)are the undominated constraints and ADJACENCY-BY-SEG will be dominated constraint.

(21) 'gugu'

/RED-gu/	ANCHORBR-L(SEG)	ANCHORBR-R(SEG)	AD-BY-SEG
a. →gugu[4]			*
b. ☹ gugu			*
c. gigu		*W	L
d. guu	*W		L

By ANCHORBR-L(SEG), ANCHORBR-R(SEG) and AD-BY-SEG constraints is not enough for AA patterns generation. Optimal candidate in tableau (21) is 'gugu', however, the constraint ranking in this tableau cannot rule out the non-optimal candidate such as 'gugu.' because of it not violate any constraint in tableau (21). The unmarked reduplication direction is right-wards. Alignment constraint will be given in tableau (22) and rule out candidates which align reduplicant to the left side of prosodic word. Alignment constraints such as ALIGN(R, PRWD)-RT and ALIGN(R, PRWD)-LT which bear reduplicant will align to certain side of prosodic word and rule out candidate b. in

[4] In all tableaux, the reduplicant is under-lined.

tableau (21). Syllable structures with complex onsets such as ‘gguu’or ‘ggu’ are not allowed in Modern Mandarin and will be ruled out by the undominated constraint *COMPLEX-ONSET (Assign one violation mark for every tautosyllabic cluster in onset position) in Modern Mandarin phonotatics, and therefore they are not included in the tableau discussions.

(22) ‘gugu’ (revised version)

Total reduplication		/RED-gu/	ALIGN(R, PRWD)-R	ANCHORBR-L(SEG)	ANCHORBR-R(SEG)	ALIGN(R, PRWD)-L	AD-BY-SEG
→	a.	gugu				*	*
	b.	gugu	*W			L	*
	c.	gigu	*W		*W	L	*
	d.	guu		*W		L	L

Candidate b. ‘gugu.’ violates the dominant constraint ALIGN(R, PRWD)-R since the reduplicant ‘ku’ is aligned to the left edge of the prosodic word and hence can be ruled out. Candidate c. ‘gigu’ which has the reduplicant syllable is aligned to the left edge of the prosodic word and right edge of reduplicant segment cannot correspondent to right edge of base segment. Hence candidate c. violates the dominant constraints ALIGN(R, PRWD)-R and ANCHORBR-R(SEG) , which can all be ruled out. Candidate e. is ruled out because of the non- correspondence of left base segment and left reduplicant segment. Candidate a. ‘gugu’ violates only low-ranking constraint ALIGN(R, PRWD)-L and AD-BY- SEG so it is the optimal candidate. The constraint ranking of Total Reduplication AA is— ALIGN(R, PRWD)-R, ANCHORBR-L(SEG), ANCHORBR-R(SEG), >> ALIGN(R, PRWD)-L, AD-BY-SEG.

3.1.4.5 Ranking argument and Hasse diagram of AA Mandarin onomatopoeia

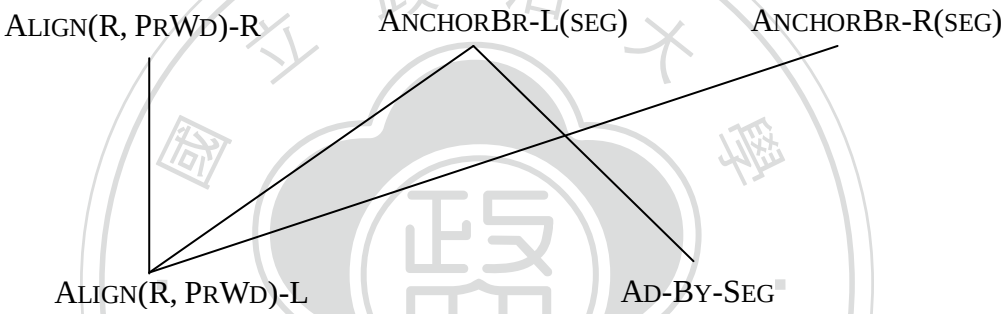
ALIGN(R, PRWD)-R>> ALIGN(R, PRWD)-L

ANCHORBR-L(SEG), >> ALIGN(R, PRWD)-L

ANCHORBR-R(SEG) >> ALIGN(R, PRWD)-L

ALIGN(R, PRWD)-R >> AD-BY-SEG

(23) Hasse diagram of AA Mandarin onomatopoeia



3.1.4.6 AB Mandarin Onomatopoeia— Consonant + /l/

In this section, I will take AB Mandarin onomatopoeia with Consonant+/l/ strucrue's input as a grammatical monosyllabic onomatopoeia. The second onset /l/ of the syllable is a pre-linked onset. The reason why /l/ is the pre-linked segment is not only due to its unmarkedness, may also because the /l/ pre-linked segment can be traced back to ancient Chinese.

The Emergence of the Unmarked (TETU) (McCarthy and Prince 1994a) is a common condition in the generation of languages in the world. In this analysis fixed segmentism occurs in the output rather than copying from the base segment to decrease phonological markedness is fall under the OT rubric of TETU. The constant occurrence of /l/ can be taken as a fixed segmentism in Consonant + /l/ group derivation since the /l/ is a coronal consonant. That the coronal consonant is a fixed

segmentism is the default choice (Paradis and Prunet 1991) according to the Place-markedness hierarchy (Prince and Smolensky 1993, Lombardi 1997). The Place-markedness Hierarchy will also take part into my examination since Clements & Hume (1995), Alderete et al. (1999) and Yip (2001) stated that there is a tendency when choose fixed segment in reduplication. Prince and Smolensky (1993; see also Smolensky 1993) proposed a universal non-permutable constraints hierarchy when inserting a segment. She extend this hierarchy at the lower end, designating a pharyngeal (which includes laryngeal) place as less marked than a coronal.

(24) Place-markedness Hierarchy (Prince and Smolensky 1993, Lombardi 2002)
*PL/LAB, *PL/DORS >> *PL/COR>>*PL/PHAR

This constraint ranking indicates when insert a segment, a less marked segment will be chosen first. It is to make sure that the fixed vowel in the output will be the proper optimal candidate.

In the study of ancient Chinese consonant clusters, Consonant + /l/ are the biggest and most reasonable one (Zhu 1995, Lin 1998, Li2003). Not only because the occurance of Consonant +/l/ is supported by much modern Mandarin evidence, but also because the phonological structure Consonant +/l/ follows the Sonority Sequencing Principle (SSP) and obeys the Universal Grammar. In the category of AB Mandarin onomatopoeia, Consonant +/l/ is the biggest group. We also found that in this category the /l/ must occur as the onset of the second syllable. Every onset of the first syllable can be /p/, /t/, /k/, /j/, /h/, /x/, etc. No matter which consonant is the onset of first syllable, it must be less sonorant than /l/. There is no AB onomatopoeia in which the onset of the first syllable is a glide while the onset of the second one is /l/. For instance, there are AB Mandarin onomatopoeias such as ‘danglang’ (sound of a metal thing falling), ‘xili’ (sound of raining), ‘gulu’ (sound of drinking), ‘xonglong’ (sound

of thunder). However, there are no AB Mandarin onomatopoeias such as '*yili' and '*wala' since I assume that in ancient Chinese the consonant cluster must obey the SSP. In addition, because of the Sonority Dispersion Principle the less sonorant the first consonant is the more sonorant the second consonant is. Mandarin onomatopoeia prefers coronal /l/ over glides such as /j/, /w/ and // since in the intervocalic position a consonant is better than vocoid. Therefore /l/ became the most popular choice of second consonant not only because its higher sonority but also its [+voiced] and [-cont] features (Yip, 2001).

The input in the Consonant+/l/ group is a monosyllabic onomatopoeia. Due to the unmarked /l/ in Modern Mandarin, this monosyllabic input reduplicates its vowel right-ward as a partial reduplication with a fixed /l/ and generates the grammatical Mandarin disyllabic onomatopoeia. Given the presence of the segment-sized reduplicant vowel and the fixed segment /l/, I propose that AD-BY-σ and *PL/DORS are high-ranking constraints. Thus I expect that ANCHORBR-R(SEG) will outrank ANCHORBR-L(SEG) because of the vowel reduplication rather than a consonant one. I will examine 'pala' (sound of something falling) first.

(25) 'pala' (Sound of something falling)

Disyllabic with suffix reduplicant	/RED-pa/	*PL/DORS	ANCHORBR-R(SEG)	ANCHORBR-L(SEG)	AD-BY-SEG	*PL/COR
→ a.	pala			*	*	*
b.	papi		*W	L	L	L
c.	paka	*W		*	L	L
☹ d.	papa				*	

In Tableau (25), we see that constraints like *PL/DORS, *PL/COR , AD-BY-SEG, ANCHORBR-R(SEG) and ANCHORBR-L(SEG) really rule out certain non-optimal candidates such as Candidate b 'papi' and Candidate c 'paka'. However, Candidate d 'papa' least violate the high-ranking constraints than candidate a. and it cannot be decided which one is the optimal candidate. In addition, Complex onset such as 'ppa' is not allowed in Modern Mandarin. The reduplicant size is syllable size in Mandarin disyllabic onomatopoeia reduplication so that candidate with complex onset such as 'ppa' will not be chosen as candidate in tableau in this thesis. I would like to give Alignment constraints to analyze the generation of Consonant+/l/ Mandarin onomatopoeia and rule out candidate such as papa.

(26) 'pala' (Sound of something falling) (Revised version)

Disyllabic with suffix reduplicant	/RED-pa/	*PL/DORS	ANCHORBR-R(SEG)	ALIGN(R, PRWD)-RT	ANCHORBR-L(SEG)	AD-BY-SEG	ALIGN(R, PRWD)-LT	*PL/COR
→ a.	pala				*		*	*
b.	papa			*W	L		L	L
c.	paka	*W			*		*	L
d.	ppaa			*W	L	L	*	
e.	papi		*W		L		*	L

In Tableau (26), there is no correspondent right reduplicant segment and reduplicant is aligned to the right edge of prosodic word so that Candidates b. violate dominant constraints ANCHORBR-R(SEG)and ALIGN(R, PRWD)-RT and be ruled out even when candidate b. is preferred by dominated constraints such as ANCHORBR-L(SEG), AD-BY-SEG and *PL/COR. Candidate c. is not violate the low-ranking constraints

ALIGN(R, PRWD)-LT and *PL/COR. However, candidate c. align its reduplicant to the right edge of the prosodic word so be ruled out by ALIGN(R, PRWD)-RT. Candidate d. is ruled out by constraint *PL/DORS because of the dorsal consonant although it is preferred by the low-ranking constraint *PL/COR. Candidate e. rule out by constraint ALIGN(R, PRWD)-RT since the reduplicant is not aligned to the right edge of the prosodic word though it is preferred by low-ranking constraints ANCHORBR-L(SEG) and AD-BY-SEG.

The constraint ranking of AB Consonant+/l/ Mandarin onomatopoeia—
*PL/DORS, ALIGN(R, PRWD)-RT, ANCHORBR-R (SEG)>> ANCHORBR-L(SEG), AD-BY-SEG, *PL/COR

3.1.4.7 Ranking argument and Hasse diagram of AB Consonant+/l/ Mandarin onomatopoeia

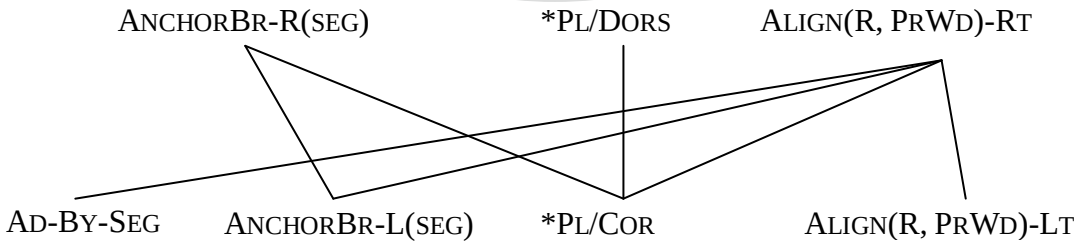
*PL/DORS >>*PL/COR

ALIGN(R, PRWD)-RT >> ALIGN(R, PRWD)-LT, *PL/COR

ALIGN(R, PRWD)-RT>> ANCHORBR-L(SEG), AD-BY-SEG

ANCHORBR-R (SEG)>> *PL/COR, ANCHORBR-L(SEG)

(27) Hasse diagram of AB Consonant+/l/ Mandarin onomatopoeia



3.1.4.8 AB Same Onset Collocation Mandarin Onomatopoeia

In this section, I will analyze the generation of AB Same Onset Collocation Mandarin

Onomatopoeia. Different from Consonant +/l/ group, the inputs of Same Onset collocation are grammatical monosyllabic Mandarin onomatopoeia. Thus, the reduplicant size in the Same Onset Collocation AB group is syllable-sized while among Consonant+/l/ ABs have segment-sized reduplicant. I state that the AD-BY-σ constraint will outrank AD-BY-SEG in Same Onset Collocation AB group.

In addition to occurrence of the fixed segment /i/ in Same Onset Collocation ABs generation, the Place-markedness Hierarchy will also take part into my examination since Clements & Hume (1995), Alderete et al. (1999) and Yip (2001) assumed that vowels bear the same place feature as consonants. Following Clements and Hume and the literature reviewed there, we assume that vowels bear the same place features as consonants. So that we know that [labial] for round vowels, [coronal] for front vowels, [dorsal] for back vowels and [pharyngeal] for low vowels. However, we cannot see any dominated constraints in the above tableau. Hence we utilize Lombardi (2002)'s study to make an advanced analysis. She extend this hierarchy at the lower end, designating a pharyngeal (which includes laryngeal) place as less marked than a coronal.

This constraint ranking from Place-markedness Hierarchy indicates when insert a segment, a less marked segment will be chosen first. It is to make sure that the fixed vowel in the output will be the proper optimal candidate. In the Same Onset Collocation AB group, the fixed segment /i/ emerges rather than /a/ in base 'ta'. According to this preference I assume *PL/DORS (i.e. * back vowel) and *PL/COR (i.e. * front vowel) act in the Same Onset Collocation AB group. Since there is no Same Onset Collocation AB such as 'tati' in Mandarin disyllabic onomatopoeia, I expect that ALIGN(R, PRWD)-L will outrank ALIGN(R, PRWD)-R as the reduplicant is always aligned to the left edge in Same Onset Collocation ABs. The ANCHORBR-L(SEG) constraint will either dominate ANCHORBR-R(SEG) because of fixed segment /i/

reduplication.

(28) 'dida' (Sound of a little rain falling)

Disyllabic with prefix reduplicant	/RED -da/	*PL/ DORS	ANCHORB R-L(SEG)	AD-B Y-SEG	ANCHORB R-R(SEG)	*PL/ COR
→ a.	dida			*	*	*
b.	dada	*W		*	L	L
c.	dai		*W	L	*	
☹ d.	dadi			*	*	*

In tableau (28), candidate b. violates the high-ranking constraint since there is a back vowel /a/ in the reduplicant and be ruled out. Fixed vowel /i/ in candidate c. does not violate the dominant constraint though violate the other high-ranking constraint because of the left edge of the reduplicant is not correspondent to the left edge of the base so that be ruled out. However, candidate d. violates low-ranking constraints with the same numbers of violation mark as the optimal candidate. Therefore Alignment constraints is needed to analysis this category correctly.

