A Comparative Study of the Production of 3rd Tone Sandhi in Disyllabic Words Produced by Native Speakers of Bayannur and Haikou Chinese Dialects

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Abstract. Tone sandhi has always been a popular topic in phonology and phonetics. The most studied type of tone sandhi is the 3rd tone sandhi. Previous researchers showed that tone sandhi patterns are different in different dialects, and dialects in the same region share similar patterns. However, few comparative studies have been done. The paper aims to compare the production of 3rd tone sandhi in Bayannur dialect and Haikou dialect. In this paper, the author focuses on three types of 3rd tone sandhi. The pronunciations were obtained from real recordings of native speakers. Besides, Mandarin was recorded as a control group. These recordings were carefully listened to and analyzed. The results show that Bayannur dialect has more similar patterns of tone sandhi with Mandarin than Haikou dialect; half-dipping tones and T1 occur more frequently in T3 disyllabic words in Haikou dialect; both dialects shift the final T3 in reiterative locutions to T2.

Keywords: Tone · 3rd Tone sandhi · Bayannur dialect · Haikou dialect

1 Introduction

There are generally four lexical tones in Mandarin Chinese: high level tone (T1), rising tone (T2), dipping tone (T3), and falling tone (T4). When combining these characters into words, on some occasions, the tone of one or more characters may change under the effect of tones from adjacent characters. This is a phonological phenomenon called tone sandhi. Tone sandhi occurs the most in disyllabic words. Among the four lexical tones, T3 is unique in that it has highly context-conditioned phonetic realizations [1]. It stays its original tone when it is the final syllable of a word or sentence. In the initial position of a disyllabic word, however, its realization is governed by the tone sandhi process, which alters the surface tone of T3 as a function of the following tonal context [1].

Previous studies have revealed that different dialects in China share different tone sandhi patterns. A study conducted by Li shows that dialects in northern China tend to occur with disyllabic tone sandhi in the first syllable, whereas southern China has the opposite trend [2]. However, the focus of dialects is mainly on the middle region of China; very few dialects of the border regions are studied. Additionally, only a few

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comparative studies of more than one dialect have been done. Thus, in this paper, the two main subject dialects will be from Inner-Mongolia (north-western region) and Hainan Province (southern region).

The aim of this study is to compare the production of tone sandhi in disyllabic words produced by native speakers of Bayannur and Haikou Chinese dialects. This study will be done by experiment, with standard Mandarin as the control group. By studying the tone sandhi patterns of these two dialects, people can pay more attention to them. Thus, not only more research aspects and results on tone sandhi are brought, but an opportunity is offered for people to grow interest and inherit these dialects as well.

2 Background Information

2.1 Tone Sandhi

Phonological context-dependent tone substitution is widely found in East Asian languages and often referred to as tone sandhi [3]. The tone sandhi is a phonological change occurring in tonal languages, in which the tones assigned to individual words or morphemes change based on the pronunciation and adjacent words or morphemes [4]. Tone sandhi will only occur when more than one character is present. One of the most well-studied types of tone sandhi is the T3 tone sandhi. For example, in a T3T3 disyllabic word, the first T3 changes to T2, with a rising pitch; this phonological process is referred to as the full sandhi process. In contrast, T3 is realized as a low-falling tone before T1/2/4, and this phonological process is referred to as the half sandhi process [5]. Because a tone is used to distinguish words in tone languages, tone sandhi can result in word/morpheme ambiguity [3]. Another categorization of tone sandhi is independent of the tone pronunciations. By this, four types of tone sandhi can be given. One of the types refers to tone sandhis which target tones in a particular position, typically the left or right edge of a polysyllabic string. In this type, tonal context does not play a role [6]. According to Bao, this is called positional tone sandhi.

2.2 Bayannur Dialect

The word “Bayannur” means “rich lake” in Mongolian. It is a city that sits in the west region of Inner-Mongolia. It connects to Baotou city in the east, Alxa League in the west, Mongolia in the north, and The Yellow River in the south. Bayannur is located between 105° 12′ - 109° 53′ E and 40° 13′ - 42° 28′ N. It also has jurisdiction over 4 banners, 2 county seats, and 1 municipal district [7]. As Northwest Mandarin, Bayannur dialect is a sub-branch of the northern dialect and shares several common features with Jin dialect. There are lots of differences between Bayannur and Mandarin. Bayannur dialect has 25 initials and 34 simples in total [8].

2.3 Hainan Dialect

Hainan is located between 108° 37′ - 111° 03′ E and 18° 10′ - 20° 10 N. It is the second biggest island in China. The census in 2000 shows that there are over 30 minorities in

Hainan, most of which have their own dialects. The most common dialect other than Mandarin is Hainan Min dialect, which is spoken by over half of the entire Hainan population [9]. Based on phonological properties, Hainan Min dialect shares a lot of similarities with Southern Fujian dialect, thus, many researchers regard Hainan Min dialect as a branch of Southern Fujian dialect [10]. Haikou is the provincial capital of Hainan. Haikou has its dialect which belongs to Min dialect. Unlike Mandarin, there are 8 citation tones in Haikou dialect [10].

