Research on Phonetic Biases of Comorian Chinese Beginners

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Abstract. In this paper, acoustic analysis has been conducted with Praat based on 22 Chinese speech samples collected from Comorian Chinese beginners. Results showed that Comorian Chinese beginners are prone to the following bias while learning Chinese phonetics: (1) *TuanYin* phonemes *j*[tɕ], *q*[tɕʰ], *x*[ɕ] being articulated as tongue-tip *JianYin* phonemes; (2) the three Chinese *i* vowels being articulated with positions neither high nor front enough; (3) palatal *i* vowel and tongue-tip *i* vowel being confused; (4) *SeCaYin* phonemes *z*[ts], *j*[tɕ], *zh*[tʂ], *c*[tsʰ], *q*[tɕʰ], *ch*[tʂʰ] being articulated lacking an effective air-blocking initial stage; (5) voiced *CaYin* phoneme "r[ʐ]" being pronounced as a trill; (6) aspirated phonemes and unaspirated ones being confused; (7) final vowels *ou* [əu], *u*/u; y; əu/, and *ü* [y] being confused; (8) the phoneme *ch* [tʂʰ] being articulated as [ʃ]; (9) neither rising the scale of the *YangPing* tone, nor lowering the scale of the *QuSheng* tone as expected; (10) the *ShangSheng* tone being pronounced into two halves and within incorrect pitch ranges; (11) deviating from the right pitch trajectory in the speech flow. Most of these biases have something to do with the multilingual background of local learners derived in an environment where the influence of their native language is lost, the phonetic and provincial rules of Chinese *PinYin* Scheme, and improper teaching and learning methods. To correct these biases, lots of treatment suggestions have been put forward, such as benchmark-referencing teaching and the *YinPing* -*QuSheng* -*YangPing* -*ShangSheng* teaching sequence for Chinese four tones.

Keywords: Multilingualism; Negative Transfer; Bias Analysis; Chinese Phonological Acquisition.

1. Introduction

Phonetic learning is the first and the most important phase of Chinese second language acquisition [1]. Currently, there have been numerous studies about the phonetics teaching and learning of Chinese as a second language. Some focus on the macroscopic laws of Chinese phonetic teaching. It has been suggested that, for English native speakers, the Chinese four tones should be taught following a *YinPing*(1st tone) -*QuSheng*(4th tone)- *YangPing* (2nd tone) -*ShangSheng*(3rd tone) sequence [2, 3]; Considering the phonetic characteristics of learners' native languages, Xiaobing Zhou (2007) proposed that similar items between target language and mother language, as well as easy items should be taught firstly [4]; Feng Shi (2023) elaborated on the principles of second language phonetic teaching, such as phonetics should be taught in the speech flow and the combination of elaborate teaching and extensive exercising[5]; Nan Ye (1999) advocated the four tones and their variants in the speech flow should be taught via singing [6]. Some explored factors affecting Chinese phonetic acquisition as a second language. Shimei Fu (2004) and Yi Zhou (2005) pointed out that the pronouncing and provincial rules of Chinese *PinYin* Scheme could mislead Chinese learners' articulation [7, 8]. And others focused on phonetic biases of Chinese learners whose mother languages, just like English and Thai, are widespread globally. For example, Hongyin Li (1995) and Zhengying Cai (2002) analyzed common phonetic biases of Thai native speakers when they are learning Chinese respectively via feature description and phonetic investigation [9, 10]. Additionally, there are studies describing overall phonetic biases of learners from various language backgrounds. For instance, Qibin Ran (2019) concluded the general trend of phonetic biases of learners from different language backgrounds based on a self-built phonetic bias database[11].

However, few studies have focused on East African languages. For colonial reasons, countries in Eastern Africa commonly use lots of languages simultaneously such as Arabic, English, French as well as tribal languages derived from pidgin or lingua franca. Taking Comoros as an example, in this muslim country, it's very easy to find a Comorian who can speak Comorian, Arabic, French, and English. However, what is unusual is that natives, both educated and uneducated, usually don't know

how to write their mother language, namely the Comorian language. And the only difference brought by education here is that, for those educated ones, they can often write their second languages well, like French and Arabic, instead of their mother language.

This, probably, is caused by the country's history, politics and economy conditions. Since independence, Comoros has had a French-language public education system. It was not until 2001 that the Comorian language has been listed as one of the country's official languages, until then French and Arabic were main official languages of the country. According to statistics, nearly 25% of Comorans speak French as a second language [12]. It can be seen that despite as the mother tongue, the influence of Comorian in the political, economic, and educational fields within the country is less strong than those of French or Arabic. This phenomenon is also related to the complex situations of the Comorian language. Ottenheimer (2012) points out that there are totally four accents, namely, shingazidja, shimwali, shinzwani, and shimaore (shingazidja and shimwali are similar, shinzwani and shimaore are similar), as well as two sets of writing systems, using Arabic alphabets or Latin alphabets respectively, in the Comorian language system [13]. In this paper, such an anomaly in which the comprehensive influence of one's mother tongue is less than that of a second language or other languages is called the loss of influence of one's mother tongue. It is reported that this problem remains in western and southern Africa, such as Benin and Botswana. However, in most East African countries and regions (except Uganda and Mozambique), this problem has been well-concerned and improved since political leaders of Tanzania, Kenya and other eastern African countries had strongly promoted Swahili, the common language in Africa [14, 15].

This paper is intended to describe Chinese phonetic biases of Comorians, explore coreelations between these biases and local multilingualism brought by an influence-limited native language, and make teaching treatment suggestions accordingly.