(29) 'dida' (Sound of a little rain falling) (Revised version)

prefix reduplicant	/RED-da/	*PL/DORS	ANCHORB R-L(SEG)	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	AD-BY-SEG	ANCHORB R-R(SEG)	*PL/ COR
→ a.	dida				*	*	*	*
b.	dada	*W			*	*	L	L
c.	ʔəda		*W		*		*	L
d.	dadi			*W	L	*	*	*
e.	dai		*W	*W		L		

In Tableau (29), Candidate b. ‘dada’ violates the dominant constraints *PL/DORS by its more marked vowel /a/ reduplication, so it is ruled out. The high-ranking constraint ANCHORBR-L(SEG) rules out Candidate c. ‘ʔəda’ since its left segment of the reduplicant is not correspondent to the left segment of the base. Candidate d. is ruled out by ALIGN(R, PRWD)-LT constraints because of right-ward reduplication. In candidate e. the reduplicant segment in left edge cannot correspondent to the left edge in base segment. Also the reduplicant is aligned to the right edge of prosodic word so candidate e. is ruled out. Candidate a. ‘dida’ is the optimal candidate.

Constraint ranking of AB Same Onset Collocation Mandarin onomatopoeia—

*PL/DORS, ALIGN(R, PRWD)-L, ANCHORBR-L(SEG) >> ALIGN(R, PRWD)-R, AD-BY-SEG, ANCHORBR-R(SEG), *PL/COR

Constraints conflicting between faithfulness and markedness ones and choose the grammatical optimal candidate.

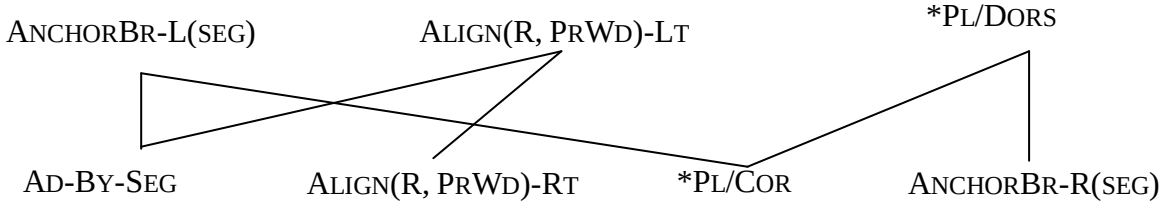
3.1.4.9 Ranking argument and Hasse diagram of AB Same Onset Collocation Mandarin onomatopoeia

*PL/DORS >> ANCHORBR-R(SEG), *PL/COR,

ANCHORBR-L(SEG)>> AD-BY-SEG, *PL/COR

ALIGN(R, PRWD)-L>> ALIGN(R, PRWD)-RT, AD-BY-SEG

(30) Hasse diagram of AB Same Onset Collocation Mandarin onomatopoeia



3.1.4.10 Cophonology in monosyllable input Mandarin disyllabic onomatopoeia

(31) Master Ranking of monosyllable input Mandarin disyllabic onomatopoeia

{ALIGN(R, PRWD)-L, ALIGN(R, PRWD)-R, ANCHORBR-R(SEG), ANCHORBR-L(SEG) }

Total reduplication

ALIGN(R, PRWD)-RT, ANCHORBR-R(SEG), ANCHORBR-L(SEG) >>ALIGN(R, PRWD)-LT

Partial reduplication

{ALIGN(R, PRWD)-LT, ALIGN(R, PRWD)-RT, ANCHORBR-R(SEG), ANCHORBR-L(SEG) }

Disyllabic with prefix reduplicant

ANCHORBR-L(SEG), ALIGN(R, PRWD)-LT >> ALIGN(R, PRWD)-RT, ANCHORBR-R(SEG)

Disyllabic with suffix reduplicant

ANCHORBR-R(SEG), ALIGN(R, PRWD)-RT>> ANCHORBR-L(SEG), ALIGN(R, PRWD)-LT

3.1.5 Analysis of Disyllabic Input

The phonological structures of disyllabic-input-holding disyllabic Mandarin onomatopoeias are extremely similar to monosyllabic-input-holding ones, although disyllabic-input-holding disyllabic Mandarin onomatopoeias have a totally different input structure and do not undergo reduplication. I will state]\a different constraint and try to figure out the generation of disyllabic-input-holding disyllabic Mandarin onomatopoeias. Mandarin disyllabic onomatopoeias underwent the diachronic change in Chinese so that the segments had to negotiate with others to fulfill the rules of Modern Chinese.

3.1.5.1 AA Original Disyllable

The AA Original Disyllable is a kind of Mandarin disyllabic onomatopoeia that has

totally identical disyllabic input. The AA Original Disyllable patterns are not generated from reduplication. The input form and output form of AA Original disyllables are completely similar. The difference between AA patterns which are generated from total reduplication is that if any AA Mandarin onomatopoeia undergoes total reduplication, any monosyllable in AA must as grammatical Mandarin monosyllabic onomatopoeia. If any monosyllable in AA is not a grammatical Mandarin monosyllabic onomatopoeia, such an AA is belongs to the AA Original Disyllable group. For instance, we find that if we take only one syllable of the AA Original Disyllable, such as /sha/ in / shasha / (Sound of the flow of the currents of wind), it is solely means sands. There is no onomatopoeia content when we see Original Disyllable Mandarin onomatopoeia respectively. That is the reason I will analyze the two kinds of AA Mandarin onomatopoeia in a different ways. One is where the AA Mandarin onomatopoeia has monosyllabic input, while the other one has the original disyllabic input. Since the input form should be completely the same as the output form, there is no need for AA Original Disyllable group to undergo the reduplication process, and I expect that the faithfulness constraint will be the highest ranking constraint.

(32) 'shasha'

/shasha/	IDENT	*PL/COR	*PL/PHAR
a.→shasha		*	
b. ʔaʔa	*W	L	*W

In tableau (32) we know there is conflict between faithfulness constraint and markedness constraint. Candidate b. violates the dominant constraint and be ruled out. Candidate a. is the optimal candidate since it violates the lower-ranking constraint and

the grammatical AA Original Disyllable can be chosen. The constraint ranking of AA Original Disyllable Mandarin onomatopoeia—IDENT >> *PL/COR >> *PL/PHAR

3.1.5.2 Sound combination in AB Mandarin onomatopoeia

In this category, because of the diachronic derivation from early Modern Chinese to Modern Chinese, I will take early Modern Chinese segments as the input and Modern Chinese segments as the output. Take 'hajiu' (sound of sneezing) as an example, the second syllable was 'ziu' in early Modern times. The reason why /z/ derived into /j/ is due to the following high vowel /i/ (or /u/). Hence I would like to set IDENT and AGREEMENT to examine about 'hajiow'.

(33) 'hajiu'

/haziu/	AGREE [+high]	IDENT
a.→ hajiu		*
b. haziu	*W	L

Due to the [+high] feature of /i/, the adjacent onset has to agree with its [+high] feature, and then the AGREE[+high] becomes the high ranking constraint. Candidate b. 'haziu''s /z/ and /i/ do not agree their feature with each other so that it is ruled out by AGREE [+high].

In this category, there is a different style of AB sound combination onomatopoeia whose dominant constraint is faithfulness constraint rather than markedness ones illustrated in tableau (34). Due to the identical relation between input and output form, the faithfulness constraints are the high-ranking constraints.

(34) 'gudu'

/gudu/	IDENT	*PL/COR	*PL/PHAR
a. gudu		*	
b. guʔu	*W	L	*W

The input form of AB Stop + Stop Mandarin onomatopoeia does not undergo reduplication and there is no fixed segmentism, either. The Faithfulness constraint is dominant in AB Stop +Stop Mandarin onomatopoeia generation. Its constraint ranking is IDENT >> *PL/COR >> *PL/PHAR.

3.1.6 Summary

In Mandarin disyllabic onomatopoeia, there are two major categories. One is a disyllabic pattern with monosyllabic input; the other is a disyllabic pattern with disyllabic input, since the Mandarin disyllabic onomatopoeia with monosyllabic input always undergoes a process of reduplication, which is main point in this thesis. Mandarin disyllabic nonomatopoeia derived from disyllabic input is not the focus in this dissertation and I will not provide any more detailed analysis and discussion on it. When Mandarin disyllabic onomatopoeia with monosyllabic input generate, it will undergo two processes of reduplication, total and partial reduplication. Therefore there are two cophonologies at the higher generation level. In the sub-level of Mandarin disyllabic onomatopoeia, in which follows partial reduplication in that there are two cophonologies depending on the size of the reduplicant. These constraint rankings assure that the optimal Mandarin disyllabic onomatopoeia will be chosen.

3.2 Mandarin Trisyllabic Onomatopoeia

3.2.1 Some Background Information

Trisyllabic Mandarin onomatopoeia occur relatively less in onomatopoeia category[5] compared with disyllabic and quadrisyllabic onomatopoeia in Mandarin Chinese, because the preference of Modern Chinese lies in favor of the disyllable. However, the phonological structure and the generation process of trisyllabic onomatopoeia provide a strengthened viewpoint on the derivation of Mandarin onomatopoeia. The function of Mandarin trisyllabic onomatopoeia is to intensify and rich the sound than disyllabic onomatopoeia. The way in which Mandarin trisyllabic onomatopoeia generates is discussed in Section 3.2. The close relation between Mandarin disyllabic and trisyllabic onomatopoeia is plausible and the proof will also be given in this section.

The rest of this chapter is organized as follows. Section 3.2.2 provides an overview of Mandarin trisyllabic onomatopoeia and its phonological character. Section 3.2.3 will show the input claim of Mandarin trisyllabic onomatopoeia. Section 3.2.4 will propose constraints for the generation of Mandarin trisyllabic onomatopoeia. Section 3.2.5 will provide a discussion of Mandarin trisyllabic onomatopoeia with suffixes. In addition, Section 3.2.6 will begin an analysis of how prefix-contained Mandarin trisyllabic onomatopoeias are generated. Section 3.2.7 gives a summary.

3.2.2 The description of the reduplication data of Mandarin trisyllabic onomatopoeia

There are two categories of Mandarin trisyllabic onomatopoeia in Mandarin onomatopoeia— ABB and AAB patterns will be discussed. The reduplication data of

[5] In Li's investigation, trisyllabic onomatopoeia occupies 14% of the whole Mandarin onomatopoeia inventory.

both groups will be given in Sections3.2.2.1 and 3.2.2.2.

3.2.2.1 ABB Mandarin onomatopoeia

In Mandarin trisyllabic onomatopoeia, the ABB pattern is the largest group[6] (Li 2007: 115). The formation of Mandarin onomatopoeia is identical to Mandarin adjective reduplication (Chiang, 1992). The ABB pattern is a common pattern in Mandarin adjectives, such as 'liang jing jing' (very shining) and 'hei qi qi' (extremely dark, as black as paint). Since the core lexicon, such as adjectives, and peripheral lexicon such as onomatopoeia share a similar process for derivation. However, the ABB Mandarin onomatopoeias are generated from the AB pattern with a syllable-sized suffix. This reduplication manifests that there is cophonology for the ABB derivation process and I will give an analysis of the process of Mandarin ABB onomatopoeia in Section 3.2.5. The reduplication data of ABB Mandarin onomatopoeia are listed below.

(35) ABB Mandarin onomatopoeia

ABB	Input	English Gloss
pususu(噗簌簌) About 1,370,000 results	pusu	sound of subtle sound fengchuideshalianpususuxiang。 'The breeze blow over the curtain and there are very low sound'
pululu(噗嚕嚕) About 483,000 results	pulu	sound of air leaking/wings flapping pululuyizhentupaopaoshengchuanlai。
palala(啪啦啦) About 1,840,000 results	pala	sound of many things falling shudiaozaidishangpalalaishengxiang。 'The books fall on the floor loudly'

[6] In Li's investigation, there are 48% ABB patterns in Mandarin trisyllabic onomatopoeia.

dilili(滴瀝瀝) About 19,300 results	dili	sound of heavier rain yushengdililiyuxiayuda。 'It is raining heavier and heavier by the sound'
didada(滴答答) About 3,160,000 results	dida	sound of many water falling shuilongtoudidadaloushuilouleyizhengwan。 'The faucet is leaking with sounds'
dinglingling(叮鈴鈴) About 2,320,000 results	dingling	sound of a phone ringing dianhuashengdinglinglingdexiangqilai。 'The phone start ringing'
galala(嘎啦啦) About 461,000 results	gala	sound of something breaking galalayishengtashenshangdetielianduandiaole。 'The fetters on him are broken loudly'
gululu(咕嚕嚕) About 750,000 results	gulu	sound of drinking faster tagululumengheshuilaijieke。 'He drinking a lot to quench his thirst'
gududu(咕嘟嘟) About 306,000 results	gudu	sound of drinling a lot tagududuyikouqihewannabeishui。 'He drink up that glass of water in one time'
kuanglanglang(匡啷啷) About 26,700 results	kuanglang	sound of metal things falling toukuikuanglanglanggunchuquhaoyuan。 'The helmet rolling away loudly'
honglonglong(轟隆隆) About 882,000 results	honglong	sound of thunder honglonglongdeleishengxialewoyitiao。 'I am scared bacuse of the loud thundering'
hululu(呼嚕嚕) About	hulu	sound of loud snoring

243,000 results		wotingjiantahululudehuxisheng。 'I heard his snoring loudly'
sualala(嘩啦啦) About 18,400,000 results	huala	sound of heavier rain hualaladexiaqiwuhouleizhenyule。 'It is a thunder shower with loud sound'
shualala(刷啦啦) About 210,000 results	shuala	sound of a heavier water flow dayushenghaishishualaladechuanjinerduo。 'I cannot stop listen to the sound of heavier raining'

In the table (35) the character of ABB onomatopoeia is that of the identical relation between vowels within three syllables and the highly frequent appearance of /l/ as an onset in the second and the third syllable.

3.2.2.2 AAB Mandarin onomatopoeia

The AAB pattern is the relatively small group in Mandarin trisyllabic onomatopoeia while has its high frequency and special character. In addition to its total reduplication with a syllable-sized prefix, there is cophonology for AAB Mandarin onomatopoeia derivation. I will discuss the derivation of Mandarin ABB onomatopoeia in 3.2.5. The AAB reduplication data are given next.

(36) ABB Mandarin onomatopoeia

AAB	Input	English Gloss
dididi(滴滴答) About 3,050,000 results	dida	sound of ticking tingjianshizhongdididadeshengyinlingrenjinzhang。 'It make me nervous when I heard the sound of

		ticking’
tidida(踢踢他) About 310,000 results	dida	sound of kicking zaitididadeqingkuaiwubushengzhongmanwu。 ‘Dance in the sound of kicking slowly’
dingdingdang(叮叮噹) About 8,620,000 results	dingdang	sound of a bell ringing shengdanjiejiaotangchuanchudingdingdangdezhongsheng。‘There are bell ringing in the church on Christmas day’
dingdingdong(叮叮咚) About 15,800,000 results	dingdong	sound of a bell ringing/music wotingjianloushangchuanlaidingdingdongdeqinsheng。 ‘I heard the sounds of piano come from upper stair’
pipipa(劈劈啪) About 1,060,000 results	pipa	sound of cracking huolulidechaihuoshaodepipipaxiang。 ‘There are sounds of firing firewoods in the fire place’

Not only the unmarked vowel /i/ shows at the first and the second syllable in Table (36), AAB onomatopoeia has the same onset structure also the need to be noticed.

