

The Phonetic Analysis of Z Rime Alternation Phenomena in Changyuan Dialect of Henan Province

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Abstract. By analyzing the Z rime alternation phenomena in Changyuan Dialect of Henan Province, the present study argues that the phenomenon of one word having two different kinds of Z rime alternation forms in this dialect is due to it that the basic rime of the word preserves the Z rime alternation form that is formed before and after the sound change of the basic rime respectively. At the mean time, the development speed of Z rime alternation forms is slower than that of the basic rimes, so the Z rime alternation form preserves the glide of its corresponding basic rime of the early period and that's exactly what leads to the differences between the glide of the present basic rime and that of the corresponding Z rime alternation form. Besides, the monophthongization phenomenon occurs between the main vowel and the [-u] ending in the compound final that is formed by sound combination during Z rime alternation process generally appears only in Jin language area of Northern Henan Province and doesn't appear in Mandarin-speaking area of Henan Province.

1. Introduction

According to Wang Hongjun (2004)^[1], Z rime alternation phenomenon refers to the phenomenon of phonetic inflection which expresses the same grammatical meaning as the noun phrase ending with the suffix "子[tsɿ]" with changes in vowels or/and vowels and tones and it is a phenomenon that is related to both phonetics and grammar in Chinese dialects.

Since the survey of the Chinese dialects conducted in the 1950s, Z rime alternation phenomena have been widely discovered in the northern and central parts of Henan, as well as in the southern and southeastern parts of Shanxi. In addition, sporadic reports of Z rime alternation phenomena have been made in dialects of Shandong, Hebei, and Shanxi Provinces. With the continuous discovery of Z rime alternation phenomena, its formation and origin have attracted much attention. At present, the academic community generally agree that the Z rimes are formed by sound combination process, and the suffix of the Z rime alternation is [-u/-o], which shares the features of [+back, +rounded].

As a special sound change phenomenon in Chinese dialects, Z rime alternation phenomenon is an important topic that cannot be ignored in the study of Chinese dialects. Although the current research on Z rime alternation still remains at the level of describing phenomena, there have been some theoretical articles or works. For example, Wang Hongjun (1994)^[2] pointed out that the retroflex rimes, Z rimes and D rimes in Chinese dialects are all products of the "two-in-one" sound combination process. Wang Futang (2005)^[3] and Wang

Hongjun (1999^[4], 2008^[5]) have both conducted detailed analyses of the phonetic phenomena of Z rime alternation in Huojia Dialect of Henan Province with relevant sound change phenomena in Shanxi dialects following the sound combination theory. Chen Weiheng (2004^[6], 2011^[7]) comprehensively and systematically analyzed the interacting relationships among phonetics, vocabulary, grammar and pragmatics in rime alternation phenomena in the dialects of Northern Henan under the "character-based" theoretical framework. Zhang Huili (2011^[8], 2017^[9]) thoroughly discussed the generation and evolution process of Z rime alternation phenomena in dialects such as Jiaozuo in Henan province with feature expansion theory, syllable structure theory, and parameter adjustment theory. In addition, based on the detailed descriptions, Wang Hongjun (2004)^[10], Xin Yongfen (2006)^[11], Chen Ning (2006)^[12], Niu Shunxin (2008)^[13], Xia Liping (2012)^[14], Gan Yuen and Dong Yibo (2020)^[15] and so on have also analyzed the phonetic forms of Z rime alternations in dialects of Wenxi Dialect in Shanxi Province, Xunxian Dialect in Henan Province, Boshan Dialect in Shandong Province, Wuzhi Dialect in Jiaozuo City and ZhaoGang Dialect in Fengqiu County of Henan Province, Xinxiang Dialect in Henan Province respectively.

Changyuan is located in the northeast part of Henan Province under the administration of Xinxiang city. And Changyuan Dialect is a part of the Zheng-Kai subgroup of the Central Plains Mandarin dialects. The Z rime alternation phenomenon in Changyuan dialect is unique and complex. The purpose of this study is to analyze the Z rime alternation phenomena in Changyuan Dialect, thus

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we can gain a more comprehensive understanding of the generative mechanism and evolutionary process of Z rime alternation phenomena.