2. Investigation

2.1 Materials & Participants

Self-designed Chinese mono-and disyllabic test tables (see Appendix I) have been used in this investigation to collect Chinese speech samples of native Comoran speakers. They have been guaranteed that their personal information would only be collected for academic use, and we would not collect their recordings until they have clearly told us that they were willing to participate in this small research. Finally, 22 Comorian speakers' samples and two Arabic samples have been collected from a nature class in the first grade of the Confucius Institute of the University of Comoros. All 22 Comorian students have been learning Chinese for about three months.

2.2 Method

Based on these samples, Praat, an application specialized in phonetic analysis, is used in this paper to compare the phonological acoustic features of these 22 primary Chinese learners' interlanguage, native language, and medium language, so as to provide statistical support for further studying Chinese phonetic bias made by beginners whose first language is Comorian.

3. Results

Common biases made by Comoran natives when learning the Chinese phonetics can be briefly summarized as follows: (1) *TuanYin* phonemes *j*[tɕ], *q*[tɕ^{h}], *x*[ɕ] being articulated as tongue-tip *JianYin* phonemes; (2) the three Chinese *i* vowels being articulated with positions neither high nor front enough; (3) palatal *i* vowel and tongue-tip *i* vowel being confused; (4) *SeCaYin* phonemes *z*[ts], *j*[tɕ], *zh*[tʂ], *c*[ts^{h}], *q*[tɕ^{h}], *ch*[tʂ^{h}] being articulated lacking an effective air-blocking initial stage; (5) voiced *CaYin* phoneme *r*[ʐ] being pronounced as a trill; (6) aspirated phonemes and unaspirated phonemes being confused; (7) vowels *ou*[əu], u([u], [y], and [əu]), and *ü*[y] being confused; (8) phoneme *ch*[tʂ^{h}] being articulated as phoneme *sh*[ʂ]; (9) neither rising the scale of the *YangPing* tone,

nor lowering the scale of the *QuSheng* tone as expected; (10) *ShangSheng* tone being pronounced in two halves and within incorrect pitch domains; (11) deviating from the right pitch trajectory in the speech flow. All these phonetic biases could be divided into three categories: articulation positioning bias, articulation method bias, and tone bias for detailed discussion.

3.1 Articulation Positioning Biases

Learners whose first language is the Comorian language generally have some articulation positioning bias while learning certain Chinese phonemes, especially the palatal *i* vowel, as well as the *TuanYin* phonemes *j*[tɕ], *q*[tɕʰ], *x*[ɕ].

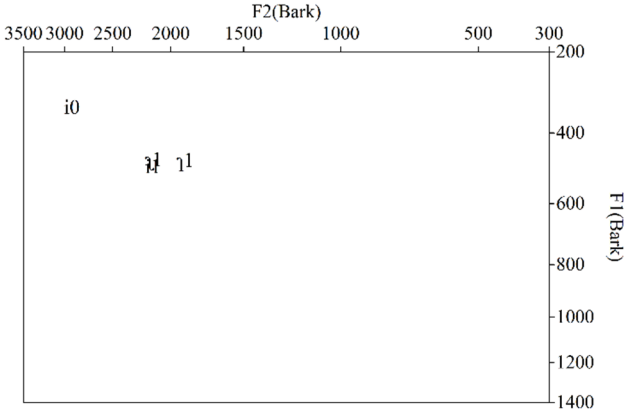

Figure 1. F1-F2 Figure of Chinese *i* Vowels in Mandarin and Comorian Interlanguage

In Chinese phonetics, the two tongue-tip vowels, namely *i*[ɿ] and *i*[ʅ], can only be respectively used after initial consonants *z*[ts], *c*[tsʰ], *s*[s] and *zh*[tʂ], *ch*[tʂʰ], *sh*[ʂ]. As is revealed by the statistical figure of three Chinese *i* vowels in both Mandarin Chinese and 22 speech samples (see Figure 1), articulating positions of the two tongue-tip *i* vowels, namely front-tongue-tip *i*[ɿ] (see ɿ1 in Figure 1) and post- tongue-tip *i*[ʅ] (see ʅ1 in Figure 1) in the 22 samples are very close to that of the palatal *i*[i] (see i1 in Figure 1) in Mandarin Chinese, and the palatal *i*[i] in the 22 samples is obviously lower and more back, than Chinese native speakers do. It suggests that native speakers of the Comorian language have generally articulated the three *i* vowels in Chinese with their tongue positions neither high nor front enough, compared with that of Mandarin Chinese speakers. The most typical problem of this is that they often mistakenly articulate the Chinese-unique tongue-tip vowel *i* as the common palatal vowel *i*. Thus, we can always hear them articulating the Chinese syllable *sì* as the French conjunction *si* in and af ter class.

In addition, pronunciations like *z-ǐ* (actually the Chinese syllable *jǐ*), *c-ī* (actually the Chinese syllable *qī*), *siè* (actually the Chinese syllable *xiè*) can often be heard among these Comorian students too. We've taken a standard Mandarin Chinese audio (Here we referred to Xianming Bei(2017), judging whether a phoneme is pronounced with position front or not according to its band energy curve shape, as well as the distribution of peak points on the curve [17].) as a reference (all denoted as"0" in Figure 2) and compared the 22 speech samples with it. Results showed that the average band energy curves of these samples (all denoted as "1" in Figure 2) generally demonstrate a more obvious declining trend and much fewer peak points than that of the standard audio does, which indicates that these 22 students had used the tip of the tongue to articulate initial consonants *j*[tɕ], *q*[tɕʰ], *x*[ɕ]. However, in Chinese, *j*[tɕ], *q*[tɕʰ], and *x*[ɕ] are all palatals (these three are also called *TuanYin* in Chinese), and only initial consonants like *z*[ts], *c*[tsʰ], and *s*[s] are tongue-tip (these three are also called *JianYin* in Chinese). Therefore, we can often hear students with a Comorian first language mistakenly articulate the *TuanYin* phoneme *j*[tɕ] as the *JianYin* phoneme *z*[ts], the *TuanYin* phoneme *q*[tɕʰ] as the *JianYin* phoneme *c*[tsʰ], and the *TuanYin* phoneme *x*[ɕ] as the *JianYin* phoneme *s*[s].