3.2.3 The input claim of Mandarin trisyllabic onomatopoeia

In Mandarin adjective reduplication, disyllabic ones can be extended into a trisyllabic pattern. Mandarin tisyllabic onomatopoeias also follow this process, hence the AB undergoes a total reduplication process with syllable-sized reduplicants and become ABB or AAB.

Since there is a limited number of Mandarin trisyllabic onomatopoeia, the statement that not all AB Mandarin onomatopoeia will be input of ABB and AAB patterns

should be noted here. Only certain patterns of AB Mandarin onomatopoeia—those in the Consonant + /l/ group such as ‘pala’, ‘dingling’ (sound of a bell ringing) and those in the Stop+stop group such as ‘gugu’ (sound of drinking) will undergo the cophonolofy for Trisyllabic reduplication with Suffix and derivate grammatical ABB Mandarin onomatopoeia. At the same time, only those Mandarin AB onomatopoeia in the Same Onset Collocation group such as ‘dida’, ‘pingpang’ (sound of small and hollow things crashing) and obstruent +affricate/fricative patterns such as ‘guji’ (sound of whispering) can undergo the chponology for Trisyllabic reduplication with Prefix and become AAB Mandarin onomatopoeia. Other Mandarin disyllabic onomatopoeia groups such as alveo-palatal fricative patterns are not possible input for Mandarin trisyllabic onomatopoeia reduplication.

3.2.4 Constraints for Mandarin trisyllabic onomatopoeia reduplication

The Mandarin trisyllabic onomatopoeia reduplication concerns different morphological construction from disyllabic ones. The constraints ALIGN (RED, PRWD)-LEFT and ALIGN (RED, PRWD)-RIGHT on Generalized Alignment mentioned in Section 3.1 also play a very important role in the generation of Mandarin tirsyllabic onomatopoeia. Those two alignment constraints ensure that a certain edge of the reduplicant will align to a certain edge of the output to form the optimal candidate. The optimal structure of Mandarin trisyllabic reduplication needs not only alignment constraint. The anchoring and adjacency tendencies in trisyllabic patterns are so obvious that anchoring and adjacency constraints are necessary. However, because of the various morphological constructions among Mandarin disyllabic and trisyllabic onomatopoeia, I would like to set Anchoring and Adjacency constraints with different regulations.

(37) ANCHORBR-LEFT (σ) (McCarthy & Prince 1993a, 1995a, b)

Assign one violation mark for every syllable at left edge of base that does not correspond to the syllable at the left edge of the reduplicant.

(38) ANCHORBR-RIGHT (σ) (McCarthy & Prince 1993a, 1995a, b)

Assign one violation mark for every syllable at right edge of base that does not correspond to the syllable at the right edge of the reduplicant.

(39) ADJACENCYBR-BY-FOOT (Lunden, 2004)

Assign one violation mark for every foot in the reduplicant that is not next to its correspondent base.

The anchoring constraints propose that the reduplicant in Mandarin trisyllabic onomatopoeia should anchor to a certain syllable edge of the output. At the same time, the size and the location are both motivation in the locality generalization when Mandarin disyllabic onomatopoeia generate trisyllabic ones.

3.2.5 Analysis of ABB Mandarin onomatopoeia

3.2.5.1 Consonant+/l/ and Stop+stop groups

The optimal structure I would like to analyze here is of the ABB pattern which is generated from certain categories of AB Mandarin onomatopoeia. The possible input forms of ABB Mandarin onomatopoeia come from the Consonant+/l/ and Stop+stop groups. The constraint ranking for ABB Mandarin onomatopoeia is—

AD-BY-σ, ANCHORBR-R(σ), ALIGN(R, PRWD)-RT>> ANCHORBR-L(σ), ALIGN(R, PRWD)-LT, AD-BY-FOOT.

I will start with the Consonant+/l/ ones. First, the ‘pala’ will be an example.

(40) 'palala' (Sound of many things falling)

Trisyllabic reduplication with suffix	/RED- pala/	AD-BY-σ	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	ALIGN(R, PRWD)-LT	AD-BY-FT
→ a.	palala				*	**	
b.	palapala	*W	**W				L
c.	papala		**W	*W	L	L	
d.	palapa	*W		*W	L	**	

In Tableau (40), Candidate b. violates the high-ranking constraints ALIGN(R, PRWD)-RT and AD-BY-σ since the reduplicant 'pala' is not aligned to the output right edge and foot-sized. Because the reduplicant 'pa' is aligned to the left edge of the output and reduplicant and base's right edge syllable is no correspondent, Candidate c. is also ruled out. Candidate d. aligns the reduplicant 'pa' to the right edge of the output, however, it is not correspondent to the right edge of the base syllable , so candidate d. is ruled out, also. Candidate a. does not violate the dominant constraints AD-BY-σ, ALIGN(R, PRWD)-RT and ANCHORBR-R(σ) and becomes the optimal candidate.

Stop+stop group is the fourth group and will be analyzed below. I will take 'gudu' as an instance.

(41) 'gududu' (Sound of drinking a lot)

Trisyllabic reduplication with suffix	/RED-gudu/	AD-BY-σ	ALIGN(R, PRWD)-RT	ANCHOR BR-R (σ)	ANCHOR BR-L (σ)	ALIGN(R, PRWD)-LT	AD-BY-FT
− a.	gududu				*	**	
b.	gudugudu	*W	**W				L
c.	gugudu		**W	*W	L	L	
d.	gudugu	*W		*W	L	**	

In Tableau (41), Candidate b. violates the high-ranking constraints ALIGN(R, PRWD)-RT and AD-BY-σ since the reduplicant 'gudu' is not aligned to the right edge of the output and is foot-sized. Because reduplicant 'gu' is aligned to the left edge of the output so that reduplicant and base's right edge is no correspondent, Candidate c. is ruled out also. Candidate d. aligns the reduplicant 'gu' to the right edge of the output, however, it is not correspondent to the right edge of the base, so Candidate d. is ruled out, also. Candidate a. does not violate the dominant constraints AD-BY-σ, ALIGN(R, PRWD)-RT and ANCHORBR-R (σ) and becomes the optimal candidate.

3.2.5.2 Other AB patterns input forms and its ABB generation prediction

AB Mandarin onomatopoeia with the Same Onset Collocation, One Onset is Alveo-palatal Fricative and Obstruent +affricate/fricative structures are cannot become an input form of ABB Mandarin onomatopoeia so far. However, it is possible that they will generate ABB patterns in the future and some AB Mandarin onomatopoeia derivates ABB patterns in question. Therefore I will discuss and predict that the AB Mandarin onomatopoeias belong to Same Onset Collocation, One Onset

is Alveo-palatal Fricative and Obstruent +affricate/fricative groups and expect their ABB patterns generation. I will begin with the Same Onset Collocation group and take ‘dida’ as an instance.

(42) ‘didada’ (Sound of many water falling)

Trisyllabic reduplication with suffix	/RED-dida/	AD-BY-σ	ALIGN(R, PRWD)-RT	ANCHOR BR-R (σ)	ANCHORBR-L (σ)	ALIGN(R, PRWD)-LT	AD-BY-FT
- a.	dida<u>da</u>				*	**	
b.	<u>dida</u>dida	*W	**W				L
c.	<u>di</u>dida		**W	*W	L	L	
d.	dida<u>di</u>	*W		*W	L	**	

In Tableau (42), Candidate b. violates the high-ranking constraints ALIGN(R, PRWD)-RT and AD-BY-σ since the reduplicant ‘dida’ is not aligned to the right edge of the output and is foot-sized. Because the reduplicant ‘di’ is aligned to the left edge of the output so that reduplicant and base’s right edge is no correspondent, Candidate c. is ruled out, also. Candidate d. aligns reduplicant ‘di’ to the right edge of output, however, it is not correspondent to the right edge of the base. So candidate d. is ruled out, also. Candidate a. does not violate the dominant constraints AD-BY-σ, ALIGN(R, PRWD)-RT and ANCHORBR-R (σ) and becomes the optimal candidate.

The predicted AB pattern I will examine is from one onset is alveo-palatal fricative category. ‘hajiu’ will be the example.

(43) 'hajiujiu'

Trisyllabic reduplication with suffix	/RED- hajiu/	AD-BY-σ	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	ANCHOR BR-L(σ)	AD-BY-FT	ALIGN(R, PRWD)-LT
→ a.	hajiujiu				*		**
b.	hajiuhajiu	*W	**W			L	
c.	hahajiu		**W	*W	L		L
d.	hajiuha	*W		*W	L		**

In Tableau (43), Candidate b. violates the high-ranking constraints ALIGN(R, PRWD)-R and AD-BY-σ since the reduplicant 'hajiu' is not aligned to the output right edge and is foot-sized. Because the reduplicant 'ha' is aligned to the left edge of the output so that reduplicant and base's right edge is no correspondent, Candidate c. is ruled out also. Candidate d. aligns reduplicant 'ha' to the right edge of output, although it not correspondent to the right edge of the base, so Candidate d. is ruled out also. Candidate a. does not violate the dominant constraints AD-BY-σ, ALIGN(R, PRWD)-R and ANCHORBR-R (σ) and becomes the optimal candidate.

Finally, 'kuji' in the Obstruent +affricate/fricative group shows the predicted ABB reduplication process next.

(44) 'gujiji'

Trisyllabic reduplication with suffix	/RED- guji/	AD-BY-σ	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	ANCHOR BR-L(σ)	AD-BY-FT	ALIGN(R, PRWD)-LT

→	a.	gujiji				*		**
	b.	gujiguji	*W	**W			L	
	c.	guguji		**W	*W	L		L
	d.	gujigu	*W		*W	L		**

In Tableau (44), Candidate b. violates the high-ranking constraints ALIGN(R, PRWD)-RT and AD-BY-σ since reduplicant 'guji' is not aligned to the output right edge and foot-sized. Because reduplicant 'gu' is aligned to the left edge of the output so that the reduplicant and base's right edge is no correspondent, Candidate c. is also ruled out. Candidate d. aligns reduplicant 'gu' to the right edge of output, although it not correspondent to the right edge of the base. So Candidate d. is ruled out as well. Candidate a. does not violate the dominant constraints AD-BY-σ, ALIGN(R, PRWD)-RT and ANCHORBR-R (σ) and becomes the optimal candidate.

3.2.5.3 Ranking argument and Hasse diagram of ABB Mandarin onomatopoeia

AD-BY-σ>> AD-BY-FOOT

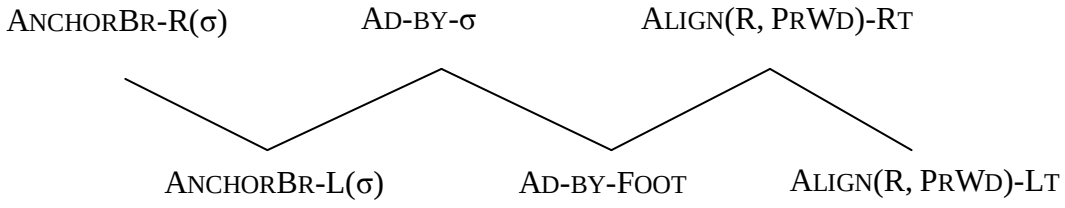
ALIGN(R, PRWD)-RT>> AD-BY-FOOT

AD-BY-σ>> ANCHORBR-L(σ)

ANCHORBR-R(σ)>> ANCHORBR-L(σ)

ALIGN(R, PRWD)-RT>> ALIGN(R, PRWD)-LT

(45) Hasse diagram of ABB Mandarin



3.2.6 Analysis of AAB Mandarin onomatopoeia

3.2.6.1 Same Onset Collocation group

The AAB pattern undergoes Mandarin trisyllabic onomatopoeia generation with syllable-sized prefix reduplication. The AB mandarin onomatopoeia are the input of the AAB ones, however, they come from a certain category— the Same Onset Collocation group. I will give an analysis and predictions for other AB patterns which cannot generate grammatical AAB Mandarin onomatopoeia until now.

The example I will examine in the Same onset collocation group is ‘dida’.

(46) ‘dididа’ (sound of ticking, sound of raining)

Trisyllabic reduplication with prefix	/RED-dida/	AD-BY-σ	ANCHOR BR-L(σ)	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	AD-BY-FT
→ a.	dididа				**	*	
b.	dididadida	*W		**W		*	L
c.	didadata		*W	**W	L	L	
d.	didadati	*W		**W	L	*	
e.	tadida	*W	*W		**	L	

In the tableau (46), since the reduplicant ‘di’ corresponds to the left edge of the base and aligns to the left edge of output, Candidate a. does not violate the high-ranking constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-LT so it is the optimal candidate. Candidate b.’s reduplicant ‘dida’ is aligned to the left edge of the output, however, it is foot-sized and thus ruled out. The optimal structure here is the AAB pattern but Candidate c. violates the dominant constraints such as ANCHORBR-L(σ) and ALIGN(R, PRWD)-L. Hence its reduplicant ‘da’ is corresponded to the right edge of base and be

aligned to the right edge of the output form so that Candidate c. is ruled out. Candidate d.'s reduplicant 'di' does not violate the high-ranking constraint ANCHORBR-L(σ), although it is aligned to the right edge of the output and is thus ruled out. Finally, the reduplicant 'da' in Candidate e. is correspondent with the right edge of the base and not adjacent to its base it is ruled out since it violates AD-BY-σ and ANCHORBR-L(σ).

3.2.6.2 Other AB patterns input forms and their AAB generation prediction

The statement that the less number of Mandarin AAB onomatopoeia was proposed at section 3.2.2.2, the generation of Mandarin AAB onomatopoeia can be predicted as other Mandarin AB onomatopoeia that has AAB patterns. Mandarin AB onomatopoeias share the similar derivational process when they undergo the trisyllabic reduplication. I would like to give the prediction of future Mandarin AAB onomatopoeia reduplication below.

The first predicted AB Mandarin onomatopoeia that will be checked is Consonant+/l/ ones and the example will be of 'pala'.

(47) 'papala'

Trisyllabic reduplication with prefix		/RED-pala/	AD-BY-σ	ANCHOR BR-L(σ)	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	AD-BY-FT
→	a.	papala				**	*	
	b.	papala	*W		**W		*	L
	c.	palala		*W	**W	L	L	
	d.	palapa	*W		**W	L	*	
	e.	lapala	*W	*W		**	L	

In Tableau (47), since the reduplicant ‘pa’ corresponds to the left edge of the base and aligns to the left edge of output, Candidate a. does not violate the high-ranking constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-LT and so it becomes the optimal candidate. The reduplicant ‘pala’ in Candidate b. is aligned to the left edge of the output form; however, it is foot-sized and is ruled out. The optimal structure here is the AAB pattern but Candidate c. violates dominant constraints such as ANCHORBR-L(σ) and ALIGN(R, PRWD)-L. Hence its reduplicant ‘la’ is correspondent to the right edge of the base and is aligned to the right edge of the output form so that Candidate c. is ruled out. The reduplicant ‘pa’ in Candidate d. does not violate the high-ranking constraint ANCHORBR-L(σ), however, it is aligned to the right edge of the output form and so is ruled out. Finally, the reduplicant ‘la’ in Candidate e. is correspondent with the right edge of the base and is not adjacent to its base it is ruled out since it violates AD-BY-σ and ANCHORBR-L(σ).