2.The Phonetic Analysis of Z Rime Alternation Phenomena in Changyuan Dialect based on Wang Qingfeng (2007)’s Description

According to Wang Qingfeng (2007)^[16], the corresponding relationships between the Z rimes and basic Rimes in Changyuan Dialect are as follows:

Table 1. The Corresponding Relationships between Z Rimes and Basic Rimes in Changyuan Dialect (2007)

a:ɔ (< a, ao)	ia:ɔ (< ia, iao)	ua:ɔ (< ua)	
a:i (< ai)	ia:i (< iai)	ua:i (< uai)	ya:i (< yai)
a:ŋ (< aŋ)	ia:ŋ (< iaŋ)	ua:ŋ (< uaŋ)	
ə:ɔ (< ɚ, ə)	iə:ɔ (< i, ie, ei, ai)	uə:ɔ (< uə, uei)	yə:ɔ (< uei, y)
ɛ:ɔ (< ɛ, ai, ei)	ue:ɔ (< uai, uei)		

(Note: The left-hand side of ‘<’ in each column represents the Z rime forms and the right hand side of ‘<’ represents the basic rimes)

At first, it should be noted that the basic *yang* rimes of *Xian* and *Shan She* as well as *Shen* and *Zhen She* in Changyuan Dialect have evolved into the corresponding *yin* rimes of *ai*-sets and *ei*-sets respectively. While the basic *yang* rimes of *Dang* and *Jiang She* as well as *Zeng*, *Geng* and *Tong She* still preserve their [-ŋ] rime tail.

Based on the analysis of the corresponding relationships between the Z rimes and basic rimes in Changyuan Dialect, we can see that the Z rime alternation phenomena are evolved from the sound combination process of the basic rime and the suffix [-o], which bears the phonetic features of [+back, +round].

According to the different sound combination ways of Z rime alternation phenomena, Wang Futang (2005)^[17] divided Z rime alternation phenomena in Chinese dialects into three types: ‘the prolonged type’, ‘the pieced type’ and ‘the fused type’. ‘The prolonged type’ refers to the kind of Z rimes, whose sound combination suffix fades away while its duration preserves and merges into the preceding syllable, thus making it a long one. ‘The pieced type’ refers to the kind of Z rimes, whose sound combination suffix occupies the coda position of the preceding syllable and can be easily distinguished from the main vowel of the syllable phonetically. And ‘the fused type’ refers to the kind of Z rimes, whose sound combination suffix has integrated into the rime of its preceding syllable and can’t be distinguished clearly from the syllable’s main vowel phonetically. By analyzing the Z rime alternation phenomena in Table 1, we can see that the sound combination way of Z rime alternation phenomena in Changyuan Dialect mainly falls into the combined way of ‘the prolonged type’ and ‘the fused type’.

The glide of the basic rimes and that of the corresponding Z rimes are almost the same in Changyuan Dialect, while there are exceptions. For example, the basic rime /uei/ changes into [yə:ɔ] in Z sound change.

According to Wang Qingfeng (2007)^[18], the corresponding word that undergoes this kind of Z rime sound change is “穗[suei]”, which means ‘fringe’ in English. The phonetic change process appears obscure if we derive the phonetic form of the Z rime from the current basic rime. Wang Futang (2005)^[19] pointed out that the phonetic form of some basic rimes may have changed after the generation of the Z rime alternation form, that is to say, the current phonetic forms of some basic rimes are different from their previous forms, based on which, the corresponding Z rime generates. If so, there is no direct generating relationship between the phonetic forms of the Z rimes and those of the current basic rimes. At the same time, Mr. Wang Futang further indicated that we should analyze the Z sound change process based on the early forms of the basic rimes rather than on the present ones. Qiao Quansheng (2008)^[20] remarked that the words such as “纬” “喂” “围” “尉” are all pronounced as [y] in the colloquial reading of Bingzhou Group and Fenhe Group of today’s Jin Dialect. And “穗[suei]” is pronounced as [ey] in the above areas. If we regard [ey] as the early phonetic form of “穗” when Z rime alternation phenomena happened in Changyuan Dialect, the phonetic change process becomes easy to understand. When the suffix-o merges with its preceding basic rime, the main vowel of the basic rime prolongs and the sound [ə] is the transitional sound during the sliding process of the tongue position from the front high vowel [y] to the back high vowel of the suffix [o].

At the meantime, there is also a situation where the same basic rime corresponds to different Z rimes. For example, the basic rime /ai/ can either change into [a:i], or change into [ɛ:ɔ] or [iə:ɔ]. The first Z rime alternation way falls into ‘the prolonged type’ and the latter two belong to ‘the fused type’ based on the analysis of the early phonetic forms of the basic rime /ai/. According to Wang Qingfeng (2007)^[21], the rime of [ai] that adopting the Z rime alternation way of ‘the prolonged type’ are basically derived from the Middle Ancient *Xian* and *Shan she*, which correspond to the rimes with a low vowel as the main vowel and [n] as the rime tail. In the monosyllabic phonology of Changyuan Dialect, the nasal ending of the first and second class of *Xian* and *Shan She* changes into the rime ending of [i], thus mixing with some of the words in *Xie* and *Zhi She* shown in the following table.