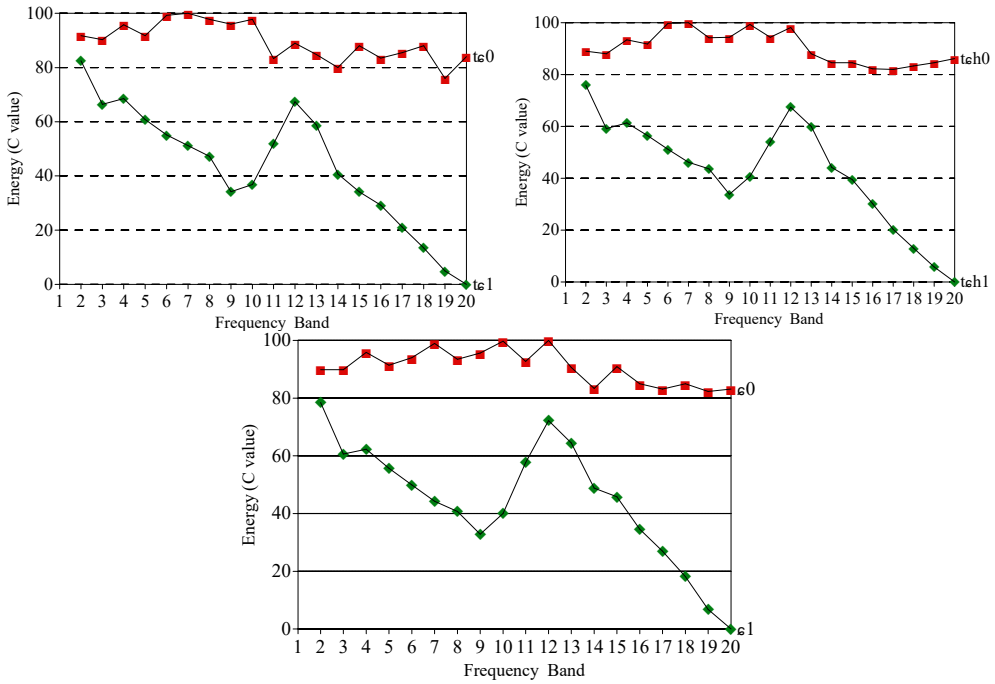

Figure 2. *Mandarin-Interlangual* Frequency Band Curves of *j, q*, and *x*

3.2 Articulation Method Biases

The syllable *rén* being articulated as a trill sound, the syllable *tā* being articulated as the unaspirated syllable *dā*, the syllable *chǎo* being articulated as *shǎo*, the syllable *dou*[dəu] being articulated as *du*[du], as well as *jia weixin* being articulated as "cia weisin" are all common bias for Comorian learners.

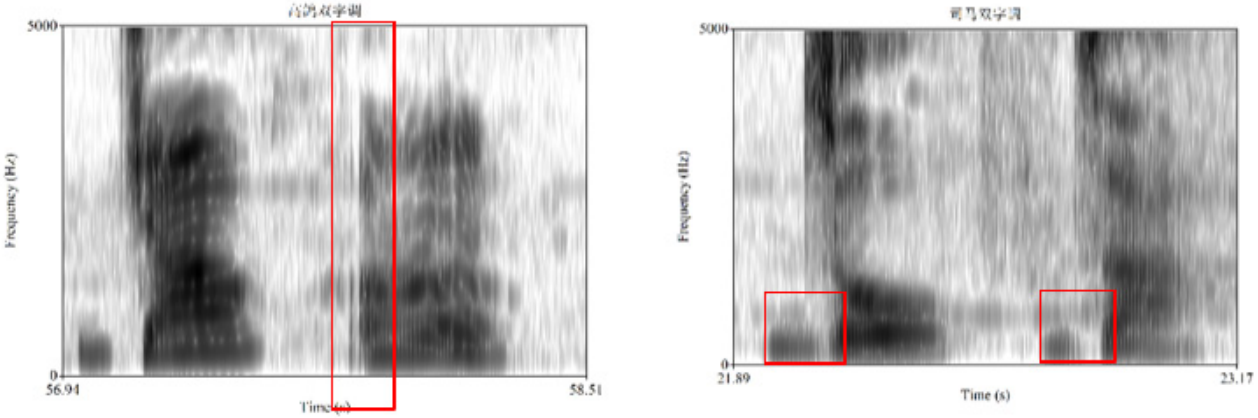

Figure 3. Wide-band Speech Diagrams of *rén* and *tā*

In one of the 22 wide-band speech diagrams of the syllable *rén* (see Figure 3 left), straight bars featuring trill sounds at the beginning are very obvious, but the dulled bars, which are features of voiced sounds, are not that obvious. This shows that Comorian learners tend to take the Chinese voiced fricative (also called *CaYin* in Chinese) *r*[ʐ] as a trill. Besides, the phonetic problem of *tā* being articulated as unaspirated *dā*, often made by local elementary school students, college students, and public officials, could also reflect the confusion of Comorian Chinese learners between Chinese aspirated and unaspirated phonemes too. In addition, the wide-band speech diagram with obvious dulled bars (see Figure 3, right) indicates that Comorian Chinese beginners have articulated the Chinese unvoiced *zhāozhā* as voiced sounds. Therefore, Comorian Chinese learners perhaps cannot differentiate unvoiced sounds from voiced sounds too.