The One onset is alveo-palatal fricative category is the second expectation of I would like to manifest. Here I will take ‘hajiu’ as an example.

(48) ‘hahajiu’

Trisyllabic reduplication with prefix	/RED- hajiu/	AD-BY-σ	ANCHOR BR-L(σ)	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	AD-BY-FT
→ a.	<u>ha</u>hajiu				**	*	
b.	ha<u>hajiu</u>	*W		**W		*	L
c.	hajiu<u>jiu</u>		*W	**W	L	L	
d.	hajiu<u>ha</u>	*W		**W	L	*	
e.	<u>jiu</u>hajiu	*W	*W		**	L	

In Tableau (48), since the reduplicant ‘ha’ corresponds to the left edge of the base and is aligned to the left edge of the output, Candidate a. does not violate the high-ranking constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-LT so it becomes the optimal candidate. The reduplicant ‘hajiu’ in Candidate b. is aligned to the left edge of the output form; however, it is foot-sized and so is ruled out. The optimal structure here is the AAB pattern but Candidate c. violates the dominant constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-L. Hence its reduplicant ‘jiu’ is corresponded to the right edge of the base and be aligned to the right edge of the output form so that Candidate c. is ruled out. The reduplicant ‘ha’ in Candidate d. does not violate the high-ranking constraint ANCHORBR-L(σ), however, it is aligned to the right edge of the output form and so is ruled out. Finally, the reduplicant ‘jiu’ in Candidate e. is correspondent with the right edge of the base and is not adjacent to its base, so it is ruled out since it violates AD-BY-σ and ANCHORBR-L(σ).

The third prediction of Mandarin AAB onomatopoeiaI will analyze is Stop+stop ones and ‘gudu’ is the instance will use in tableau (51).

(49) ‘gugudu’

Trisyllabic reduplicition with prefix	/RED-gudu/	AD-BY-σ	ANCHOR BR-L(σ)	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	AD-BY-FT
→ a.	gugudu				**	*	
b.	gudugudu	*W		**W		*	L
c.	gududu		*W	**W	L	L	
d.	gudugu	*W		**W	L	*	
e.	dugudu	*W	*W		**	L	

In Tableau (49), since the reduplicant ‘gu’ corresponds to the left edge of the base and aligns to the left edge of output, Candidate a. does not violate the high-ranking constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-LT so it becomes the optimal candidate. The reduplicant in Candidate b. ‘gudu’ is aligned to form the left edge of the output form, however, it is foot-sized and is ruled out. The optimal structure here is AAB patterns but Candidate c. violates the dominant constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-L. Hence its reduplicant ‘du’ is corresponded to the right edge of the base and is aligned to the right edge of the output form so Candidate c. is ruled out. The reduplicant ‘gu’ in Candidate d. does not violate the high-ranking constraint ANCHORBR-L(σ), however, it is aligned to the right edge of the output form and so is ruled out. Finally, the reduplicant ‘du’ in Candidate e. corresponds with the right edge of base and not adjacent to its base it is ruled out since it violates AD-BY-σ and ANCHORBR-L(σ).

The final expectation I would like to discuss is the Obstruent +affricate/fricative one. Here I take ‘kuji’ as an example.

(50) ‘guguji’

Trisyllable with prefix	/RED-guji/	AD-BY-σ	ANCHORBR-L(σ)	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	ANCHORBR-R(σ)	AD-BY-FT
→ a.	guguji				**	*	
b.	gujiguji	*W		**W		*	L
c.	gujiji		*W	**W	L	L	
d.	gujigu	*W		**W	L	*	
e.	jiguji	*W	*W		**	L	

In the tableau (50), since the reduplicant ‘gu’ corresponds to the left edge of the base

and aligns to the left edge of output, Candidate a. does not violate the high-ranking constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-LT so that it is the optimal candidate. The reduplicant 'guji' in Candidate b. is aligned to output form's left edge, however, it is foot-sized and it is thus ruled out. The optimal structure here is AAB patterns but Candidate c. violates the dominant constraints ANCHORBR-L(σ) and ALIGN(R, PRWD)-L. Hence its reduplicant 'ji' is corresponded to the right edge of base and is aligned to the right edge of the output form so that Candidate c. is ruled out. The reduplicant 'gu' in Candidate d. does not violate the high-ranking constraint ANCHORBR-L(σ), however, it is aligned to the right edge of the output form and so is ruled out. Finally, although reduplicant 'ji' in Candidate e. correspondent with the right edge of the base and is not adjacent to its base, it is ruled out since it violates AD-BY-σ and ANCHORBR-L(σ).

3.2.6.3 Ranking argument and Hasse diagram of AAB Mandarin onomatopoeia

AD-BY-σ>> AD-BY-FOOT

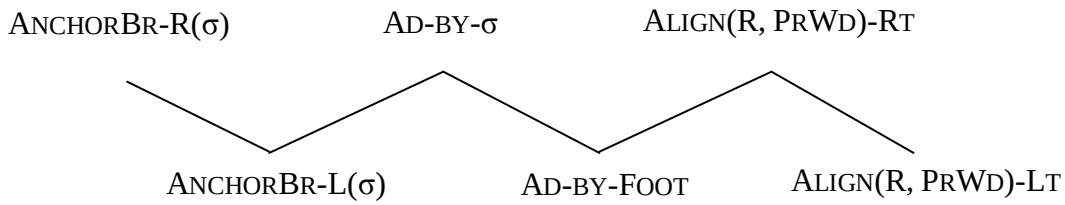
ALIGN(R, PRWD)-RT>> AD-BY-FOOT

AD-BY-σ>> ANCHORBR-L(σ)

ANCHORBR-R(σ)>> ANCHORBR-L(σ)

ALIGN(R, PRWD)-RT>> ALIGN(R, PRWD)-LT

(51) Hasse diagram of AAB Mandarin onomatopoeia



3.2.7 Summary

In the analysis of ABB and AAB trisyllabic Mandarin onomatopoeia, we can see that

the interaction constraints and various cophonologies will generate different output forms when their input forms are come from the same AB Mandarin onomatopoeia categories. The cophonology of Mandarin trisyllabic onomatopoeia is shown in the table in (52).

(52) Cophonology in Mandarin trisyllabic onomatopoeia

Master Ranking for Mandarin Trisyllabic Onomatopoeia

{ ANCHORBR-L(σ), ANCHORBR-R(σ), ALIGN(R, PRWD)-LT, ALIGN(R, PRWD)-RT}

Cophonology A	Cophonology B
Trisyllablic reduplication with prefix	Trisyllabic reduplication with suffix
ANCHORBR-L(σ), ALIGN(R, PRWD)-L>> ANCHORBR-R(σ), ALIGN(R, PRWD)-R	ANCHORBR-R(σ), ALIGN(R, PRWD)-R>> ANCHORBR-L(σ), ALIGN(R, PRWD)-L

In ABB Mandarin onomatopoeia, the reduplicant is shown as suffix and the direction of the reduplication is right-ward. Therefore in Cophonology B, the process of the reduplication in ABB with suffix ANCHORBR-R(σ) and ALIGN(R, PRWD)-RT are high-ranking constraints to choose the optimal candidate. When discussing AAB Mandarin onomatopoeia, there is different Cophonology A for Trisyllabic reduplication with prefix because the reduplicant as prefix in AAB Mandarin onomatopoeia generation and the reduplication direction is left-ward. Hence ANCHORBR-L(σ) and ALIGN(R, PRWD)-L are dominant constraints and choose the optimal candidate. The constraint ranking for ABB Mandarin onomatopoeia we analyzed above may only be suitable for AB Mandarin onomatopoeia which comes from, Stop+stop and Consonant + /l/ groups. At the same time, Same onset collocation AB patterns are the only input form which will generate AAB quadrisyllabic onomatopoeia. Hence ABB and AAB Mandarin onomatopoeia hold

closed constraint ranking and various cophonologies. Because of the different morphological construction in the process of the generation of Mandarin trisyllabic onomatopoeia the AB input forms undergo total reduplication while ABB patterns with suffix reduplicant and AAB patterns with prefix reduplicant. Therefore there are two cophonoogies constraints ranking when Mandarin trisyllabic onomatopoeia derivate. After all, the ranking of alignment constraints, adjacency constraints and anchoring constraints in the various cophonologies generate Mandarin trisyllabic onomatopoeia and provide an explanation of their different phonological structures at the same time. The diversity of the structure of Mandarin onomatopoeia is not random but has its own principles.

CHAPTER 4

MANDARIN QUADRISYLLABIC ONOMATOPOEIA

4.1 Mandarin Quadrisyllabic Onomatopoeia

4.1.1. Some background information

As earlier mentioned in Chapter 3, there are four groups of phonological structures in Mandarin onomatopoeia— monosyllable, disyllable, trisyllable and quadrisyllable. Quadrisyllabic patterns comprise the second largest group in Mandarin onomatopoeia, after the disyllabic ones (Li 2007: 114-115)[7]. There are three main patterns in Mandarin quadrisyllabic onomatopoeia— ABAB, AABB and AlBl structures. ABAB and AABB patterns comprise nearly 40% of Mandarin quadrisyllabic onomatopoeia respectively. When compared with ABAB and AABB patterns, AlBl Mandarin quadrisyllabic onomatopoeia hold the fixed segmentism /l/ in generation process so there are relatively uncommon structures. Hence the generation ABAB and AABB undergo is that of a total reduplication process and the AlBl undergoes a partial reduplication one.

The rest of this chapter is organized as follows. Section 4.2 provides an overview of Mandarin quadrisyllabic onomatopoeia and manifests its phonological character. Section 4.3 will show the input claim explain the input information of Mandarin quadrisyllabic onomatopoeia. Section 4.4 will propose constraints for Mandarin quadrisyllabic generation. Section 4.5 gives an OT analysis of Mandarin quadrisyllabic onomatopoeia with foot-sized reduplication. Section 4.6 begins an analysis of how syllable-sized reduplication generates Mandarin quadrisyllabic onomatopoeia. Section 4.7 declares the generation of Mandarin quadrisyllabic

[7] In Li's investigation, disyllabic patterns comprise 38% of Mandarin onomatopoeia which is the largest group. The second largest category is of quadrisyllabic ones, which comprise 28% of Mandarin onomatopoeia.

onomatopoeia with fixed segementism. Section 4.8 provides the master ranking for Mandarin quadrisyllabic onomatopoeia under a cophonology approach. Finally, Section 4.9 gives a summary.

4.2. The description of reduplication data of Mandarin quadrisyllabic onomatopoeia

There are three categories in Mandarin quadrisyllabic onomatopoeia— ABAB, AABB and AlBl to be discussed. The reduplication data of these three groups will be given in Sections 4.2.1, 4.2.2 and 4.2.3.

4.2.1. ABAB Mandarin onomatopoeia

In the Mandarin quadrisyllabic onomatopoeias, ABAB patterns occur a few more frequently than AABB ones[8] (Li 2007:115). Chiang (1992) claimed that the process of the formation of Chinese onomatopoeia is identical to that of the core lexicons. In the Mandarin core lexicon, when disyllabic verbs undergo reduplication due to a meaning reduction, the ABAB pattern will be the surface form. For instance, a Mandarin verb such as ‘zhuyi’ (pay attention) applies reduplication for meaning reduction when it becomes ‘zhuyizhuyi’ (pay a little attention). However, there is a major difference between Mandarin onomatopoeia and Mandarin verb. After reduplication, sounds in Mandarin onomatopoeia are intensified while the meaning of the verb is lightened. The reduplicant size for ABAB Mandarin onomatopoeia generation is foot-sized and it shows a different cophonology from other Mandarin quarisyllabic onomatopoeia such as AABB and AlBl which have syllable-sized reduplicants. The reduplication data of ABAB Mandarin onomatopoeia are listed

[8] In Li’s investigation, ABAB patterns comprise 39% of Mandarin quadrisyllabic onomatopoeia while AABB ones 36%.

below.

(53) ABAB Pattern Mandarin onomatopoeia

ABAB	Input	English Gloss
padapada (啪搭啪搭) About 170,000 results	pada	sound of flapping continually zoulangshangchuanlaipadapadadejiaobusheng。‘There are sound of walking come from the hall way’
palapala(啪啦啪啦) About 548,000 results	pala	sound of flapping or falling continually fanglichuanlaipalapaladefanshusheng。‘There are sounds of leafing through books in the room’
pingpangpingpang(乒乓乒乓) About 49,200 results	pingpa	sound of things crashing together continually loushangchuanlaipingpangpingpangdezhuangjisheng。‘There are sounds of crashing come from upper stair’
pipapipa(劈啪劈啪) About 119,000 results	pipa	sound of cracking continually dongtiantuomaoyishichangfachupipapipadeshengyin。‘When take off sweater there will be sounds of cracking at winter’
didadida(滴答滴答) About 2,940,000 results	dida	sound of water dropping/ tickingcontinually yubutingdexia，chuangwaiyipiandidadidasheng。‘It still raining and there are sound of raining out of the window’
dingdangdingdang(叮噹叮噹) About 167,000 results	dingdang	sound of bells ringing continually tingdaoxiakezhongshengdingdangdingdang。‘I heard the bell ringing and the class is over’
dingdongdingdong(叮	dingdong	sound of a door bell ringing continually

咚叮咚) About 4,650,000 results		menlingdingdongdingdongjijidexiangqi。‘The door bell start ringing’
dinglingdingling(叮鈴叮鈴) About 4,570,000 result	dingling	sound of bell ringing continually dinglingdingling，dianhualingshengdazuo。 ‘The phone ringing so loud’
danglangdanglang(噹啷噹啷) About 13,200 result	danglang	sound of metal crashing together tazoudongshishenshangdetieliandanglangdanglangdexiang。 ‘When he moving the fetters on him sounds’
donglongdonglong(咚隆咚隆) About 97,500 results	donglong	sound of many thing rolling down yikeshitoudonglongdonglongcongshanshangunxiaqu。 ‘There is a stone rolling down very loud’
gazhigazhi(嘎吱嘎吱) About 1,460,000 results	gazhi	sound of chewing loud continually tagazhigazhidejiaozhehetao。 ‘He chewing up walnuts loudly’
gudugudu(咕嘟咕嘟) About 1,600,000 results	gudu	sound of drinking loud continually tagudugududebashuiwangzuiliguan。 ‘He gulp water loudly’
honglonghonglong(轟隆轟隆) About 337,000 results	honglong	sound of loud thundering continually honglonghonglongdeleishengxiangqi，yaoxiadayule。 ‘It start thundering very loud and will raining soon’
hualahuala(嘩啦嘩啦) About 2,120,000 results	huala	sound of heavy rain falling continually tingdaoyushilihualahualadeshuisheng。‘I heard that there is someone take shower in the bathroom,’

gujiguji(咕唧咕唧) About 1,360,000 results	guji	sound of whispering continually tamenkaishigujigujideshuoqiaoqiaohua。‘They start whispering in low volume ’
gulugulu(咕嚕咕嚕) About 1,910,000 results	gulu	sound of stomach rumble loudly duziedegulugulujiao。‘My stomach rumbling with the sound’
gudonggudong(咕咚咕咚) About 1,810,000 results	gudong	sound of many things falling down gudonggudong，shoutoudeshuiguocongshushangdiaoxialai。 ‘Ripe fruits are falling on the ground with sounds’
huluhulu(呼嚕呼嚕) About 545,000 results	hulu	sound of snoring continually tingjian woshizhongchuanchu ciqibiluohuluhuludedahusheng。 ‘There are sounds of snoring comes from bedroom’
sualasuala(刷啦刷啦)	suala	sound of something passing fast continually fengchuideshuyeyizhenshualashualaxiang。 ‘Wind blow over leaves and there are sounds occur’

In Table (53) we saw that all ABAB Mandarin onomatopoeias are generated from AB Mandarin onomatopoeia. Basically, all AB Mandarin onomatopoeia listed in table (13) at Chapter 3 can be reduplicated and become ABAB Mandarin onomatopoeia. Hence we know ABAB pattern is the most frequent structure for Mandarin quadrisyllabic onomatopoeia. Moreover, all of the reduplicants are foot-sized and undergo total reduplication. Finally, the direction of reduplication will be discussed later analysis and I will give some reasonable explanation.