Table 2. The Words with the Basic Rime /ai/ in Changyuan Dialect

<i>Xian</i> and <i>Shan She</i>		<i>Xie She</i>		<i>Zhi She</i>	
BP	CP	BP	CP	BP	CP
庵 ai ‘nun- ner- y’	瓜庵 ^Z a:i	奶 nai ‘grandm- -a’	俺奶 ^Z na:i	子 tsɿ ‘son’	败家 子 ^Z tsə:ɔ
板 pai ‘boa- rd’	床板 ^Z pa:i	袋 tai ‘bag’	面袋 ^Z ta:i	皮 p ^{hi} ‘skin’	眼皮 ^Z p ^{hi} ə: o
鞭 piai	马鞭 ^Z pia:i	孩 xai ‘child’	孩 ^Z xɛ:ɔ	痲 fi ‘miliari’	痲 ^Z fiə:ɔ

'whi p'				a'	
镰 liai 'sick le'	镰 ^Z lia:i	拐 kuai 'turn'	线拐 ^Z kue:o	筛 sai 'screen'	筛 ^Z ʂe:o
尖 tsiai 'tip'	笔尖 ^Z tsia:i	筷 k ^h uai 'chopsti- cks'	竹筷 ^Z k ^h ue:o	台 t ^h ai 'platfor m'	香台 ^Z t ^h io: o
院 yai 'yar d'	后院 ^Z ya:i	腿 t ^h uei 'leg'	床腿 ^Z t ^h uə:o	锤 t ^ʂ h ^{uei} 'hamme r'	锤 ^Z t ^ʂ h ^{ue} :o
暖 nuai 'war m'	耳暖 ^Z nua:i	妹 mei 'sister'	妹 ^Z miə:o	穗 sui 'fringe'	麦穗 ^Z suə: o

(Note: BP refers to the Basic Pronunciation and CP refers to the Changed Pronunciation.)

Based on the analysis of the words in Table 2 that are given in Wang Qingfeng (2007)^[21], the basic rimes /ai/ from *Xian* and *Shan She* will adopt the way of 'the prolonged type' to generate their Z rime forms while the corresponding Z rime forms of the basic rimes /ai/ and /uai/ from *Xie* and *Zhi She* are [ɛ:o] and [uə:o] respectively following the combined ways of 'the prolonged type' and 'the fused type'. The difference between Z rime alternation ways of the rime of /ai/ from *Xian* and *Shan She* and the rimes of /ai/ and /uai/ from *Xie* and *Zhi She* illustrates that the phonetic forms of *Xian* and *Shan She* were different from those of *Xie* and *Zhi She* at the time when Z rime alternation phenomena came into being, which is the same with the related phenomena at the time of the formation of Z rime alternation in Zhaogang dialect of Fengqiu County, Henan Province observed by Xia Liping (2012)^[22]. It should be noted that there are also syllables of few words with the rime /ai/ from Middle Ancient *Xie She* generate their corresponding Z rimes adopting the pattern of 'the prolonged type', which indicates that even though the phonetic forms of *Xian* and *Shan She* were different from those of *Xie* and *Zhi She* at the time of the formation of Z rime alternation, there were signs of convergence between the two then.

In addition, different from other dialects, there is also phenomenon of one word having two kinds of Z rime alternation forms in Changyuan Dialect. For example, the original pronunciation of the word “盖” is [kai], but in the phrases “锅盖” and “鳖盖”, “盖” is pronounced as [ka:i] and [kɛ:o] respectively. And also, the original pronunciation of the word “台” is [t^hai], but in the phrases “门台” and “香台”, “台” is pronounced as [t^ha:i] and [t^hio:o] separately. By examining the medieval pronunciation of “盖” and “台”, it can be seen that both of their rimes belong to two different types of rimes simultaneously. The rime of “盖” comes from both *Xie She* and *Xian She*, and their constructed pronunciations in middle ancient Chinese are [kai] and [kap] respectively and the derived pronunciations of the two are [kai] and [kɛ] in modern Chinese separately. For the rime of “台[t^hai]”, it evolves from both *Xie She* and *Zhi She*, and their

constructed pronunciations in middle ancient Chinese are [t^hɔi] and [j^hɛ] respectively and the derived pronunciations of the two are [tai] and [ji] in modern Chinese separately. When *Xian*, *Shan She* and *Xie*, *Zhi She* began to mix together in Changyuan Dialect, the phenomenon that the rimes of “盖[kai]” evolving from *Xie She* and *Xian She* generate their corresponding Z rime forms adopting the way of 'the prolonged type' and the combined way of 'the prolonged type' and 'the fused type' respectively is consistent with the general phonological rules of Z rime alternation in Changyuan Dialect. In the process of changing into [kɛ], it is possible that the main vowel of the syllable [kap], which is the pronunciation of “盖” evolving from *Xian She*, raises its tongue height and becomes [ɛ] firstly.