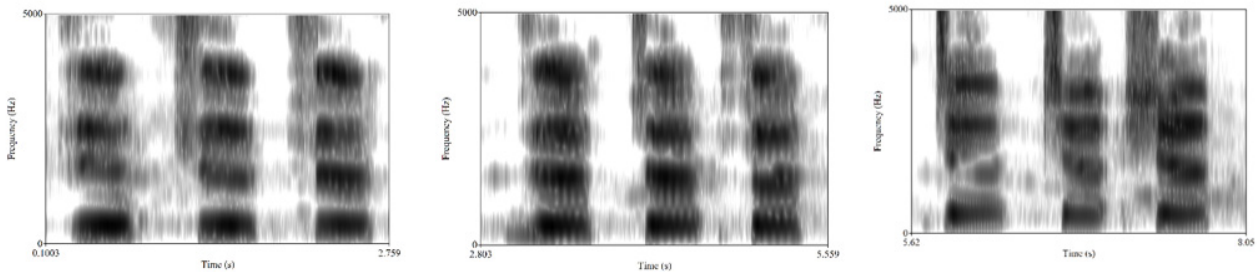

Figure 4. Wide-band Speech Diagrams of *j, q, x, z, c, s, zh, ch* and *sh* in Chinese

In Chinese, there are totally three possible articulating positions for both fricatives (also called *CaYin* in Chinese) and affricatives (also called *SeCaYin* in Chinese), namely pre-tongue-tip, pre-palatal, and post-tongue-tip. Wide-band speech diagrams of Chinese *CaYin* and *SeCaYin* phonemes in pre-tongue-tip, post-tongue-tip, and pre-palatal positions (see Figure 4, left, middle and right, respectively) articulated by Comorian native speakers are generally very similar, which suggests that Comorian Chinese beginners may consider pre-tongue-tip, pre-palatal, and post-tongue-tip *CaYin* and *SeCaYin* phonemes just as the same sounds, especially the pre-tongue-tip ones and their pre-palatal counterparts (see Figure 4, left and middle). In the wide-band speech diagrams of Chin ese *SeCaYin* phonemes, there is no straight stripes representing the initial stage of airflow blockage while articulating affricatives, but there are instead vertical and then chaotic patterns which are typical features of *CaYin*. Thus, most Comorian Chinese learners can not block the airflow effectively in the initial stage when pronouncing the Chinese *SeCaYin* phonemes *z*[ts], *zh*[tʂ], *j*[tɕ], *q*[tɕ^{h}], *c*[ts^{h}], *ch*[tʂ^{h}]. And we call this the bias of *SeCaYin* phonemes being articulated lacking an effective air-blocking initial stage.

3.3 Tone Biases

Tone biases can be not only reflected in the relative pitch pattern, but also seen from the fundamental frequency data of speech samples [18]. In this research, the relative pitch pattern and fundamental frequency data of mono-and disyllabic samples were both used to analyze tone problems of Comorian Chinese learners. Among 22 speech samples, 7 had interrupted third tone, accounting for nearly 32%. In the T-mean diagrams of the remaining 15 monosyllabic samples(see Figure 5), the first tone (also called *YinPing* in Chinese) has been pronounced as a 45 tone with a main problem in the tone value (see the line 1 in Figure 5); the second tone (also called *YangPing* in Chinese) has been pronounced as a 24 tone with a pitch curve similar to that of the third tone but more flat and its problems are first in the tone domain and then in the tone type (see line 2 in Figure 5); the fourth tone (also called *QuSheng* in Chinese) is pronounced as a 454 tone, of which, the overall trend is still falling and its main problem is also first in the tone domain and then in the tone type (see line 4 in figure 5); the third tone (also called *ShangSheng* in Chinese) is pronounced as a 204 tone and its main problem lies mainly in the tone domain (see line 3 in Figure 5). Obviously, for Chinese learners with a Comorian first language, the *YinPing* tone is the easiest to learn since they've made the least mistakes in this tone. Generally, there is little difference in the learning difficulty between the *YangPing* tone and the *QuSheng* tone since their main problems are both first in the tone domain and then in the tone type. However, we still think the *QuSheng* tone is much easier to learn than the *YangPing* tone, since the latter is a middle-rising tone, of which, the starting pitch point can be very difficult to find. And the *ShangSheng* tone should be the most difficult tone for Comorian Chinese learners, as its tone domain problems and tone pattern bias are both very obvious. Besides, when it mentions to the learning of the *ShangSheng* tone, several Comorian students tend to break the *ShangSheng* tone in two havles in pronunciation. Therefore, for Comorian Chinese beginners, the acquisition sequence of the four Chinese tones, also the sequence from easy to difficult, should be the *YinPing* tone, the *QuSheng* tone, the *YangPing* tone and finally the *ShangSheng* tone.