4.2.2. AABB Mandarin onomatopoeia

AABB patterns play a very important role in Mandarin quadrisyllabic onomatopoeia since they provide another vivid way to strengthen sounds. Similar to ABAB patterns, AABB structures are also very common in Mandarin core lexicons. There are many differences between ABAB and AABB patterns— ABAB styles are common in Mandarin verb reduplication, AABB, however are general Mandarin adjective reduplication. For instance, 'piaoliang' (beautiful) undergoes reduplication and becomes 'piaopiaoliangliang' (very beautiful). After the process of reduplication Mandarin disyllabic extends its length and strengthens the meaning at the same time. AABB Mandarin onomatopoeia undergoes reduplication with syllable-sized reduplicants and represents the various cophonologies among ABAB and AABB Mandarin onomatopoeia generation. The reduplication data of AABB Mandarin onomatopoeia will give in the table below.

(54) AABB Pattern Mandarin Onomatopoeia

AABB	Input	English Gloss
dididada(滴滴答答) About 2,870,000 results	dida	sound of a lot of water dropping at the same time yudididadaxiagebuting。 'It is keep raining and wont stop'
dingdingdangdang(叮叮噹噹) About 884,000 results	dingdang	sound of many bells ringing at the same time meijiadiandouguashangdingdingdangdang defengling。'Every store on the street hang up wing bells which will ringing'
dingdingdongdong(叮叮咚	dingdong	sound of many bells ringing at the same

咚) About 1,520,000 results		time/music playing wotingjiandingdingdongdongdeqinsheng。'I heard the sound of playing piano'
jijizhazha(嘰嘰喳喳) About 606,000 results	jizha	sound of many people chatting at the same time erbiandoushijijizhazhadechaonaosheng。'There are very loud noise of chatting around me'
jijigugu(嘰嘰咕咕) About 1,400,000 results	jigu	sound of many people whispering at the same time dajiajijigugudetaolungairuhefayan。'Everybody discuss together to decide how to make a statement in low volume'
bibiboubou(嗶嗶啵啵) About 591,000 results	bibou	sound of cracking occurring at the same time baoyumihuashihuiyoubibibouboudesheng yin。'When popping popcorn there are sound of popping'
pipipapa(劈劈啪啪) About 3,610,000 results	pipa	sound of heavy firing occur at the same time zenmehuiyouyizhenpipipapadebianpaoshe ng。'Why there are loud sound of fireworks?'
pingpingpangpang(乒乒乓乓) About 2,170,000 results	pingpang	sound of many things crashing together tatingdaowaimianchuanlaipingpingpangpa

		ngdezhuangjisheng。‘He heard there are loud crashing sound outside’
gugududu(咕咕嘟嘟) About 125,000 results	gudu	sound of boiling water hulideshuikukududuzhimaopao。‘Water in the pot boiled with the sound ’

In Table (54) we can see that all AABB Mandarin onomatopoeias are generated from certain AB ones such as the Same onset collocation group. The input forms of AABB Mandarin onomatopoeia are more limited than ABAB ones. In addition, the reduplicant size of AABB patterns is syllable-sized rather than foot-sized. Further, all reduplicants are close to their base. Finally, the direction of reduplication will be the main point in later analysis.

4.2.3. AlBl Mandarin onomatopoeia

In Mandarin quadrisyllabic onomatopoeia, there is a special subcategory ‘AlBl’. Compare with other pattern’s onset structure such as Mandarin ABAB and AABB onomatopoeia, AlBl patterns’ onset of second and fourth syllable is /l/ are stand out. The /l/ is the fixed segmentism in the reduplication process and it is the most special character AlBl patterns different from ABAB and AABB Mandarin onomatopoeia. While ABAB and AABB Mandarin onomatopoeia undergo a total reduplication, AlBl ones undergo partial reduplication with fixed segmentism /l/. However, because of the syllable-sized reduplicant in AlBl Mandarin onomatopoeia generation, AlBl patterns share a closed cophonoloy with AABB. The reduplication data of AlBl Mandarin is shown below.

(55) AlBl Pattern Mandarin Onomatopoeia

AlBl	Input	English Gloss
dilidala(滴哩答啦) About 2,650 results	dida	sound of a lot of water falling together yushengdilidalabutingdexiang。'The sound of raining is continuing'
dinglingdanglang(叮鈴噹啷) About 200,000 results	dingdang	sound of many metal things falling together chuiguoyizhenfeng，fenglingdinglingdanglangdexiangqilai。 'After a breeze blew the wind bells ringing'
pinglingpanglang(乒令乓啷) About 7,020 results	pingpang	sound of big things crashing together tingjianpinglingpanglangshuaidongxidejuxiang。'I heard very loud sound of smash things'
pilipala(劈哩啪啦) About 746,000 results	pipa	sound of big firing waimianpilipaladoushibianpaosheng。'There are loud sound of fireworks outside'
jiliguala(嘰哩呱啦) About 609,000 results	jigua	sound of many people talking together youqunrenjiligualadedashengtantian。'There are several people talk very loud'
jiligulu(嘰哩咕嚕) About 1,310,000 results	jigu	sound of many people whispering together tamenjiliguludishengshuolejijuhua。'They talk a while in very low volume'

In Table (55) we can see that the /l/ is always in the onset position of the second and the fourth syllables. In addition, the onset of the first and the third syllable are the same. Moreover, the vowel of the first and the second syllable are the same, and the third and the fourth syllable share the same vowel. The input form of AlBl Mandarin onomatopoeia will be discussed in later analysis.

4.3. The input claim of Mandarin quadrisyllabic onomatopoeia

In the group of Mandarin disyllabic onomatopoeia, there are relatively large numbers of AB ones. Based on my previous study I think that all Mandarin quadrisyllabic onomatopoeias are generated from grammatical AB Mandarin onomatopoeia as input. One reason for this is the phonological structure of Mandarin quadrisyllabic onomatopoeias, which always both duplicate and reiterate their AB style counterparts. The other reason is that the sound of quadrisyllabic Mandarin onomatopoeia is always richer in expression than a disyllabic one. However, not all five categories of AB Mandarin onomatopoeia will undergo reduplication and generate Mandarin quadrisyllabic onomatopoeia.

4.3.1. The input of ABAB and AABB Mandarin onomatopoeia

Check the ABAB and AABB reduplication data given in Tables (54) and (55), I will assume that AB Mandarin onomatopoeia undergo a process of total reduplication and extend into quadrisyllabic ones to intensify the sounds. However, an AB Mandarin onomatopoeia undergoes a different generation and becomes an ABAB or AABB pattern. Almost every AB Mandarin onomatopoeia can undergoes total reduplication with a foot-sized reduplicant and generates ABAB patterns. However, in addition to the specific morphological construction of AABB patterns, only limited groups such as Same Onset Collocation, Sound combination categories of AB Mandarin onomatopoeias extend into AABB ones with syllable sized reduplicants. For instance, ‘pala’ can extend into ‘palapala’ although there is no ‘*papalala’ while ‘dida’ can reduplicate to become ‘didadida ’ and ‘dididada’. The different reduplication process of ABAB and AABB Mandarin onomatopoeia will be illustrated in Sections 4.5 and 4.6.

4.3.2. The input of AABB and AlBl Mandarin onomatopoeia

I will assume that limited groups of AB Mandarin onomatopoeia undergo total and partial reduplication and then generate AABB and AlBl patterns. Three AB Mandarin onomatopoeia groups, Same Onset Collocation, Sound combination patterns can extend into AABB patterns. However, only AB Mandarin onomatopoeia in the Same Onset Collocation category can undergo partial reduplication and generate AlBl Mandarin onomatopoeia. When grammatical AB onomatopoeia inputs undergo partial reduplication and generate AABB Mandarin onomatopoeia, the syllable-sized reduplicant is always adjacent to its base and the reduplication direction is always right-wards. A similar generation process occurs when AB Mandarin onomatopoeia extend into the AlBl pattern. The only difference between the AABB and AlBl patterns is that there are fixed-segments in AlBl Mandarin onomatopoeia so that the markedness constraint will outrank the faithfulness constraint while in AABB ones is in opposite way, i.e. the faithfulness constraint will dominate the markedness constraint.

Take ‘pilipala’ (sound of heavy firing) as an example. The second syllable ‘li’ is reduplicated from the first syllable ‘pi’, while the fourth syllable ‘la’ is reduplicated from the fourth syllable ‘pa’ and the high-ranking markedness constraint drive the output form emerge with fixed-segmentism. There is further evidence that AlBl Mandarin onomatopoeia are generated from certain AB ones sharing with AABB patterns, if I take ‘pinglingpanglang’ as an instance, I found that the only input form that can be detected is ‘pingpang’ since ‘*pingling’ is not a grammatical AB Mandarin onomatopoeia. Accordingly I would like to take AB as the input form of AlBl Mandarin onomatopoeia rather than other possibilities.

4.3.3. The /l/ segment as second and fourth onset of AlBl Mandarin onomatopoeia

In the AlBl Mandarin onomatopoeia category, it undergoes partial reduplication to expect different semantic meanings from AABB and ABAB Mandarin onomatopoeia. In AB Consonant +/l/ Mandarin onomatopoeia, I proposed /l/ shown as a pre-linked segment because of its unmarkedness. The segment which will be chosen as a fixed segmentism is determined by the OT rubric of the emergence of the unmarked. The /l/ at the onset position of the second and fourth syllables in AlBl Mandarin onomatopoeia will be defined as a fixed segmentism in reduplication, the same as for the /l/ presented in AB Consonant +/l/ ones.

When assigning a pre-linked segment for partial-reduplicated quadrisyllabic Mandarin onomatopoeia, /l/ is the optimal choice since it can be distinguished from the onset of the first and third syllables such as with /t/ in /tinglingtanglang/, /p/ in /pilipala/, and so on. After checking all AlBl Mandarin onomatopoeia we can find that every onset of the first and third syllables is less sonorant than /l/. Therefore the fixed segmentism /l/ will be assigned for Sonority Dispersion Principle, because of the distinctive requirement between odd and even number syllables.

4.4. Constraints for Mandarin quadrisyllabic onomatopoeia reduplication

4.4.1. Generalized alignment constraint

Due to the need to predict the right form of quadrisyllabic Mandarin onomatopoeia, I would like to use alignment constraints ALIGN (RED, PRWD)-LEFT and ALIGN (RED, PRWD)-RIGHT. Constraints like these lies in generalized alignment are observed in the triggering of the left or right edge coincidence of quadrisyllabic Mandarin onomatopoeia reduplication.

4.4.2. Anchoring constraint

Due to the need to predict the right form of quadrisyllabic Mandarin onomatopoeia, we set two anchoring constraints ANCHORBR-R(σ) and ANCHORBR-L (σ). These constraints ask the certain edge of the reduplicant syllable correspondent with certain edge of the base syllable.

4.4.3. Adjacency constraint

Due to the need to predict the right form of quadrisyllabic Mandarin onomatopoeia, we give two adjacency constraints below ADJACENCYBR-BY-FOOT and ADJACENCYBR-BY-σ. In Mandarin quadrisyllabic onomatopoeia reduplication, the reduplicant's the location of them are both motivations in the locality generalization.

4.5. Analysis of ABAB Mandarin onomatopoeia

In this section, we will use alignment anchoring and adjacency constraints to analyze quadrisyllabic Mandarin onomatopoeia. By the variations in the ranking of constraints, we found that the interaction of the same group constraint and the same group inputs will show the different outputs if we take ABAB style Mandarin onomatopoeia as a predicting output. Since the unmarked direction of reduplication is the right direction, in this analysis we assume that ALIGN(RED, PRWD)-RIGHT dominate ALIGN(RED, PRWD)-LEFT. To match the ABAB quadrisyllabic output form, ADJACENCYBR-BY-FOOT dominates ADJACENCYBR-BY-σ. The preference of quadrisyllabic form both the ANCHORBR-R(σ) and ANCHORBR-L (σ) are high-ranking constraints.

(56) Constraint ranking of ABAB Mandarin onomatopoeia

ALIGN(R, PRWD)-R, ANCHORBR-R(σ), ANCHORBR-L (σ), AD-BY-FOOT >> AD-BY-σ, ALIGN(R, PRWD)-L

4.5.1. Consonant+/l/ group

(57) 'palapala' (sound of many large things falling)

Foot-sized reduplicant		/pala-RED/	ALIGN(R, PRWD)-RT	ANCHORBR-R(σ)	ANCHORBR-L (σ)	AD-BY-FT	AD-BY-σ	ALIGN(R, PRWD)-LT
→	a.	palapala					*	**
	b.	palapala	**W				*	L
	c.	palala			*W		L	**
	d.	papalala	***W			*W	L	***
	e.	papala	*W	*W			L	*

In Tableau (57), since the reduplicant 'pala' is aligned to the right edge of output form, the ALIGN (RED, PRWD)-RIGHT constraint has to be dominant over the ALIGN(RED, PRWD)-LEFT constraint. The reduplicant 'pala' in Candidate b. is aligned the to the left edge of the output form and violates the dominant constraint ALIGN(RED, PRWD)-RIGHT. That is the reason why Candidate b. is ruled out. Although Candidate c. does not violate the dominant constraint ALIGN(RED, PRWD)-RIGHT, it does violate another dominant constraint ANCHORBR-L (σ). Candidate c.'s left edge of the reduplicant syllable cannot correspondent with left edge of the base syllable and is ruled out. Candidate d. seems a successful quadrisyllabic Mandarin onomatopoeia, but the reduplicant 'pala' still violates ADJACENCYBR-BY-FOOT. The reduplicant of candidate d. is not foot-sized, and, is also not adjacent to its foot-sized base, and hence Candidate d. will be ruled out. Candidate e.'s reduplicant is not aligned to the right edge of prosodic word and the right edge of the reduplicant cannot correspondent with the right edge of the base syllable there is ruled out. So candidate a. 'palapala' is the optimal candidate.