Although it makes sense to explain the two kinds of Z rime alternation forms of “盖” from its two different phonetic sources, it won't work from the semantic perspective. The pronunciation [kap] of “盖” evolving from *Xian She* refers to place names and the surname while both “盖” in the phrases “锅盖” and “鳖盖” means something serves as a shield. Besides, the rime of “筷” only belongs to *Xie She*, but according to Wang Qingfeng (2007)^[23], “筷” in the phrase “竹筷” can be pronounced as [k^hua:i] and also [k^hue:o], which demonstrates that it is not proper to explain the two kinds of Z rime alternation ways from the two different phonetic sources in Changyuan Dialect.

The present study agrees with Xia Liping (2012)^[24] on the opinion that the rimes evolving from the first and second class of *Xie She* exhaling with mouth opened and closed will undergo the phonetic change process of /ai/ to [ɛ]. After deleting the coda /i/, the tongue position of the main vowel in the rime /ai/ will become higher and more forward, during which process, /ai/ will firstly change into /ɛ/, then /ɛ/ changes into [i]. So, the phonetic change process of the rime /ai/ should be “ai→...→ɛ→...i”, the point of which is basically the same with Wang Futang (2005)^[25]. When reconstructing the phonological change process of the rime /ai/ in Huojia Dialect of Henan Province, Wang Futang (2005)^[25] put forward that the rimes /ai/ and /uai/ will firstly undergo monophthongization and then, the tongue position of the monophthong will become higher and higher, and eventually it will be palatalized. Besides, Liu Baojun (1993)^[26] once discussed the phonetic conditions required for the rime /a/ to produce the pre-nuclear glide “i” in modern Chinese dialects. He pointed out that the forward shift and raising of the vowel “a” in middle Chinese period is a necessary condition for the production of the pre-nuclear glide “i” (it can't be said that if this condition is met, there will definitely be an “i” glide), and the disappearance and the weakening of the coda “i, n, m” in middle Chinese is a sufficient condition for the vowel “a” to change its tongue position more forward and higher (it can't be said that if this condition is met, tongue position of the vowel “a” will definitely become more forward and higher). In the history of Chinese phonology, the rime endings have always played a big role in affecting the main vowel. Once the rime ending disappears, its preceding main vowel will undergo dramatic change. In

the process of phonetic evolution, it is very common to see that the pronunciation of the rime before the sound change coexists with that of the rime after the sound change. So, it's no wonder that there are two different Z rime alternation forms for the rime /ai/ in Changyuan Dialect. Accordingly, the Z rime alternation form [ue:ɔ] of “锤”, whose basic rime is /uei/, indicates that during the process of raising into “i”, the rime /ei/ will change into [ɛ] firstly and the phonetic change process of the rime /ei/ may be “ei→...→ɛ→...i”.

For the word “台[t^hai]”, the authors find out that both the rime evolving from *Xie She* and the rime /ai/ coming from *Xian, Shan She* of “台” adopt ‘the prolonged type’ way to generate their corresponding Z rime forms and the rime [iə] that belongs to *Zhi She* changes into [iə:ɔ] following the combined ways of ‘the prolonged type’ and ‘the pieced type’. But similar to the word “盖”, although it makes sense to explain the different kinds of Z rime alternation ways of “台” from its different phonetic sources, it won't work from the semantic perspective. The pronunciation of “台” evolving from *Zhi She* refers to place names and mountain names while both “台” in the phrases “门台” and “香台” means the platform that rises above the ground. Besides, the rime of “苔” only belongs to *Xie She*, but according to Wang Qingfeng (2007)^[27], “苔” in the phrase “蒜苔” can be pronounced as [t^ha:i] and also [t^hiə:ɔ], which further demonstrates that it is not accurate to explain the different kinds of Z rime alternation ways of a certain rime from its different phonetic sources in Changyuan Dialect. We've discussed the sound change process of /ai/ becoming [i] in the above, the present study argues that the Z rime alternation form [t^hiə:ɔ] of “台[t^hai]” may be formed after the prenuclear glide “i” comes into being.

Similarly, the Z rime alternation form [miə:ɔ] of “妹 [mei]” should be formed after the original rime /ei/ changes into [i], the point of which has already been further testified by the language facts reported in the previous literature. For example, Liu Xunning (1994)^[28] once mentioned that in Qingjian Dialect of Lvliang District, Shanxi Province, “每” is pronounced as [mi]. Since the rime of “妹” and “每” belongs to the same rime in middle ancient Chinese, it is possible that “妹” will be pronounced as [mi] in the adjacent dialect regions. When analyzing the Z rime alternation phenomena in Huojia Dialect of Henan Province, Wang Futang (2005)^[29] and Wang Hongjun (1999^[30], 2008^[31]) pointed out that the glide “i” in the Z rime alternation form [i:ou] of the basic rime /ei/ is formed by the palatalization process of the mid-front vowel. And Wang Hongjun (1999^[30], 2008^[31]) reconstructed the Z rime alternation process of the basic rime /ei/ in Huojia Dialect of Henan Province as “ei+u > *e:u > *ie:u > i:ou” or “i+u > i:ou”. For “妹”, which has a bilabial initial, its Z rime alternation process should be “uei + o → ei + o → ie + o → iə:ɔ” in Changyuan Dialect since the bilabial glide will gradually disappear when it is preceded by a bilabial initial and the sound [ə] can be seen as the transitional sound during the sliding process of the tongue position from the front high vowel [i] to the back

high vowel of the suffix [ɔ].