3 Experiment Design

The aim of this study is to compare the production of tone sandhi in disyllabic words produced by native speakers of Bayannur and Hainan Chinese dialects. This would be a lab experiment. The independent variable is the dialect. In this study, Mandarin will be included as both a control group and a reference for standard tone.

3.1 Participants

About the selection of participants, the traditional choice is to take those who are elderly and have less education and travel experience to ensure the true dialect [4]. However, due to the current COVID-19 situation, it is both difficult and inconvenient to visit the locals and select the best participants. Instead, it is possible to find people who were born and grew at the local area, but they left their places for some reasons. This can ensure that the participants are native speakers of their dialects. For each type of dialect, two people who suit the conditions above will be selected, with one male and one female for fairness. Considering there are three types of dialects, there will be six participants in total.

3.2 Procedure

The study is going to focus on three types of tone sandhi:

1) T3T3: T3 (initial) → T2
2) T3T3: T3 (initial) → half-dipping tone (special occasions)
3) T3T2/-T1/-T4: T3 → half-dipping tone

For each type of tone sandhi, ten words from daily life will be chosen. There will be thirty words in total.

During the experiment, each participant will be asked to read these words loud enough so that researchers can clearly record them. They will be asked to follow their native pronunciation habit, which means there should not be too much time hesitating for deducing the true pronunciation of a certain word. Since the COVID-19 condition is severe right now, the only achievable recording method is online recording. This would no doubt interfere with the accuracy of the results because background noises naturally exist, but it is for safety purposes.

After recording, their pronunciation will be analyzed and compared with standard Mandarin. There will be two people analyzing these pronunciations for accuracy.

Table 1. T3T3 disyllabic words list.

Words	Phonemic transcription	Meaning
打鼓	/ta3 ku3/	[v.] to play drum
匕首	/pi3 ʂoʊ3/	[n.] knife
鼓舞	/ku3 u3/	[v.] to cheer up
老虎	/lɑʊ3 xu3/	[n.] tiger
领导	/lɪŋ3 tɑʊ3/	[n.] leader/[v.] to lead
炒米	/ʈʂʰɑʊ3 mi3/	[n.] fried-rice/[v.] to fry rice
母语	/mu3 y3/	[n.] mother-tongue
五谷	/u3 ku3/	[n.] five kinds of cereal
祖母	/tsu3 mu3/	[n.] grandmother
苦楚	/kʰu3 ʈʂʰu3/	[n.] pain; miserableness

3.3 Word Choice

This study is going to study three types of tone sandhi. For each type of tone sandhi, ten disyllabic words will be chosen at random. These words are words that are frequently used in daily life, thus it is easier for participants to pronounce them. The first ten disyllabic words seen in Table 1 belong to the T3T3 type. Both characters have the third tone when both are isolated and formed together as a disyllabic word. In other words, there is no neutral tone on this occasion:

Table 2 shows another ten words that belong to a special condition of T3T3 type. Unlike the first type, the latter tone is a neutral tone. The neutral tone usually occurs in a disyllabic word ending with pronunciations like /tsɯ/, in reiterative locution, and in other special cases. Among these ten words, three end with a /tsɯ/, three are reiterative locutions, and the rest four are randomly chosen.

The last ten words in Table 3 are combinations of a T3 character and another character with tones other than T3. Among these ten words, three of them are T3+T4, three are T3+T1, and the rest four are T3+T2.

4 Result

4.1 Bayannur Dialect

In the first group, both participants changed the initial tone from T3 to T2 in nine out of the ten words, which matches the pattern in Mandarin (the control group). However, there is one exception: 匕首. Both female and male participants pronounce the first character as /pi4/ rather than its official tone /pi3/. Not only both participants, but people of similar ages who even speak standard Mandarin as well pronounce 匕 as /pi4/. History may be a reason to explain this. In their era when they are educated, they are taught to pronounce it in T4, while in the current era, after several official revisions, the correct pronunciation is changed to /pi3/. Thus, this word is not taken into analysis.

Table 2. T3T3 disyllabic words (special occasions) list.

Words	Phonemic transcription	Meaning
椅子	/i3 tsɯ˝/	[n.] chair
本子	/pən3/ tsɯ˝/	[n.] book; notebook
果子	/kuɔ3 tsɯ˝/	[n.] fruit
姐姐	/tɕjɛ3 tɕjɛ˝/	[n.] older sister
狗狗	/koʊ3 koʊ˝/	[n.] dog
奶奶	/naɪ3 naɪ˝/	[n.] grandmother
尾巴	/weɪ3 pa˝/	[n.] tail
数落	/ʂu4 luɔ˝/	[v.] to blame; to criticize
老实	/lɑʊ3 ʂə˝/	[adj.] honest; quiet
马虎	/ma3 xu˝/	[adj.] careless

Table 3. T3T4/-T1/-T2 disyllabic words list.