4.5.2. Same onset collocation group

(58) 'didadida' (sound of water dropping continually)

Foot-sized reduplicant		/dida-RED/	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-FT	AD-BY-σ	ALIGN(R, PRWD)-LT
→	a.	dida<u>dida</u>					*	**
	b.	<u>dida</u>dida	**W				*	L
	c.	dida<u>da</u>			*W		L	**
	d.	<u>di</u>dida<u>da</u>	***W			*W	L	***
	e.	di<u>dida</u>	*W	*W			L	*

In Tableau (58), we take AB Mandarin onomatopoeia which at left edge of output as base form. Since the reduplicant 'dida' shall be aligned to the right edge of the output form, ALIGN(RED, PRWD)-RIGHT must dominate over ALIGN(RED, PRWD)-LEFT. That is the reason why Candidate b. will be ruled out. Candidate b. aligns the reduplicant 'dida' to the left edge of output form and violates the dominant constraint ANCHORBR-L (σ). Candidate c.'s left edge of the reduplicant syllable cannot correspondent with left edge of the base syllable and is ruled out. Candidate d. seems as a successful quadrisyllabic Mandarin onomatopoeia, but the reduplicant 'dida' still violates ADJACENCYBR-BY-FOOT. The reduplicant of Candidate d. is not foot-sized, and also not adjacent to its foot-sized base. Hence Candidate d. is ruled out. Candidate e.'s reduplicant is not aligned to the right edge of prosodic word and the right edge of the reduplicant cannot correspondent with the right edge of the base syllable there is ruled out. So Candidate .a. 'didadida' is the optimal candidate.

4.5.3. Sound combination group

(59) 'hajiuhajiu' (sound of sneezing continually)

Foot-sized reduplicant		/hajiu-RED/	ALIGN(R, PRWD)-R	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-FOOT	AD-BY-σ	ALIGN(R, PRWD)-L
→	a.	hajiu<u>hajiu</u>					*	**
	b.	<u>hajiu</u>hajiu	**W				*	L
	c.	hajiu<u>jiu</u>			*W		L	**
	d.	<u>ha</u>hajiu<u>jiu</u>	***W			*W	L	***
	e.	ha<u>hajiu</u>	*W	*W			L	*

In Tableau (59), we take AB Mandarin onomatopoeia which at left edge of output as base form. Since the reduplicant 'hajiu' shall be aligned to the right edge of output form, ALIGN (RED, PRWD)-RIGHT has to dominate ALIGN(RED, PRWD)-LEFT. That is the reason why Candidate b. will be ruled out. The reduplicant 'hajiu' in Candidate b. is aligned to the left edge of the output form and violates the dominant constraint ALIGN(RED, PRWD)-RIGHT. Although Candidate c. does not violate the dominated constraint ANCHORBR-L (σ), Candidate c.'s left edge of the reduplicant syllable cannot correspondent with left edge of the base syllable and is ruled out. Candidate d. seems as a successful quadrisyllabic Mandarin onomatopoeia, but the reduplicant 'hajiu' still violates ADJACENCYBR-BY-FOOT. The reduplicant of Candidate d. is not foot-sized, meanwhile not adjacent to its foot-sized base, hence Candidate d. will be ruled out. Candidate e.'s reduplicant is not aligned to the right edge of prosodic word and the right edge of the reduplicant cannot correspondent with the right edge of the base syllable there is ruled out and so Candidate a. 'hajiuhajiu' is the optimal candidate.

(60) ‘gudugudu’ (sound of drinking fast continually)

Foot-sized reduplicant		/gudu-RED/	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-FT	AD-BY-σ	ALIGN(R, PRWD)-LT
→	a.	gudugudu					*	**
	b.	gudugudu	**W				*	L
	c.	gududu			*W		L	**
	d.	gugudutu	***W			*W	L	***
	e.	gugudu	*W	*W			L	*

In Tableau (60), we take AB Mandarin onomatopoeia which at left edge of output as base form. Since the reduplicant ‘gudu’ shall be aligned to the right edge of the output form, ALIGN (RED, PRWD)-RIGHT have to dominate over ALIGN(RED, PRWD)-LEFT. That is the reason why Candidate b. is ruled out. The reduplicant ‘gudu’ in Candidate b. is aligned to the left edge of the output form and violates the dominated constraint ALIGN(RED, PRWD)-RIGHT. Although candidate c. does not violate the dominated constraint ANCHORBR-L (σ), Candidate c.’s left edge of the reduplicant syllable cannot correspondent with left edge of the base syllable and is ruled out. Candidate d. seems a successful quadrisyllabic Mandarin onomatopoeia, but the reduplicant ‘gudu’ still violates ADJACENCYBR-BY-FOOT. The reduplicant of Candidate d. is not foot-sized meanwhile not adjacent to its foot-sized base. Hence candidate d. will be ruled out. Candidate e.’s reduplicant is not aligned to the right edge of prosodic word and the right edge of the reduplicant cannot correspondent with the right edge of the base syllable there is ruled out.So candidate a. ‘gudugudu’ is the optimal candidate.

(61) ‘gujiguji’ (sound of whispering continually)

Foot-sized reduplicant		/guji-RED/	ALIGN(R, PRWD)-RT	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-FT	AD-BY-σ	ALIGN(R, PRWD)-LT
→	a.	gujiguji					*	**
	b.	gujiguji	**W				*	L
	c.	gujiji			*W		L	**
	d.	gugujiji	***W			*W	L	***
	e.	guguji	*W	*W			L	*

In Tableau (61), we take AB Mandarin onomatopoeia which at left edge of output as base form. Since the reduplicant ‘guji’ shall be aligned to the right edge of the output form, ALIGN(RED, PRWD)-RIGHT have to dominate ALIGN(RED, PRWD)-LEFT. That is the reason why candidate b. will be ruled out. The reduplicant ‘guji’ in Candidate b. is aligned to the left edge of the output form and violates the dominated constraint ALIGN (RED, PRWD)-RIGHT. Although candidate c. does not violate the dominated constraint ANCHORBR-L (σ), Candidate c.’s left edge of the reduplicant syllable cannot correspondent with left edge of the base syllable and is ruled out. Candidate d. seems a successful quadrisyllabic Mandarin onomatopoeia, but the reduplicant ‘guji’ still violates ADJACENCYBR-BY-FOOT. The reduplicant of candidate d. is not foot-sized meanwhile not adjacent to its foot-sized base. Hence candidate d. will be ruled out. Candidate e.’s reduplicant is not aligned to the right edge of prosodic word and the right edge of the reduplicant cannot correspondent with the right edge of the base syllable there is ruled out. So candidate a. ‘gujiguji’ is the optimal candidate.

4.5.4 Ranking argument and Hasse diagram of ABAB Mandarin onomatopoeia

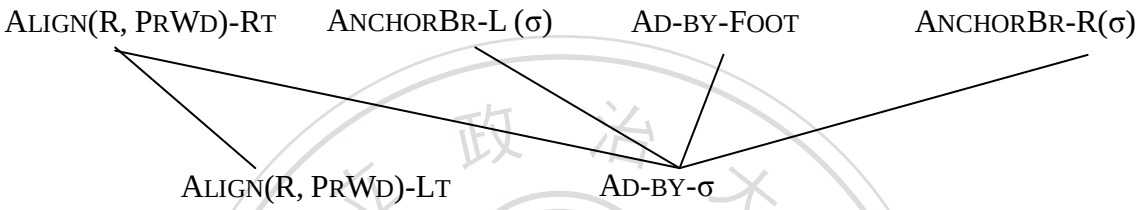
ALIGN(R, PRWD)-RT>> ALIGN(R, PRWD)-LT

ANCHORBR-L (σ)>> AD-BY-σ

ALIGN(R, PRWD)-R , AD-BY-FOOT>> AD-BY-σ

ANCHORBR-R(σ)>> AD-BY-σ

(62) Hasse diagram of ABAB Mandarin onomatopoeia



4.6 Analysis of AABB Mandarin onomatopoeia

The input forms of AABB style Mandarin onomatopoeia are from the Same onset collocation and Sound combination groups. Different from ABAB style Mandarin onomatopoeia, AABB style ones undergo other derivational progress and that is the reason the same input will generate various output forms. I will use the AB Mandarin onomatopoeia which belongs to the Same onset collocation and Sound combination groups and manifest differences between ABAB and AABB Mandarin onomatopoeia. In AABB style quadrisyllabic Mandarin onomatopoeia, I will take the first and the third syllable as the base with the second and the fourth syllable as the reduplicant because of the right-wards reduplication direction with syllable-sized reduplicant.

(63) AABB Mandarin onomatopoeia Constraint ranking

ANCHORBR-R(σ), ANCHORBR-R(σ),AD-BY-σ>> ALIGN(R, PRWD)-L, ALIGN(R, PRWD)-R , AD-BY-FOOT

Based on the constraint ranking in (63), an analysis of three AB style Mandarin onomatopoeia input groups will be shown below.

4.6.1 Same onset collocation group

(64) 'tididata' (sound of a lot of water dropping)

Todal reduplicadion		/dida+ RED/	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-σ	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	AD-BY-FT
→	a.	dididada				***	**	*
	b.	dida<u>dida</u>			*W	L	**	L
	c.	<u>dida</u>dida			*W	**	L	L
	d.	didada		*W		*	*	L
	e.	<u>di</u>dida	*W			L	**	L

In Tableau (64), 'di' and 'da' will be reduplicant respectively. So ADJACENCYBR-BY-σ is dominated constraint. Candidate b. reduplicates to the left direction and has foot-sized reduplicant violates dominated constraint ADJACENCYBR-BY-σ. It cannot become the optimal candidate. Candidate c. has the foot-sized reduplicant 'dida' and violates dominated constraint ADJACENCYBR-BY-σ as candidate b., and will be ruled out. Candidate d. has syllable-sized reduplicant 'da' and does not violate the dominated constraint AD-BY-σ though violate other high-ranking constraint since the left edge of reduplicant syllable cannot correspondent with the left edge of base syllable and be ruled out. Candidate e's right edge of reduplicant syllable cannot correspondent with the right edge of base syllable when ADJACENCYBR-BY-σ is not violated. Therefore candidate a. is the optimal candidate.

The AABB Mandarin onomatopoeia has the problem to figure out its base form and I will assume AABB Mandarin onomatopoeia is generated from AB patterns undergoes the suffixation process with syllable-sized reduplicant. The evidence will be illustrated when discussing AlBl Mandarin onomatopoeia in Section 4.7.

4.6.2 Sound combination group

(65) 'gugududu' (sound of boiling water)

Total reduplication		/gudu+ RED/	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-σ	ALIGN(R, PRWD)-L	ALIGN(R, PRWD)-R	AD-BY-FT
→	a.	gugududu				***	**	*
	b.	gudugudu			*W	L	**	L
	c.	gudugudu			*W	**	L	L
	d.	gududu		*W		*	*	L
	e.	gugudu	*W			L	**	L

In Tableau (65), 'gu' and 'du' will be reduplicant respectively. So ADJACENCYBR-BY-σ is the dominated constraint. Candidate b. reduplicates with a foot-sized reduplicant violates dominated constraint AD-BY-σ. It cannot become the optimal candidate. Candidate c. has foot-sized 'gudu' as reduplicant and violates dominated constraint ADJACENCYBR-BY-σ, and will be ruled out. Candidate d. has syllable-sized reduplicant 'du' and does not violate the dominated constraint AD-BY-σ though violate other high-ranking constraint since the left edge of reduplicant syllable cannot correspondent with the left edge of base syllable and be ruled out. Candidate e's right edge of reduplicant syllable cannot correspondent with the right edge of base syllable when ADJACENCYBR-BY-σ is not violated. Therefore Candidate a. is the optimal candidate.

4.6.3 Obstruent +affricate/fricative group

(66) 'jijigugu' (sound of many people whispering)

Total reduplication		/guji+ RED/	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-σ	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	AD-BY-FT
→	a.	jijigugu				***	**	*
	b.	jigujigu			*W	L	**	L
	c.	jigujigu			*W	**	L	L
	d.	jigugu		*W		*	*	L
	e.	jijigu	*W			L	**	L

In Tableau (66), 'gu' and 'ji' will be reduplicant respectively. So ADJACENCYBR-BY-σ is dominated constraint. Candidate b. reduplicates with a foot-sized reduplicant violates dominated constraint AD-BY-σ. It cannot become the optimal candidate. Candidate c. has foot-sized 'jigu' as reduplicant and violates dominated constraint ADJACENCYBR-BY-σ, and will be ruled out. Candidate d. has syllable-sized reduplicant 'gu' and does not violate the dominated constraint AD-BY-σ though violate other high-ranking constraint since the left edge of reduplicant syllable cannot correspondent with the left edge of base syllable and be ruled out. Candidate e's right edge of reduplicant syllable cannot correspondent with the right edge of base syllable when ADJACENCYBR-BY-σ is not violated. Therefore candidate a. is the optimal candidate.

4.6.4 The prediction of other AB Mandarin onomatopoeia groups

There are some limitations in AABB Mandarin onomatopoeia nowadays. However, AB Mandarin onomatopoeia in categories other than those of the Same Onset

Collocation, Sound combination categories may generate AABB patterns in the future. I would like to give a prediction that AB Mandarin onomatopoeia which belong to Consonant+/l/ and which cannot undergo the AABB reduplication will follow the derivation process which AB Mandarin onomatopoeia in Same Onset Collocation, certain Mandarin AB onomatopoeia in Sound combination categories have taken so far. The expected analysis will give below and 'pala' as the first example.

(67) 'papalala'

Total reduplication		'pala+ RED'	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-σ	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	AD-BY-FT
→	a.	papalala				***	**	*
	b.	palapala			*W	L	**	L
	c.	palapala			*W	**	L	L
	d.	palala		*W		*	*	L
	e.	papala	*W			L	**	L

In Tableau (67), 'pa' and 'la' will be reduplicant respectively. So ADJACENCYBR-BY-σ is dominated constraint. Candidate b. reduplicates with a foot-sized reduplicant violates dominated constraint ADJACENCYBR-BY-σ. It cannot become the optimal candidate. The foot-sized 'pala' as the reduplicant in Candidate c. violates the dominated constraint ADJACENCYBR-BY-σ, and so Candidate c. is ruled out. Candidate d. has syllable-sized reduplicant 'la' violates the dominated constraint ANCHORBR-L (σ) since the left edge of reduplicant syllable cannot correspondent with the left edge of base syllable and be ruled out. Candidate e's right edge of reduplicant

syllable cannot correspondent with the right edge of base syllable when ADJACENCYBR-BY-σ is not violated. Therefore candidate a. is the optimal candidate. The predicted discussion for some AB Mandarin onomatopoeia in Sound combination group is similar to Consonant+/l/ category. I will take ‘hajiu’ as a second instance.

(68) ‘xahajiujiu’

Total reduplication		‘hajiu+ RED’	ANCHOR BR-R(σ)	ANCHOR BR-L (σ)	AD-BY-σ	ALIGN(R, PRWD)-LT	ALIGN(R, PRWD)-RT	AD-BY-FT
→	a.	ha<u>hajiujiu</u>				***	**	*
	b.	<u>hajiu</u>hajiu			*W	L	**	L
	c.	hajiu<u>hajiu</u>			*W	**	L	L
	d.	hajiujiu		*W		*	*	L
	e.	<u>ha</u>hajiu	*W			L	**	L

In Tableau (68), ‘ha’ and ‘jiu’ will be reduplicant, respectively. So ADJACENCYBR-BY-σ is dominated constraint. Candidate b. reduplicates with a foot-sized reduplicant violates dominated constraint ADJACENCYBR-BY-σ. It cannot become the optimal candidate. Candidate c. has foot-sized ‘hajiu’ as the reduplicant and violates dominant constraint ADJACENCYBR-BY-σ, and so is ruled out. Candidate d. has syllable-sized reduplicant ‘jiu’ violates the dominated constraint ANCHORBR-L (σ) since the left edge of reduplicant syllable cannot correspondent with the left edge of base syllable and be ruled out. Candidate e’s right edge of reduplicant syllable cannot correspondent with the right edge of base syllable when ADJACENCYBR-BY-σ is not violated. Therefore candidate a. is the optimal candidate.