In conclusion, the phenomenon of one word having two kinds of Z rime alternation forms can be explained as it that the basic rime preserves the Z rime alternation forms that are formed before and after the sound change of the basic rime respectively. And the above illustration further demonstrates that we should analyze the Z rime alternation forms based on the early forms of the basic rimes rather than on the present ones, the point of which is put forward by Wang Futang (2005)^[32]. We can also see that the Z rime and the basic rime belong to different evolutionary systems and the development speed of Z rime is slower than that of the basic rime. So the phenomenon that the glide of the Z rime is different from its corresponding basic rime is due to it that Z rime preserves the glide of the basic rime of the early period.

3. Phonetic Analysis of the Z Rime Alternation Phenomena in Changyuan Dialect Based on the Author's Investigation

In the autumn of 2020, the authors conducted a survey on the Z rime alternation phenomena in Changyuan Dialect. According to the authors' investigation, the corresponding relationships between the Z rimes and basic rimes in this dialect are shown as follows :

Table 3 The Corresponding Relationships Between Z Rimes and Basic Rimes in Changyuan Dialect (2020)

ɲəu (< ɲ)	ɲəu (< ɲ)		
əu (< uɣ, ɣ)	iəu (< i, ei, uei, ai, uai, iɛ)	uəu (< u, uɣ, uɔ)	yəu (< y, yɣ, yɛ)
au (< a, ai)	iau (< i, ɲ, ia, ai, uai, iɛ, yɛ)	uau (< ua)	

By observing the corresponding relationships between the basic rimes and the Z rimes listed in the above table, we can see that the sound combination suffix of Z rime alternation phenomena in Changyuan dialect is [-u], which possesses the features of [+back, +high, +rounded]. And there are two types of Z rime forms in this dialect: the [-au] type rime and the [-əu] type rime. It should be noted that the basic *yang* rime in Changyuan Dialect has only one set of the [-ɲ] rime tail and *yang* rimes ending with [-ɲ] are all pronounced as the corresponding *yin* rimes ending with [-i]. In this dialect, only basic *yang* rimes of *Xian* and *Shan She* still preserve their Z rime alternation forms.

Besides, the present study also finds that the phenomena of one word having two kinds of Z rime alternation forms also exist in today's Changyuan dialect. For example, in the phrase “铁丝” (“iron wire”), the Z rime alternation forms of the word “丝[sɿ]” can be [sɿəu] or [siau]. And in the phrase “树叶” (“tree leaves”), the pronunciation of the word “叶[iɛ]” can change into [iəu] or [iau]. Likewise, the word “孩[xai]” will be pronounced as [xiəu] or [siau], the meaning of which is identical with the phrase “孩子” (“child”), which ends with the suffix “子”. And also, the pronunciation of the word “筷[k^huai]” will change into [k^hiəu] or [k^hiau] to express the meaning

of the phrase “筷子” (“chopsticks”). It is important to point out that the authors conducted two rounds of investigations into the Z rime alternation phenomena of Changyuan Dialect. And to our surprise, even for the same native speaker, the pronunciations of the Z rime alternation forms of the above words are different in the two times of investigations. It seems that the different Z rime alternation forms of the same word are just free variations.

In addition, there is also the phenomenon that one basic rime corresponds to two kinds of Z rime alternation forms in Changyuan dialect. For example, the words “茄 [tɛ^hiɛ]” and “撇 [p^hiɛ]” will be pronounced as [tɛ^hiau] and [p^hiau] to express the meaning of “茄子” (“eggplant”) and “左撇子” (“left-handed person”) respectively, both of which end with the suffix “子”. And the rime of the words “鼻 [pi]” and “李 [li]” will be alternated as [iəu] and [iau] to express the meanings of “鼻子” (“nose”) and “李子” (“plum”) separately. In the analysis of the Z rime alternation phenomena in Changyuan Dialect described by Wang Qingfeng (2007)^[33] mentioned earlier, the authors puts forward that the phenomenon of one word having two kinds of Z rime alternation forms in this Dialect is not related with its two rime sources in the middle Chinese period, but is actually due to it that the basic rime preserves the Z rime alternation forms that are formed before and after the sound change of the rime respectively. The above Z rime free alternation phenomena in this Dialect further confirms our previous hypothesis.