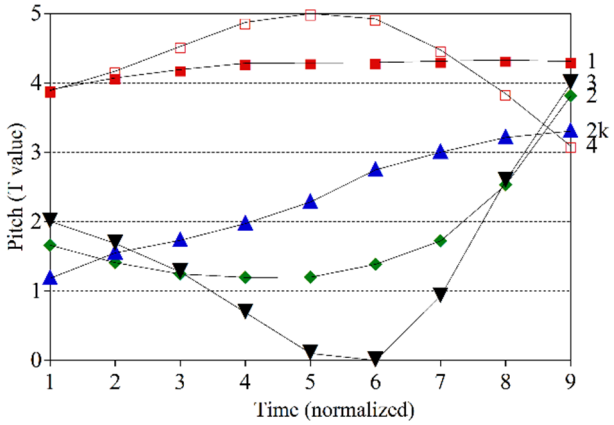

Figure 5. Pitch Curve of Comorian Chinese Beginners' Four Chinese Tones

The pitch curve of the monosyllabic broken *ShangSheng* samples shows that Comorian Chinese beginners tend to break the *ShangSheng* tone into two halves at the turning point from the falling trend to a rising one (see Figure 6, left), and some conventional samples even pronounced the *ShangSheng* tone as a rising-falling-rising pattern, which is similar to the stroke shape of the Chinese character *ji*, and we call it *ji* -type tone bias(see Figure 6, right).

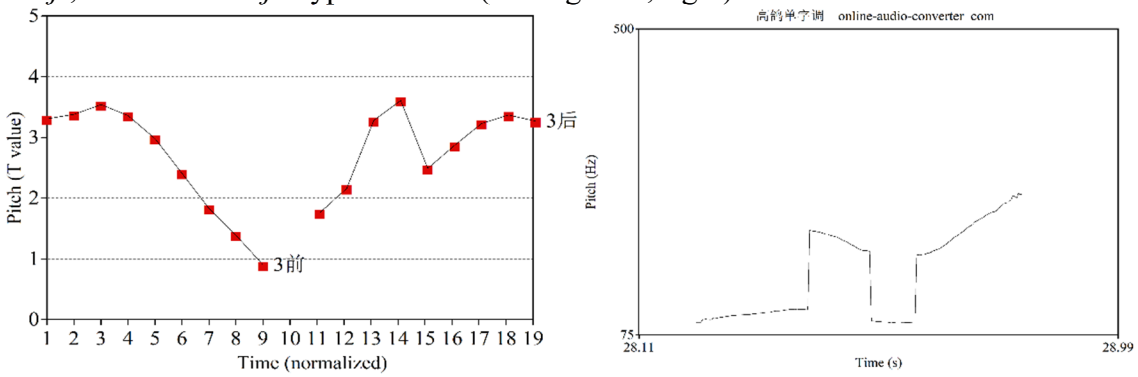

Figure 6. Problematic Pitch Curve of *ShangSheng* in Monosyllabic Samples

When pronouncing the disyllables started by a *ShangSheng* syllable, Comorian Chinese learners' problems in the tone type and tone domain are both very conspicuous (see the left figure in Appendix II). On the one hand, the incomplete intonation domain of the *ShangSheng* tone could also affect its following tone, leading to *ShangSheng* bias, like pronouncing the *ShangSheng-YangPing* pattern disyllable as a 323-323 tone value pattern; on the other hand, the pitch ending of the syllable ahead of the *ShangSheng* syllable could also drive *ShangSheng* away from its original tone pattern. As is said by Yunjia Wang (1995), the high-pitch ending of the former syllable could make the ending *ShangSheng* syllable start higher too, such as pronouncing the *QuSheng-ShangSheng* pattern as a 54-55 tone value pattern, and so on [3]. In addition, when pronouncing disyllables consisting of two *ShangSheng*, local beginners generally made bias of pronouncing this syllable within narrow pitch ranges and without variation of tones. For example, when pronouncing the *ShangSheng-ShangSheng* disyllable, the first *ShangSheng* tone should have been changed into a *YangPing* tone, but Comorian learners hadn't done that as expected. Instead, they pronounced the *ShangSheng-ShangSheng* pattern as a 323-43 tone value pattern, like *hao*^{214} *xiang*^{214} being pronounced as *hao*^{323}*xiang*^{43} and so on. As is said in the former part, in monosyllabic samples, the *YangPing* tone is overall pronounced lower in tone domain and closer to the *ShangSheng* tone in tone pattern (see line2, Figure 5). When pronouncing disyllables starting with *YangPing* syllables, Comorian Chinese beginners often pronounced the *YangPing* tone with flat tone patterns and within pitch ranges too high and too narrow (see middle figure in Appendix II), which has directly affected the pitch starting point of their adjacent syllables, and finally caused out-of-tone problems in the speech flow, such as *zuo*^{35}*tiān*^{55} being

pronounced as *zuo*^{44}*tiān*^{33}. Comorian Chinese beginners' main phonetic bias of disyllables ending with *YangPing* syllables is that the pitch ending of their *YangPing* syllables is not high enough. It can also be seen that Comorian Chinese beginners' pitch starting point of the *QuSheng* tone in monosyllabic samples is very low and their pitch ranges are very narrow too (see Figure 5). These problems are also evident in disyllabic samples (see right figure in Appendix II). As a result, Comorian learners' problematic *QuSheng* tone could affect tones of its adjacent syllables or being affected by its neighboring syllables in the speech flow, rendering bias like *hao*^{214}*xiang* ^{51} being pronounced as *hao*^{323}*xiang*^{42}, and so on.