4.6.5 Ranking argument and Hasse diagram of AABB Mandarin onomatopoeia

ANCHORBR-L (σ)>> AD-BY-FOOT

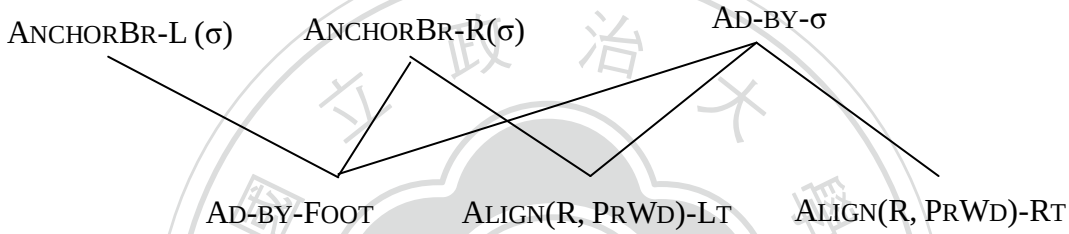
AD-BY-σ>> AD-BY-FOOT

AD-BY-σ>>ALIGN(R, PRWD)-R

AD-BY-σ>> ALIGN(R, PRWD)-L

ANCHORBR-R(σ)>> ALIGN(R, PRWD)-L, AD-BY-FOOT

(69) Hasse diagram of AABB Mandarin onomatopoeia



4.7 Analysis of AlBl Mandarin onomatopoeia

Since the phonological structure of AlBl Mandarin onomatopoeia is very close to that of AABB patterns, Alignment and Adjacency must play an important role in the process of the generation of AlBl. In addition to the emergence of the unmarked (TETU) occur within partial reduplicaiton, the markedness constraints in the Place-markedness constraint family become essential constraints either. Consequently I will use Alignment, Adjacency and certain Place-markedness constraints to explain the generation of AlBl patterns. In the input of AlBl patterns as illustrated in Section 4.3.2, the most possible input form is AB Mandarin onomatopoeia which comes from Same onset collocation group. The fixed onset /l/ choice shows that the coronal consonant is more preferred than labial and dorsal consonants. The choice of /l/ over

/t/[9] suggests that *[-voice] is high-ranked, selecting the only voiced oral coronal, /l/ in Chinese. In most cases, the choice of the voiced /l/ might be attributed to intersonorant voicing since the preceding syllable ends in a vocoid or a nasal (Yip, 2001). On the basis mentioned above, I will analyze Mandarin AlBl onomatopoeia and try to give an explanation for them below.

I will take 'pilipala' as an example and its input is 'pipa'.

(70) 'pilipala'

Partial reduplication		/RED-pipa/	**MAX(σ)**	AD-BY-σ	*PL/LAB	ALIGN (R, PRWD)-RT	AD-BY-FT	ALIGN (R, PRWD)-LT	*PL/COR
→	a.	pilipala				**		***	*
	b.	pipapipa		*W	*W	*		*	L
	c.	lilapipa		*W		**	L	L	*
	d.	pipala	*W			L	L	**	*
	e.	pipaʔa	*W			L			L

If we only examined 'pilipala' generated from 'pipa' with ALIGN (R, PRWD)-R, ANCHORBR-R(σ), ANCHORBR-L (σ), ALIGN (R, PRWD)-L and AD-BY-σ five constraints cannot explain fixed segment appear when reduplication occurs. Since the non-optimal candidate is preferred than optimal one, the acting of other constraints is needed. Hence thefaithfulness constraint MAX(σ) and markedness constraints come from the Place-markedness Hierarchy in necessary because of the fixed segmentism in AlBl reduplication.

[9] The /t/ mention in this paragraph is as non-asperated alveolar stop in IPA form rather than /t/ in pingyin system. Therefore /t/ here should take as /d/ in the data I used in this thesis.

(71) MAX(σ)

Let input $=\sigma_1\sigma_2\sigma_3\ldots\sigma_n$ and output $=\sigma'_1\sigma'_2\sigma'_3\ldots\sigma'_m$

Assign one violation mark for every σ_x if there is no σ'_y, where σ_x R σ'_y.

(72) 'pilipala'

/RED- pipa/	ALIGN (R, PRWD)-R	ALIGN (R, PRWD)-L	ANCHORBR-R(σ)	ANCHORBR-L (σ)
a. →pilipala	**	***	*	*
b. ☹pipipapa	**	***	L	L

Here I would like to analyze the how AlBl Mandarin onomatopoeia 'pinglingpanglang' and 'dilidala' generate from their grammatical AB input 'pingpang' and 'dida' in turns.

(73) 'pinglingpanglang'

Partial reduplication		'RED- pingpang'	MAX(σ)	AD-BY-σ	*PL/LAB	ALIGN (R, PRWD)-RT	AD-BY-FT	ALIGN (R, PRWD)-LT	*PL/COR
→	a.	pinglingpanglang				**		***	*
	b.	pingpangpingpang		*W	*W	*		*	L
	c.	linglangpingpang		*W		**	L	L	*
	d.	pingpanglang	*W			L	L	**	*
	e.	pingpangʔang	*W			L			L

(74) ‘dilidala’

Partial reduplication		‘RED-dida’	MAX (σ)	AD-BY-σ	*PL/LAB	ALIGN (R, PRWD)-RT	AD-BY-FT	ALIGN (R, PRWD)-LT	*PL/COR
→	a.	dilidala				**		***	*
	b.	didadida		*W		*		*	L
	c.	liladida		*W		**	L	L	*
	d.	didala	*W			L	L	**	*
	e.	didaʔa	*W			L			L

In Tableaux (72), (73) and (74), the optimal Candidate a. reduplicates the vowels from the base, respectively and the reduplicant syllables are adjacent to its base so that the AD-BY-σ is the high-ranking constraint. The /l/ as the onset of the second and fourth syllable is the fixed segmentism in the reduplication process. Hence *PL/LAB became the dominant constraints. Candidate b. has a foot-sized reduplicant and violates the high-ranking constraint AD-BY-σ, so it is ruled out. Some AB Mandairin onomatopoeia’s input form has no labial consonant such as ‘dida’ examined in tableau (74) and vacuously satisfy the constraint*PL/LAB. Candidate c.’s reduplicant is foot-sized and violates the dominant constraint AD-BY-σ and is ruled out. Candidate d. and e. violate the high-ranking constraints MAX(RED), respectively because the reduplicant segment is deleted compare with base segment so that they are ruled out. The constraint ranking of AlBl Mandarin onomatopoeia generation is given below.

(75) AlBl Mandarin onomatopoeia generation constraint ranking

MAX(σ),*PL/LAB, AD-BY-σ>> ALIGN (R, PRWD)-L, ALIGN (R, PRWD)-L,*PL/COR, AD-BY-FOOT

4.7.1 Ranking argument and Hasse diagram of AlBl Mandarin onomatopoeia

*PL/LAB>> *PL/COR

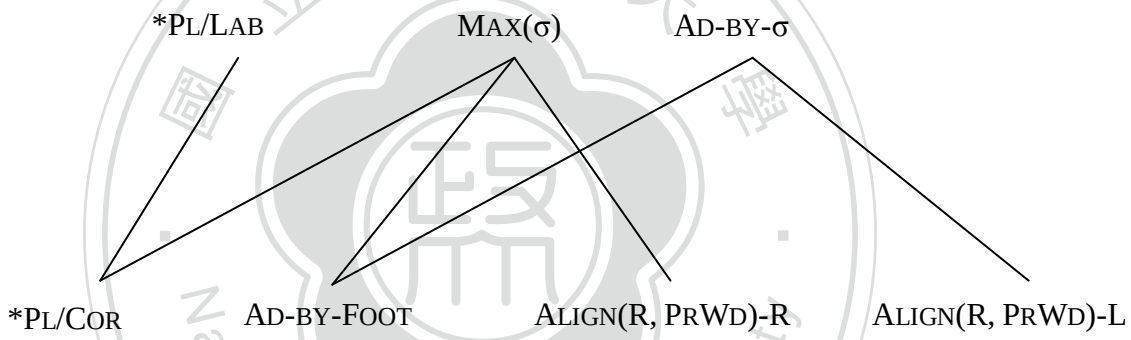
AD-BY-σ>> AD-BY-FOOT

AD-BY-σ>> ALIGN (R, PRWD)-L

MAX(σ)>> ALIGN (R, PRWD)-R, AD-BY-FOOT

MAX(σ)>> *PL/COR

(76) Hasse diagram of ALBl Mandarin onomatopoeia



4.7.2 Other AB Mandarin onomatopoeia

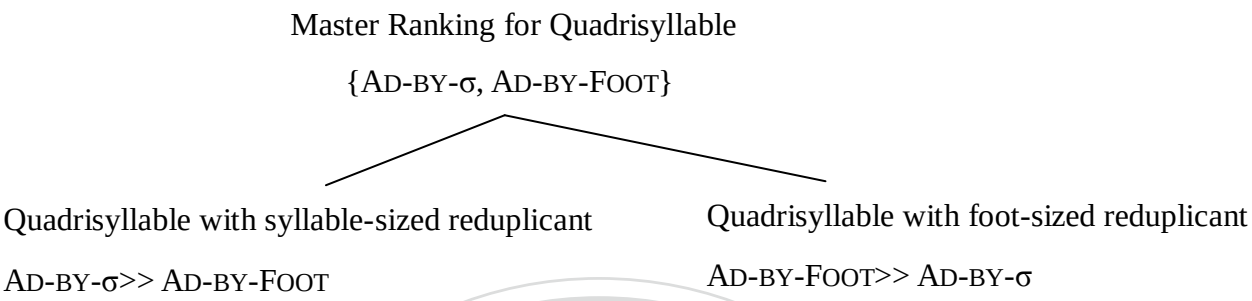
Other AB Mandarin onomatopoeia categories such as Sound combination group are not possible input forms of AlBl patterns although they are grammatical Mandarin disyllabic onomatopoeia. Since all AlBl Mandarin onomatopoeia are generated from AB patterns of the Same onset collocation group with the /i/ as the nucleus in the first syllable.

4.8 Summary

In the analysis of ABAB, AABB and AlBl quadrisyllabic Mandarin onomatopoeia, we can see that the interaction constraints and various cophonologies generate different output forms when their input forms come from the same AB Mandarin

onomatopoeia categories. The cophonologies of Mandarin quadrisyllabic onomatopoeia are illustrated in Table (77).

(77) Cophonology of Mandarin quadrisyllabic onomatopoeia



In ABAB Mandarin onomatopoeia, the reduplicant is at the right edge of the output form and always is foot-sized. In the cophonology for Quadrisyllable with foot- sized reduplicants, ALIGN(R, PRWD)-RT and AD-BY-FOOT are high-ranking constraints to choose the optimal candidate. In discussing AABB and AlBl Mandarin onomatopoeia, there is a different cophonology for Quadrisyllable with syllable-sized reduplicants because of the identical reduplicant size of AABB and AlBl Mandarin onomatopoeia. The constraint ranking for AABB Mandarin onomatopoeia we analyzed above may only be suitable for AB Mandarin onomatopoeia which comes from Same onset collocation, Stop+stop and Obstruent +affricate/fricative groups. In other words, Consonant + /l/ and One onset is alveo-palatal fricative AB patterns would generate AABB quadrisyllabic onomatopoeia. AlBl Mandarin onomatopoeia which is derived from Same Onset Collocation AB patterns shares a similar generation process with AABB Mandarin onomatopoeia. Hence AABB and AlBl Mandarin onomatopoeia hold closed constraint ranking and various cophonologies. Because of the fixed-segmentism occurs in AlBl Mandarin onomatopoeia generation process, the AB input forms undergo partial reduplication while AABB patterns follow total reduplication. Therefore certain Place-markedness constraints are high-ranking

constraints when AlBl Mandarin onomatopoeia derivate. After all, the ranking of the alignment adjacency and markedness constraints in the various cophonologies generate Mandarin quadrisyllabic onomatopoeia and provide an explanation for them at the same time. The phonological structure of Mandarin onomatopoeia is not random but follows its own principles.

CHAPTER 5

CONCLUSION

This thesis attempts to give an overview of the Mandarin onomatopoeia and is special in several aspects. First, it pioneers in the Mandarin onomatopoeia generation from a phonological viewpoint. Onomatopoeia are sound-imitating icons which play an important role in Mandarin Chinese, however, the previous study of the complex phonological structure of Mandarin onomatopoeia did not give the whole picture of Mandarin onomatopoeia. Second, this study has discussed the reduplication types of disyllabic, trisyllabic and quadrisyllabic patterns in Mandarin onomatopoeia, and looked into the similarities and differences in these reduplication constructions. I have shown that constraint rankings vary in different structures of Mandarin onomatopoeia because of its various reduplication types.

This thesis concludes that Mandarin onomatopoeia have two major derivational processes, total reduplication and partial reduplication. In addition to the syllable number of Mandarin onomatopoeia such as Mandarin disyllabic and Mandarin trisyllabic onomatopoeia they reduplicate with various reduplicant sizes such as segment-sized and syllable-sized. Therefore the phonological structure of Mandarin onomatopoeia present in a complex way. I manifest the generation of Mandarin onomatopoeia from Mandarin disyllabic onomatopoeia which is input form as Mandarin trisyllabic and quadrisyllabic onomatopoeia, and then explain the derivation of Mandarin trisyllabic and quadrisyllabic onomatopoeia.

This thesis develops the following constraint rankings to describe Mandarin disyllabic trisyllabic and quadrisyllabic onomatopoeia reduplication.Since constraint ranking varies in the Mandarin onomatopoeia generation process I posit a master ranking under the cophonology approach which is shown in Table (84).

(78) Cophonology of Mandarin ono matopoeia Master ranking of Mandarin onomatopoeia

{ALIGN(R, PRWD)-L, ALIGN(R, PRWD)-R, ANCHORBR-R(SEG), ANCHORBR-L(SEG), AD-BY-SEG, AD-BY-σ, AD-BY-FOOT }

Cophonlogy A Mandarin disyllabic onomatopoeia

{ALIGN(R, PRWD)-L, ALIGN(R, PRWD)-R,

ANCHORBR-R(SEG), ANCHORBR-L(SEG }

Cophonlogy B Mandarin trisyllabic onomatopoeia

{ ANCHORBR-L(σ), ANCHORBR-R(σ),

ALIGN(R, PRWD)-LT, ALIGN(R, PRWD)-RT}

Cophonlogy C Mandarin quadrisyllabic onomatopoeia

{AD-BY-σ, AD-BY-FOOT}

Cophonology D

Total reduplication

ALIGN(R, PRWD)-R,

ANCHORBR-R(SEG),

ANCHORBR-L(SEG)

>>ALIGN(R, PRWD)-L

Cophonology E

Partial reduplication

{ALIGN(R, PRWD)-L,

ALIGN(R, PRWD)-R,

ANCHORBR-R(SEG),

ANCHORBR-L(SEG) }

Cophonology F

Trisyllabic reduplication with prefix

ANCHORBR-L(σ), ALIGN(R, PRWD)-LT >>

ANCHORBR-R(σ), ALIGN(R, PRWD)-RT

Cophonology G

Trisyllablic reduplication with suffix

ANCHORBR-R(σ), ALIGN(R, PRWD)-RT>>

ANCHORBR-L(σ), ALIGN(R, PRWD)-LT

Cophonology H

Quadrisyllable with syllable sized reduplicant

AD-BY-σ>> AD-BY-FOOT

Cophonology I

Quadrisyllable with foot sized reduplicant

AD-BY-FOOT>> AD-BY-σ

Cophonology J

Disyllabic with prefix reduplicant

ANCHORBR-L(SEG), ALIGN(R, PRWD)-L >>

ALIGN(R, PRWD)-R, ANCHORBR-R(SEG)

Cophonology K

Disyllabic with suffix reduplicant

ANCHORBR-R(SEG), ALIGN(R, PRWD)-R>>

ANCHORBR-L(SEG), ALIGN(R, PRWD)-L

The master ranking of Mandarin onomatopoeia indicates that the reduplication process is a significant mechanism in the generation of Mandarin onomatopoeia. There are various reduplication processes for the generation of disyllabic, trisyllabic and quadrisyllabic Mandarin onomatopoeia, hence the constraint ranking of the Alignment, Anchoring and Adjacency constraints are different.