By observing the corresponding relationships between the basic rimes and Z rimes in Changyuan Dialect, and eliminating the phenomena that one word as well as one basic rime carrying two kinds of free Z rime alternation forms discussed earlier, it can be found that the *yin* rimes with low and mid vowels as the main vowel roughly correspond to the [au]-type Z rime alternation form, and the *yin* rimes with mid and high vowels as the main vowel approximately correspond to the [əu]-type Z rime alternation forms. The Z rime alternation phenomena in Changyuan Dialect illustrated above are similar to those in Zhengzhou Dialect of Henan Province described by Zhou Qingsheng (1987)^[34]. And it should be noted that like Changyuan Dialect, Zhengzhou dialect also belongs to the Central Plains Mandarin and only has two kinds of Z rime alternation forms: [-au] type rime and [-əu] type rime. It can be assumed that the *yin* rimes with mid vowels as the main vowel will generate the [V_{mid}-u] type Z rime forms when followed by the sound combination suffix [-u/-o] at the beginning. Li Sijing (1994)^[35] once suggested that the Chinese compound final can be divided into two systems based on the main vowel: one is the [a-] system, and the other is the [ə-] system. The [V_{mid}-u]-type Z rime form doesn't belong to any of them, which makes its phonetic form unstable. So it may merge partially into the [au]-type Z rime form and partially into the [əu]-type Z rime form later on. Therefore, the relationships between Z rime alternation forms and the basic rimes can be generated as follows:

(1)The Corresponding Relationships between the Z Rime Alternation Forms and the Basic Rimes:

$$\left. \begin{array}{l} V_{\text{low}} + u \rightarrow au \\ V_{\text{mid}} + u \rightarrow V_{\text{mid}}u \\ V_{\text{high}} + u \rightarrow əu \end{array} \right\} \begin{array}{l} \rightarrow au \\ \rightarrow əu \end{array}$$

In the Z rime alternation systems of Zhaogang Dialect in Fengqiu county of Henan province analyzed by Xia Liping (2012)^[36] and Hua County Dialect of Henan province described by Li Congcong (2018)^[37], *yin* rimes in these two dialects only generate one kind of Z rime alternation forms: the [au] type rime. It should be noted that both of the two dialects belong to the Central Plains Mandarin. Therefore, after the formation of the coexistence of the [au] type and [əu] type Z rime forms, the Z rime alternation system will continue to evolve, and will undergo the analogical flattening phenomenon according to the investigation of the Z rime alternation phenomena in Changyuan Dialect. The evolution of Z rime alternation forms in Changyuan dialect has undergone a process of advancing from the basic rimes with a low main vowel to those with a middle main vowel and have even evolved towards the basic rimes with high vowel. For example, in the Z rime alternation phenomena of Changyuan Dialect described by Wang Qingfeng (2007)^[38], “李子” is pronounced as [liə:ɔ], the pronunciation of which has changed to [liau] in our investigation. The analogical flattening of [əu]-type Z rime forms also has undergone a process of advancing from basic rimes with a high main vowel to those with a middle main vowel. It can be foreseen that the result of this kind of sound evolution is that the [au]-type Z rime alternation forms will continue to occupy the the phonetic space of the [əu]-type Z rime forms, and ultimately [au]-type Z rime forms will dominate the whole Z rime alternation system. Therefore, the corresponding relationships between Z rimes and the basic rimes mentioned above can be further illustrated as follows:

(2)The Corresponding Relationships between Z Rimes and Basic Rimes:

$$\left. \left. \begin{array}{l} V_{\text{low}} + u \rightarrow au \\ V_{\text{mid}} + u \rightarrow V_{\text{mid}}u \\ V_{\text{high}} + u \rightarrow əu \end{array} \right\} \begin{array}{l} \rightarrow au \\ \rightarrow əu \end{array} \right\} \rightarrow au$$

In addition, apart from the [əu]-type Z rime alternation forms, the *yin* rimes and the basic rimes in the checked syllable of Huojia Dialect also correspond to the [ɔ]-type and [o]-type Z rime alternation forms, according to He Wei (1989)^[39]. Wang Futang (2005)^[40] pointed out that these two kinds of Z rime forms are derived firstly by the sound combination process between the suffix [-u] and the basic rimes, the main vowels of which can be divided into the low vowels and the mid vowels and then the compound rime formed by the sound combination process will undergo monophthongization. And it can be seen that when the main vowel is a low vowel, the sound combination suffix and basic rime will fuse into [ɔ]-type Z rime forms; when the main vowel is a mid-vowel, the sound combination suffix and basic rime will fuse into [o]-