Table 1. Overview of Chinese Phonetic Biases

<table>
<tr><th>Articulation Positioning Biases</th><th>Articulation Method Biases</th><th colspan="2">Tone Biases</th></tr>
<tr><td rowspan="2">Confusion between tongue-tip i vowels and palatal i vowels</td><td rowspan="2">Confusion among ü[y], u[u], and ou[əu]; Confusion between ch[tʂʰ] and sh[ʂ]</td><td>Monosyllable tone biases</td><td>Disyllable tone biases</td></tr>
<tr><td>QuSheng's scale hasn't fallen down to the lowest as expected</td><td rowspan="3">Out-of-tone in the speech flow</td></tr>
<tr><td>The phoneme r being pronounced as a trill</td><td>YangPing's scale hasn't risen up as expected</td></tr>
<tr><td rowspan="2">TuanYin phonemes being pronounced as JianYin phonemes</td><td>Confusion between voiced sounds and unvoiced ones; Confusion between aspirated sounds and unaspirated ones</td><td rowspan="2">ShangSheng being pronounced within wrong pitch ranges and being pronounced as two halves</td></tr>
<tr><td>SeCaYin phonemes being pronounced lacking an effective air-blocking initial stage.</td></tr>
</table>

In this paper, several phonetic biases made by Comorian Chinese when learning the Chinese phonetics have been found and then summarized as *Table 1*. To be specific, biases like *TuanYin* phonemes *j*[tɕ], *q*[tɕʰ], *x*[ɕ] being articulated as tongue-tip phonemes, the three Chinese *i* vowels being articulated with positions back and low, *SeCaYin* phonemes *z*[ts], *zh*[tʂ], *j*[tɕ], *c*[tsʰ], *ch*[tʂʰ], *q*[tɕʰ] being articulated lacking an effective initial airflow-blocking initial stage, are generally post-system biases occurring mainly after the formation of learners' interlanguage systems, which affects learners' understanding but can not be corrected by themselves. Similarly, tone biases, if not corrected timely, will get more prominent, further causing the fossilization of interlanguage systems. However, with a higher Chinese level, the articulation of Chinese voiced sounds and unvoiced ones could be ameliorated by learners themselves.

4. Reasons

Phonetic biases made by Comorian Chinese beginners are related with multiple factors, such as improper teaching and learning strategies, the interfering of Chinese *PinYin* Scheme, as well as the negative transfer of Comorian learners' multilingual background brought by their influence-lacking mother tongue. As local Chinese learners' mother tongue, the Comorian language should have been widely used by all social strata, but in fact the French-speaking public education system there has made French the main educational language, which means that, at least in phoneme-pronouncing, local learners could be affected, by both the Comorian language system and the French language system simultaneously.

4.1 Reasons for Articulation Positioning Biases

The bias of the three Chinese *i* vowels being articulated with positions too back and too low is a combined result of multilingual interference (mother tongue, medium language, as well as target language) and improper teaching methods. As is shown by Figure 7, tongue positions of palatal *i* in both the Comorian language system, for example the *i* in *dji*, and the French language system, for example the *i* in *ici*, are not so front and high as that of the Chinese palatal *i* (see relative positions of *ik, if* and *i0* in Figure 7). Obviously, local Chinese learners' acquisition of Chinese high-and-front palatal *i* vowel certainly will be interfered when palatal *i* in their native language and teaching language are both articulated with a back-and-low tongue position. As for the bias made by Comorian Chinese learners of confusing the tongue-tip *i* vowel with the palatal *i* vowel while learning Chinese *PinYin*, the complex phonetic provincial rules of Chinese *PinYin* Scheme and the improper teaching methods are both to blame. On the one hand, the Chinese tongue-tip *i* vowel and its palatal counterpart are both written as the Latin alphabet *i* in Chinese *PinYin* Scheme, which is inevitably confusing to learners who differentiate phonemes with Latin alphabets. On the other hand, there is a great number of syllables consisting of the three *i* vowels, which means that teaching only by mechanically repeating is far from enough, and will surely make Chinese beginners lose their confidence in learning the three different Chinese *i* vowels.

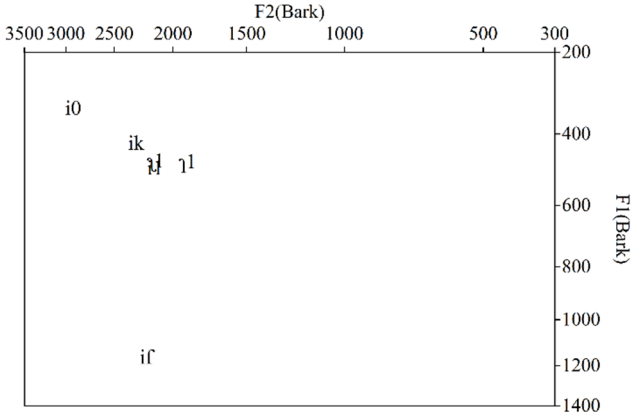

Figure 7. F1-F2 Figure of the vowel *i* in Comorian, French, and Chinese

Figure 7 shows the pronunciation conditions of the vowel *i* in the 22 Chinese interlanguage samples, the French language, and the Chinese language. It can be seen that compared with the Mandarin Chinese pronunciation, in the 22 samples, the three Chinese *i* vowels, including two tongue-tip *i*[ɿ], *i*[ʅ] and one palatal *i*[i], have generally been articulated with positions not high or front enough.