Words	Phonemic transcription	Meaning
马戏	/ma3 ɕi4/	[n.] circus
紫色	/tsɯ3 sɤ4/	[n.] color purple
祖父	/tsu3 fu4/	[n.] grandfather
乳鸽	/ʐu3 kɤ1/	[n.] squab
捕捉	/pu3 ʈʂuɔ1/	[v.] to catch
马蜂	/ma3 fɤŋ1/	[n.] hornet
打球	/ta3 tɕ^{h}joʊ2/	[v.] to play with a ball
旅游	/ly3 joʊ2/	[n.] travel/[v.] to travel
赌博	/tu3 pɔ2/	[n.] gamble/[v.] to gamble
洗牌	/ɕi3 p^{h}aɪ2/	[v.] to shuffle

The results in the second group show a little difference. The half-dipping tone in the first character is heard in eight out of ten words. The exceptions occur in neither /tsɯ/ type nor reiterative locution: 老实 and 马虎. When pronouncing /lɑʊ3 ʂə˝/ and /ma3 xu˝/, both participants pronounced the initials as /lɑʊ2/ and /ma2/ and keep the second character as a neutral tone. Besides these two exceptions, another pattern is also noticed. When pronouncing a reiterative locution, both participants would pronounce the second character as a T2 instead of a neutral tone. Thus, another type of tone sandhi can be concluded: if there is a T3 reiterative locution, native Bayannur speakers will not only pronounce the first T3 character as a half-dipping tone but also change the latter neutral tone to a T2. Similarly, the difference in the third group is mainly in the second character. Both participants pronounced the first T3 as a half-dipping tone for all ten words, which

follows the pattern in Mandarin. However, the second character is not the same. Both participants pronounced a neutral tone in two of the three T3T1 words: /ʐu3 kɤ˧/ instead of /ʐu3 kɤ1/; /pu3 ʈʂuɔ˧/ instead of /pu3 ʈʂuɔ1/. Besides, a change when pronouncing T3T2 words is detected. Except for 打球, both participants pronounced the T2 in the other three words as T1. However, after letting them pronounce the three T2 characters alone, it is found that they naturally pronounce them as T1, thus it cannot belong to tone sandhi.

4.2 Haikou Dialect

The first group was designed to choose ten words with normal T3T3 condition, and it was expected that the initial T3 would be pronounced as a T2. However, both participants pronounced either a half-dipping T3 or a T1 instead. There were four words in total where they pronounced the first T3 as a T1: 打鼓, 匕首, 老虎, and五谷. Others were pronounced in a half-dipping tone except for one word. The word 祖母 does not exist in Haikou dialect; instead, they would say 阿嫲 (a word in Min dialect pronounced as /a1 ma4/) for grandmother, so this word was not taken into account.

The results from the second group are more discrete. As mentioned above, the second ten words consisted of three ending with a /tsɯ/, three reiterative locutions, and four ending with a neutral tone. Both participants pronounced the initial T3 as a half-dipping tone. This follows the pattern in Mandarin. All /tsɯ/s were pronounced as a T2 instead of neutral tones. Similar to Bayannur dialect, the second T3 in reiterative locution was pronounced as a T2 except for 奶奶. The reason is the same as 祖母. As for the rest four words, the neutral tone is replaced by a T1 except for 尾巴. The neutral tone in 尾巴 was pronounced as a T4. Similarly, eight out of ten initial T3 were pronounced as a half-dipping tone; only the initial of 打球 was a T1. 祖父 is not included because it is not frequently used by Haikou people. The pronunciations of the second character seem to have no obvious pattern: T1, T2, and T4 occurred in all three kinds of tones.

5 Conclusion

This study attempts to compare the production of the 3rd tone sandhi produced by native speakers of Bayannur and Haikou dialects. Generally, no significant difference is noticed between Bayannur dialect and Mandarin. When facing a T3T3 word (with no neutral tone), Bayannur speakers change the initial T3 to a T2. In the other two groups, most of the initial T3s were pronounced as a half-dipping tone. However, there are some special cases and lots of variations in the second character. Haikou dialect shows a more varied pattern than Bayannur dialect. Almost none of the three types followed the same pattern as Mandarin. The phenomenon of T3 changing to T2 in T3T3 type of word seems not to frequently occur; instead, they pronounce more half-dipping tone and T1 for initial T3. A common pattern for both dialects is that they will pronounce the second T3 as a T2 in T3 reiterative locutions. However, there are only 30 words and 6 participants in total; the size lacks reliability. Additionally, the study focuses on the disyllabic tone sandhi, thus only the tones in two-character words were measured. There was no recording of citation tones for both dialects beforehand, which made it difficult to analyze, and the

analysis for Haikou dialect is limited. Additionally, some words chosen for this study may not exist in certain dialects. Therefore, in future studies, the weaknesses mentioned above should be avoided for more accurate results.

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