type Z rime forms. In addition to Huojia Dialect, in the Z rime alternation phenomena of Jiyuan Dialect, Xiuwu Dialect, Boai Dialect, Wuzhi Dialect, Wenxian Dialect, Jiaozuo Dialect, Qinyang Dialect, Huixian Dialect, and Mengzhou Dialect in the northwestern part of Henan Province surveyed by Zhang Juan (2005)[41], the yin rimes and the checked rimes will also change into the [ɔ]-type and [o]-type Z rime alternation forms as well as the [əu]-type Z rime forms. And the basic rimes corresponding to the [əu]-type Z rime forms are all yin rimes with high vowels or checked rimes with the main vowel being a high vowel. As the monophthong with a high vowel and the checked rime with the high vowel being its main vowel have the potential to act as prenuclear sounds, they will be squeezed by the fused components during the sound combination process, serving as a glide in the compound syllable, while the fused components occupy the vowel nucleus and coda position of the compound syllable. This kind of sound combination process belongs to ‘the fusion type’. And the “ə” in the [əu]-type Z rime can be regarded as a transitional sound during the sliding process of the tongue position from the front high vowel to the back high suffix. Therefore, the following generative relationships exists among the [əu]-type, [ɔ]-type, and [o]-type Z rime forms are as follows:

(3) The Corresponding Relationships between Z Rimes and Basic Rimes:

$$\left\{ \begin{array}{l} V_{\text{low}} + u \rightarrow au \rightarrow \text{ɔ} \\ V_{\text{mid}} + u \rightarrow V_{\text{mid}}u \rightarrow \text{o} \\ V_{\text{high}} + u \rightarrow \text{əu/u} \end{array} \right.$$

In the Z rime alternation systems of Xinxiang Dialect of Henan province investigated by Gan Yuen and Dong Yibo (2021)[42], apart from the [əu]-type Z rime forms, the corresponding Z rime forms of the yin rimes and the checked rimes are only the [ɔ]-type Z rime. In addition, in the Z rime alternation system in Jiyuan Dialect of Henan province described by He Wei (1981)[44], the corresponding Z rime forms of the yin rimes and the checked rimes are only the [ɔ]-type and [əu]-type Z rime. And the basic rimes corresponding to the [əu]-type Z rime forms are the monophthong with a high vowel and the checked rime with the high vowel being its main vowel, while the basic rimes with the main vowel being a mid or low vowel will generate the [ɔ]-type Z rime alternation forms. Therefore, it can be assumed that the [ɔ]-type and [o]-type Z rime alternation forms will continue to evolve and eventually merge into one, with [o]-type Z rime alternation forms mixing into [ɔ]-type Z rime forms. The corresponding relationships between the Z rimes and basic rimes in (3) can be further illustrated as follows:

(4) The Corresponding Relationships between Z Rimes and Basic Rimes:

$$\left\{ \begin{array}{l} V_{\text{low}} + u \rightarrow au \rightarrow \text{ɔ} \\ V_{\text{mid}} + u \rightarrow V_{\text{mid}}u \rightarrow \text{o} \\ V_{\text{high}} + u \rightarrow \text{əu/u} \end{array} \right\} \rightarrow \text{ɔ}$$

As can be seen from the above, during the initial stage of the Z sound change, in the compound final ending with [-u] formed by the sound combination process will further undergo sound fusion process between the main vowel and the suffix [-u], based on which, the [ɔ]-type and [o]-type Z rime alternation forms in dialects of the northern Jin area in Henan Province, such as Huojia and Jiyuan. However, in dialects of the Henan Mandarin area, such as Changyuan and Zhengzhou, the fusion process doesn't happen. It is worth considering whether the [au]-type Z rime forms in Dialects of Henan Mandarin area have undergone a process of monophthongization to become the [ɔ]-type Z rime forms, just like what the [au]-type Z rime forms in dialects of Jin area have undergone in history. And are the current [au]-type Z rime forms in Henan Mandarin area are formed by the influence of Standard Mandarin and thus being restored? In the authors opinion, this is impossible. If influenced by the Standard Mandarin, the monophthongization of the [ɔ]-type Z rime alternation should gradually disappear rather than being re-diphthongized as the [au]-type Z rime, and it is also unlikely to have syllable structures such as [uou, you, uau, yau], which are not allowed in Standard Mandarin.

4. Conclusion

In Changyuan Dialect, it is a relatively unique phenomena that one word has two kinds of Z rime alternation forms. Through the above analysis, we know that it is due to it that the basic rime preserves the Z rime alternation forms that are formed before and after the sound change of the rime respectively. In addition, the developmental speed of Z rime forms is slower than that of the basic rimes, so the Z rime alternation form preserves the glide of its corresponding basic rime of the early period, which leads to the differences between the glide of the present basic rime and that of the corresponding Z rime alternation form. At the same time, we find that the compound rime ending with the suffix [-u] during Z rime revolution has undergone a fusion process between the main vowel and the suffix [-u] in the dialects of northern Henan regions, whereas the compound rime ending with [-u] during the Z rime revolution process in dialects of Henan Mandarin area hasn't undergone monophthongization. We look forward to further reports on related language facts that can explain the aforementioned Z rime alternation phenomena.