As is shown by Figure 7, the average tongue position of *i* vowels pronounced by the 22 students (see *i1*, *ɿ1*, and *ʅ1* in Figure 7) are vertically close but more back to that of the palatal *i* vowel in their mother language (see *ik* in Figure 7), while horizontally very close to that of the palatal vowel *i*[i] articulated by French native speakers in French (see *if* in Figure 7), although the latter is obviously lower. Even the articulation of Comorian palatal *i*[i] is horizontally close to that of French palatal *i*[i], which may be related to the contact between the Comorian language system and the French language system in the last century. In this case, we believe that the articulation biases of Chinese *i* vowels made by Comorian Chinese learners are due to not only improper teaching methods, but also the interfering of Chinese target language, Comorian mother language, and French teaching language. Since French is the dominant medium language of teaching in the country, their Comorian mother language is losing influence in this field. From this point of view, the incorrect tongue positions used by Comorian Chinese learners when pronouncing the Chinese *i* vowels might have something to do with their native language, namely the Comorian language, as well as their medium language, of which, the palatal vowel *i*[i] is pronounced with a tongue position neither so high nor that front as the Chinese palatal vowel *i*[i] does. After all, the former had once been deeply influenced by the latter in the last century.

To be specific, when the vowel *i* is articulated with a low and back tongue position in both their mother language system and their medium language system, these Comorian Chinese learners' pronunciation of the three Chinese *i* vowels, especially tongue-tip ones they've never known before, might be affected negatively. In Chinese, *s*[s], *sh*[ʃ], *x*[ɕ] are all fricatives (namely *CaYin* in Chinese phonetics), and *j*[tɕ], *z*[ts], *zh*[tʂ], *ch*[tʂ^{h}] are all affricates (namely *SeCaYin* in Chinese). The difference between *CaYin* and *SeCaYin* is in their articulation method. Phonologically, to articulate a *SeCaYin* phoneme, one has to block the airflow firstly, then keep the blockage, and finally break the airflow barrier instantly, while to articulate a *CaYin* phoneme, one just need to let the airflow out straightly.

In Chinese phonetic terms, tongue-tip *CaYin* and *SeCaYin* phonemes, namely *z*[ts], *c*[ts^{h}], and *s*[s], are *JianYin* phonemes, while palatal *CaYin* and *SeCaYin* phonemes, that is, *j*[tɕ], *q*[tɕ^{h}], and *x*[ɕ], are *TuanYin* phonemes. But in the Comorian language system, it's very different. Feedbacks collected from these 22 Comorian Chinese learners showed that in the shingazidja and shinzwani branches, one Latin alphabet corresponds strictly to a phoneme, and that Chinese *CaYin* phonemes *f*[f], *s*[s], *sh*[ʂ] and the *SeCaYin* phoneme *sh*[ʂ] do exist, but *TuanYin* phonemes exactly do not exist. Instead, there are only syllables featured by *dz+Vowel* or *ts+Vowel* auditorily close to Chinese *JianYin* phoneme *z*[ts], *TuanYin* phoneme *j*[tɕ] and *JianYin* phoneme *c*[ts^{h}], *TuanYin* phoneme *q*[tɕ^{h}] respectively. Moreover, the phonemes in the former part of these consonant groups, the voiced *d* or the unvoiced *t*, actually serve as nothing but an airflow regulator. Based on these feedbacks, all the auditorily similar phonemes between Chinese and Comorian language systems have been summarized as follows (see Table 2). According to *Table 2*, it can be seen that Comorian *dz* and *ts* are actually ended with *JianYin* phonemes *z*[ts] and *s*[s] in Chinese, which means that these consonant groups are, in fact, still pronounced as *JianYin* phonemes in Chinese, and to be further, there is virtually no *TuanYin* phonemes in the shingazidja branch. Therefore, the bias of articulating Chinese *TuanYin* phonemes *j*[tɕ], *q*[tɕ^{h}], *x*[ɕ] with tongue-tip positions is actually due to the transfer of their mother language as well as their learning strategies. To be specific, while learning Chinese *TuanYin* phonemes, Comorian Chinese learners who've never been exposed to *TuanYin* phonemes can only turn to their mother language system to find phonemes they've known and thought were auditorily closest to *TuanYin* as a substitute. As a result, the problem of articulating *TuanYin* phonemes with tongue-tip positions comes into being.

Table 2. Auditorily Similar *SeCaYin* Phonemes between Chinese and Comorian

Items / Languages	Consonant Phonemes			
Chinese	*ji*	*za*	*qi*	*ca*
Comorian	*dzi*	*dza*	*tsi*	*tsa*

4.2 Reasons for Articulation Method Biases

In French, the Latin alphabet *t* corresponds with the unvoiced stop phoneme *d*[t] in Chinese phonetics. Probably being affected by this pronunciation habit, Comorian Chinese beginners sometimes also uses *t* to record the Chinese unvoiced stop phoneme *d*[t]. Therefore, when learning Chinese *PinYin* Scheme, local beginners often mistakenly pronounced the aspired syllable *tā*[t^{h}a^{55}] as an unaspirated phoneme. Besides, in the Comorian language system, phonetic rules like *ch*[tʂ^{h}] being pronounced as [ʃ] and *ou*[əu] being pronounced as [u] also originated from French phonetics. For example, the word *chouma (meaning iron in English)* is just pronounced as [ʃuma] in Comorian. Therefore, phonetic biases like the syllable rén being articulated as a trill, the syllable *tā*[t^{h}a^{55}] being articulated as the unaspirated *dā*, the syllable *chǎo*[tʂ^{h}au^{214}] being articulated as *shǎo*[ʂau^{214}], the syllable *dou*[təu] being articulated as [tu], as well as *jia weixin* being articulated as [tsi∧ ueisin] are