In Cophonology A for Mandarin disyllabic onomatopoeia, since the reduplicant sized is syllable-sized, only Alignment and Anchoring constraints will re-rank.

Further cophonologies in Mandarin disyllabic onomatopoeia are found when total reduplication or partial reduplication occurs. In Cophonology D for Mandarin disyllabic patterns with total reduplication, both the segment edge of the reduplicant and the base are correspondent therefore ANCHORBR-R(SEG) and ANCHORBR-L(SEG) are high-ranking constraints, while when the reduplication direction is rightward then ALIGN(R, PRWD)-R dominates ALIGN(R, PRWD)-L.

In the Cophonology E Mandarin disyllabic pattern with partial reduplication the constraint rankings of the Alignment and Anchoring constraints are unclear since there are various reduplication direction— reduplication with prefix and suffix.

When Mandarin disyllabic onomatopoeia undergo partial reduplication with prefix the reduplicant is always at the left edge of the output and the segment's left edge of reduplicant and base are correspondent, therefore ALIGN(R, PRWD)-L and ANCHORBR-L(SEG) are the dominant constraints.

On the other hand, when Mandarin disyllabic onomatopoeia reduplicate with suffix, the reduplicant and base's right segment edge are correspondent so that ANCHORBR-R(SEG) and ALIGN(R, PRWD)-R outranks ALIGN(R, PRWD)-L and ANCHORBR-L(SEG).

Mandarin trisyllabic and quadrisyllabic onomatopoeia are derived from Mandarin disyllabic onomatopoeia. However, they undergo completely different processes of

reduplication and the constraint rankings for them are either given in cophonology way.

In Cophonology B for Mandarin trisyllabic onomatopoeia, Alignment and Anchoring constraints play an important role as well as disyllabic patterns.

There are two different types in Mandarin trisyllabic onomatopoeia which reduplicate with a prefix or suffix. Therefore there are advanced cophonologies to explain these generations.

When Cophonology F trisyllabic reduplication with prefix the reduplication direction is always leftward so ALIGN(R, PRWD)-LT outranks ALIGN(R, PRWD)-RT at all times. In contrast, while Cophonology G trisyllabic reduplication with suffix ALIGN(R, PRWD)-RT outranks ALIGN(R, PRWD)-LT because of right reduplication direction. In addition to the adjacency tendency between base and reduplicant, trisyllabic reduplication with prefix has high-ranking constraint ANCHORBR-L(σ) while since it is trisyllabic reduplication with suffix the dominant constraint is ANCHORBR-R(σ).

In Ccophonology C for Mandarin quadrisyllabic onomatopoeia, the Adjacency constraint will be manifested which reduplicate with syllable-sized reduplicant or foot-sized reduplicant.

In the Cophonology H quadrisyllabic pattern with a foot sized reduplicant, AD-BY-FOOT dominates AD-BY-σ since a foot-sized reduplicant will occur in the output form. AD-BY-σ outranks AD-BY-FOOT in the Cophonology I quadrisyllabic pattern with a syllable-sized reduplicant because the syllable-sized reduplicant is the base choice.

To conclude this thesis, Mandarin onomatopoeia exhibits various processes in the generation of reduplication. Three phonological structures in Mandarin onomatopoeia, Mandarin disyllabic onomatopoeia, Mandarin trisyllabic onomatopoeia and Mandarin quadrisyllabic onomatopoeia, share the same general constraints, but different

constraint rankings as accounted for under OT.

For future study, the onomatopoeia in other Chinese dialects such as Southern Min, Hakka or Cantonese can be subject to discussion. By investigating the process of the generation of onomatopoeia in other Chinese dialects we can understand the similarities and differences in onomatopoeia structure. Thus the typology and morpho-phonology of onomatopoeia can be manifested more clearly.

NOTE

Monosyllabic and disyllabic Mandarin onomatopoeia such as AA and AB patterns are used from ancient China to nowadays. The example and evidences will be provided in the table below.

(79)

bo About 488,000 results, from Tang Dynasty (A.D 618-907). '**bobo**duoduo,youkezhimen (The sounds of knocking door occur therefore there are guest coming' in *duomushi* (The poem of knocking door) of Yu Han.
chi About 398,000 results, from Qing Dynasty (A.D 1644-1911.) 'zhibuzhu**chichi**dexiao (Cannot stop to laugh)' in *Xingshitinyuan* (The novel of irony) of Xizhousheng.
peng About 1,850,000 results, from Western Jin Dynasty (A.D 265-317). 'gu**pengpeng**yiqingtou,xiaocaocaoerweiyin.(Play the drum softly and also play the vertical bamboo flute gentlely' in *guchuifu* (The Chinese prose-poem of playing music) of Ji Lu.
pu About 2,270,000 results, from Ming Dynasty (AD 1368-1644). 'yongshuangshoubatadetuijinliyitui,**pudeyisheng**,zhejianganbianlilepirou. (He pull his legs with his both hands in full power and the arrow is out of his body with the sound)' in *sansuipingyaozhuan* (The fiction of ghost-hunting) of Menglong Feng.
mou About 129,000 results, from Tang Dynasty (A.D 618-907.).

‘zhuifeiniuhu**mou** (The cows are mooing)’ in *Zhengshulianju* (The cooperated poem of Shu expedition) of Yu Han and Jiao Meng.
ding About 1,520,000 results, from Tang Dynasty (A.D 618-907.). ‘yuxiemingfeiwanliqing, zicaohongboye**dingding**. (The music of playing pipa can be taked as the emotion expression of Princess Ming)’ in *Tingpipashi* (The poem of listening to pipa) of Hun Xu.
dong About 1,550,000 results, fromYuan Dynasty (A.D 1271-1368). ‘**dongdong**yaguxiang (The drum on the court sounds)’ in *Xudiemeng* (The dream of butterfly) of Henqing Guan.
du About 1,750,000 results, fromYuan Dynasty (A.D 1271-1368). ‘song**dudu**xuwuxiu (The soliloquizing is non-stop) in *Tangmnghuangqiyiguxiangnang* (The Yuan drama of Emperor Ming of Tang bury and cry for sachet) of Henqing Guan.
da About 11,200,000 results, from Qing Dynasty (A.D 1644-1911.)
dang About 11,200,000 results, from Tang Dynasty (A.D 618-907.). ‘zhiyu**dangdang**xiaolou (There are sounds of water dropping in metal container) ’ in *Chenshu* (The history of Nan Chen Dynasty) of Siqian Yao.
ga About 1,380,000 results, from Qing Dynasty (A.D 1644-1911.) ‘shuanghechuanzhiguo, wanglaifeiwu, ruzhisuoran, jigahouyousheng (There are two cranes fly smoothly and shout loudly)’ in *Yueweiczotangbiji* (The Note of Yun Ji) of Yun Ji.
gua About 330,000 results, from Han Dynasty (206 BC-AD 195) ‘qi**guagua**erqi(Qi cries loudly)’ in *Shiji* (The History) of Qian Sima.
hua About 1,390,000 results , from Ming Dynasty (AD 1368-1644). ‘nagenzhuyingzhefengshi, hualayishengzhezuoliangduan (That bamboo broken by wind blow loudly)’ in *sansuipingyaozhuan* (The fiction of ghost-hunting) of Menglong Feng.
ling About 218,000 results, from Han Dynasty (206 BC-AD 195)

‘zhuxianbingduan, leibingquanshiyiding**ling** (The strings are broken with the sounds like rock broken)’ in *Daiandaosuiqinfu* (The Prose-poem of chant for broken Qin in Daiandao) of Tao Huang.
long About 12,300 results, from Han Dynasty (206 BC-AD 195) ‘**longlong**ruleisheng (As loud as thunder)’ in *Hanshu* (The history of Han) of Bangu.
ji About 754,000 results, from Ming Dynasty (AD 1368-1644) ‘**ji**dingdangzouzhejuntianyue (The music is played in several tones)’ in *Taohuashan* (The drama of the fan of peach blossom) of an anonymous person.
jiu About 658,000 results, from Han Dynasty (206 BC-AD 195) ‘**jiujiu**, xiaoshengerfaye (This sound is very low)’ in *Hanshu* (The history of Han) of Bangu.
hong About 4,870,000 results, from Song dynasty (A.D 960-1279.) ‘**Hong**ruoleiting (As loud as thunder)’ in *Xintangshu* (The New Tang History) of Xiu Ouyang and Qi Song.
si About 1,830,000 results, from Tang Dynasty (A.D 618-907.). ‘songjunwenma**si** (When I see you off I hear the neigh)’ in Pusaman *Yuloumingyuechangxiangyici* (The poetry in ci form of miss you with jade chamber and the moon) of Tingyun Wen。
weng About 87,200 results, from Qing Dynasty (A.D 1644-1911.) ‘tahanlejisheng, jiurupiliyiban, zhendeergen**wengweng**zuoxiang (He shout out just like thundering and make our ear very hurt)’in *Jinhuayuan* (The novel of illusion) of Ruzhen Li.
wang About 1,960,000 results, fromYuan Dynasty (A.D 1271-1368 ‘tingde**wangwang**chuanfeizhulinyou (I heard the barking and feel the quiet in the bamboo grove) in *Zhuyezhou* (The Yuan Drama of bamboo-leaf-shape boat) of Kang Fang.

pang About 196,000 results, from Han Dynasty (206 BC-AD 195) ‘chenchenyinyin,ping**pang**hingran (There are sounds of bury things that are very loud) ’ in *Hanshu* (The history of Han) of Bangu.
shua About 13,100,000 results, from Qing Dynasty (A.D 1644-1911.) ‘hujianshansangguaqiyizhendafeng, chuideshumuss**huashua**luanxiang (Suddenly there is blast blow over woods and make the loud noise)’ in *Jinhuayuan* (The novel of Illusion) of Ruzhen Li.
xi About 1,060,000 results, from Nan Dynasty (AD 420-581) ‘xian**xili**erxianji (The graupel fall together loudly)’ in *Wenxuan* (The selected prose collection) of Tung Xiao.
langlang From Han Dynasty (206 BC-AD 195) ‘laishixiangji, **langlang**keke (The Rocks crashing together loudly) in *Hanshu* (The history of Han) of Bangu.
dede From Song dynasty (A.D 960-1279.) ‘jinyeyunkai, xudaohenge**dede**lai (Cloud is disappear and the moon is showing gradually tonight)’ in *Jianzimulanhua Zhongqiuduoyuci* (The poetry in ci from about raining on moon festival) of Tingjian Huang.
zhi About 2,150,000 results
zhazha From Jin Dynasty (A.D 1115– 1234) ‘gechuangyequer**zhazha**dejiao (There is a magpie songs out of the window)’ in *Dongxixiang* (The drama of west chamber in Dong version) of Dongxieyuan.
gu About 2,060,000 results, from Ming Dynasty (AD 1368-1644)
jianjian From Nan Dynasty (AD 420-581) ‘danwenhuangheliushuiming**jianjian** (However I heard the sound of the Yellow River flows)’ in *Mulanshi* (The poem of Mulan) of an anonymous person

huohuo From Nan Dynasty (AD 420-581) ‘modao**huohuo**xiangzhuyang (Sharpening knife loud to kill the livestock) ’ in *Mulanshi* (The poem of Mulan) of an anonymous person.
chanchan From Wei Dynasty (AD 220-265) ‘gushui**chanchan** (The river flows with sounds’ in *Danxiabirixing* (The poem of evening glows hide the sun) of Pi Cao.
shasha FromYuan Dynasty (A.D 1271-1368.) ‘wozehuibaba**shasha**moyuxia (I will grab seafood invery low sound) in *Zhangguobinzaquxuan* (The selected Yuan drama of Guobin Zhang) of Guobin Zhang.
caocao From Nan Dynasty (AD 420-581) ‘guchuiyihe**caocao** (The sound of music are very loud)’ in *Songshu* (The history of Nan Song Dynasty) of Yue Shen.
congcong From Tang Dynasty (A.D 618-907.). ‘shiquan**congcong**ruofengyu (The spring from the stone flows with sound) in *Fudehuanshanyin songshensishanrenshi*(The poem of come back from mountain and chant for Qianyun Shen) of Shi Gao.
sese From Wei Dynasty (AD 220-265) ‘**sese**guzhongfeng (The wind blow over the valley loudly) in *Zengcongdishi* (The poem for brother) of Zhen Liu.
sasa From Warring States Period (475 BC - 221 BC) ‘Feng**sasa**ximuxiaoxiao (The wind blow over the woods loudly) in *Chuci* (Chu Verses) of Yuan Qu.
susu From Ming Dynasty (AD 1368-1644) ‘shanbianzhutengli**susu**dexiang, qiangchutitiaodiaotongdaxiaoxuehuayesishelai (There is large and white snake comes from the bamboo grove loudly) in *Shuijuzhuan* (The novel of

Shuihu) of an anonymous person
putʂʰi From Qing Dynasty (A.D 1644-1911.) 'bujue**puchi**xiaoleyisheng (She cannot help but titters)' in *Jinhuayuan* (The novel of illusion) of Ruzhen Li.
putong From Yuan Dynasty (A.D 1271-1368) 'jinri**putong**depingzhuijing (He fall in the well loudly)' in *Qingshanlei* (The Yuan drama of tear of woman in green dress) of Zhiyuan Ma.
jitʂa From Qing Dynasty (A.D 1644-1911.) 'ruyanziyiban, mankou**jijizhazha**de (he is talkative as bird and very annoying)' in *Jinhuayuan* (The novel of illusion) of Ruzhen Li.
qiang About 588,000 results, from Han Dynasty (206 BC-AD 195) 'yourenguanxiankeng**qiang**jiyue (The players start to play music)' in *Hanshu* (The history of Han) of Bangu.
gudu From Qing Dynasty (A.D 1644-1911.) 'bafangcailiangdenawanliangchaduanqilai, **gudu**gududehele (Take that cup of tea and gulp it loudly)' in *Ernvyingxiongzhuan* (The novel of Great Young People) of Kang Wen.
guji From Qing Dynasty (A.D 1644-1911.) In *Hongloumeng* (The novel of Dream of Red Chamber) of Xueqin Cao.
gudong From Qing Dynasty (A.D 1644-1911.) 'gudongyijiaodiedao (She fell on the floor loudly)' in *Hongloumeng* (The novel of Dream of Red Chamber) of Xueqin Cao.

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