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References

- [1, 10] Wang Hongjun. On the Decline of the Z Variation from the Differences of Small Dialects in Wenxi, Shanxi Province [J]. *Chinese Studies*, Issue Number 1, 2004.
- [2] Wang Hongjun. Two Commonly Used Phonetic Word

- Formation Methods in Chinese -- Starting from Pingding Er Hua and Taiyuan Embedded '1' Word [J]. *Language Studies*, Issue Number 1, 1994.
- [3, 17, 19, 25, 29, 32, 40] Wang Futang. *The Evolution and Hierarchy of Chinese Dialect Phonetics (Revised Edition)* [M]. Peking: Chinese Publishing Press, 2005.
- [4, 30] Wang Hongjun. *Chinese Nonlinear Phonology/Phonological Patterns and Monosyllabic Sounds in Chinese* [M]. Peking: Peking University Press, 1999.
- [5, 31] Wang Hongjun. *Chinese Nonlinear Phonology/Phonological Patterns and Monosyllabic Sounds in Chinese (Updated Edition)* [M]. Peking: Peking University Press, 2008.
- [6] Chen Weiheng. *The Dialects of North Henan and The Sound Change in Chinese* [D]. Doctoral Dissertation of Peking University, 2004.
- [7] Chen Weiheng. *Syllable and Meaning and the Relationships among Phonology, Lexicalization, grammaticalization, and subjectivism: A Theoretical Study of the Phonetic Variation in Northern Henan Dialect* [M]. Peking: Peking Language and Culture University Press, 2011.
- [8] Zhang Huili. *The Sound Pattern of Chinese Rime Change* [D]. Doctoral Dissertation of Peking University, 2011.
- [9] Zhang Huili. *A Study of Rhyme Variation in Mandarin Dialect* [M]. Peking: Peking Normal University Press, 2017.
- [11] Xin Yongfen. Sound Changes of the Suffix 子 of Xunxian Dialect in Henan Province [J]. *Dialects*, Issue Number 3, 2006.
- [12] Chen Ning. Final Varied Pattern of Suffix “子” of Boshan Dialect in Shandong Province and the Related Issues [J]. *Dialects*, Issue Number 4, 2006.
- [13] Niu Shunxin. Sound Changes of Suffix Zi and its Production and Development of Wuzhi Dialect in Henan Province [J]. *Yindu Academic Journal*, Issue Number 3, 2008.
- [14, 22, 24, 36] Xia Liping. Final Varied Patterns of Suffix-Zi 子 in Zhaogang Dialect of Fengqiu County, Henan Province [J]. *Dialects*, Issue Number 3, 2012.
- [15, 42] Gan Yuen and Dong Yibo. Gan Yuen, Dong Yibo. On the Phonetic Types of Final Varied Patterns of Suffix-Zi 子 in Xinxiang Dialect of He'nan Province [J]. *Dialects*, Issue Number 2, 2020.
- [16, 18, 21, 33, 38] Wang Qingfeng. *Phonetics of Changyuan Dialect* [M]. Zhengzhou: Zhongzhou Ancient Books Publishing House, 2007.
- [20] Qiao Quansheng. History of the Same Rhyme of Ancient Ahi - hui in Jin Dialect [J]. *Journal of Jinzhong University*, Issue Number 1, 2008.
- [26] Liu Baojun. On the Phenomenon of "First Class Preposition [i]" in Modern Chinese Dialects [J]. *Journal of Central China Normal University (Philosophy and Society Edition)*, Issue Number 1, 1993.
- [28] Liu Xunning. On the Origin of Personal Pronouns and Personal Nouns [°mi] in Qingjian Dialect [J]. *Language and Linguistics in China (Part 2: Historical Linguistics)*, 1994.
- [34] Zhou Qingsheng. The Initial, Final and Tone of Zhengzhou Dialect [J]. *Dialects*, Issue Number 3, 1987.
- [35] Li Sijing. *Research on the Phonological History of 'er' [ə] in Chinese* [M]. Peking: Peking Commercial Press, 1994.
- [37] Li Congcong. *A Study of Rime Change in Huaxian Dialect* [D]. Master's Thesis of Henan University, 2018.
- [39] He Wei. *A Study of Huojia Dialect* [M]. Peking: Peking Commercial Press, 1994.
- [41] Zhang Juan. *A Study on the Z Rime Change in Henan and Shanxi Dialects* [D]. Master's Thesis of Peking University, 2005.
- [44] He Wei. *A Brief Account of Jiyuan Dialect* [J]. *Dialects*, Issue Number 1, 1981.