all brought by the phonetic interference of their mother tongue and medium language. There are also phonetic biases brought by the negative tranfer not only of Comorian and French phonetics, but also of the pronouncing and provincial rules of Chinese *PinYin* Scheme. For instance, perhaps because the alphabet *u* in French is pronounced as [y] and local Chinese learners don't know the alphabet *u* in Chinese has three pronunciations, namely [u], [y], and [əu], they often mistakenly pronounced *Xiuxi*[ɕiəuɕi] as [ɕiyɕi] or sometimes [ɕiuɕi]. Biases of pronouncing the *r* phoneme as a trill and pronouncing *Zhāozhā* as a voiced disyllable are mainly the result of the negative transfer of their mother tongue. Moreover, sometimes we can also hear Comorian Chinese learners pronounce the Chinese voiced *CaYin* phoneme *r*[ʐ] as a trill and that's mainly because the phoneme *r*[ʐ] in their mother language is right a trill, which may be related with the Arabic phonetics. As is shown by the wide band diagram in Figure 8, there are many straight bars at the beginning of the Arabic syllable ربا/ri∧ba/ pronounced by the other two Arabic first-language students not counted within the 22 Comorian Chinese learners 'speech samples, which means that, in the Arabic phonetic system, the phoneme *r* is just a trill. Therefore, it has been considered that the Comorian trill phoneme *r* is probably brought by the contact between Arabic language and Comorian language.

Additionally, although there was a voiced Comorian consonant phoneme, written as *dj* in shinzwani or *dz* in shingazijia, in the Comorian language system which is auditorily similar to the unvoiced Chinese phoneme *zh*[tʂ], in fact, they are two different phonemes. The latter phonologically records post-tongue-tip unvoiced *SeCaYin* while the former actually records the *SeCaYin* [ʤ], of which, the tongue position is not that front or high as that of the former [13]. And this should be the source of the bias that local students pronounced the Chinese unaspirated and unvoiced word *zhāozhā* as a voiced one. In addition to the above biases, the problem of *SeCaYin* being pronounced lacking an effective air-blocking initial stage is also a main phonetic bias of these students.

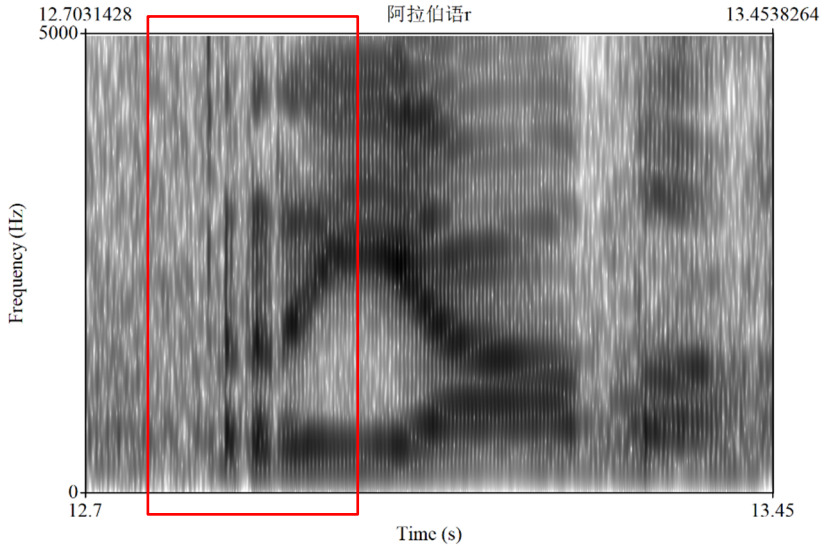

Figure 8. Wide-band Diagram of "r" in Arabic

This problem is mainly caused by the negative transfer of mother tongue and improper teaching and learning strategies. As was said above, in the Comorian language system, there are totally three phonemes sounding close to the Chinese *SeCaYin*: (1) the voiced *dz*, close to both the unvoiced Chinese *SeCaYin j*[tɕ] or the unvoiced Chinese *CaYin z*[ts]; (2) the unvoiced *c*[ts^h], close to the aspirated and unvoiced Chinese *SeCaYin* q[$tɕ^h$] or the aspirated and unvoiced Chinese *SeCaYin c*[ts^h]; (3) the voiced *dj*/dz close to the unaspirated and unvoiced Chinese *SeCaYin zh*[tʂ]. Each of these three *SeCaYin* phonemes corresponds to a doublephoneme combination, since in the Comorian language system one alphabet represents a phoneme, while in Chinese *PinYin* Scheme, each *SeCaYin* corresponds to a single letter. Therefore, when learning the Chinese language, faced with a single letter representing a complex *SeCaYin* phonetic form, it is easy for a Comorian Chinese learner to

mistake these single letters for single phonemes when learning Chinese. In addition, teachers overemphasized the unvoiced features of Chinese *SeCaYin* phonemes in teaching, which could also make these Comorian Chinese beginners mistakenly think that the main difference lying between *SeCaYin* phonemes in Chinese and *SeCaYin* phonemes in their mother tongue is just in the point that the former should always have a strong unvoiced feature in pronunciation, and thus directly gave up the air-blocking initial stage in pronunciation, causing the bias of *SeCaYin* phonemes lacking an effective air-blocking initial stage in pronunciation.

4.3 Reasons for Tone Biases

When learning the Chinese *PinYin,* negative transfer of Multilingualism, as well as improper teaching and learning strategies is responsible for Comorian Chinese learners' tone biases. To be specific, teaching the four Chinese tones directly without helping them establish the concept of scales firstly will force students who have never learnt anything on tones to imitate pitch levels of these four tones only by subjective judgement, causing various tone-type and tone-domain phonetic biases further.

As was mentioned above, for Comorian Chinese learners, in single syllables, the hardest tone is *ShangSheng*, which is also a tone type with the most biases, followed by *QuSheng* and *YangPing*. Without the concept of scales, learners can not determine where is the highest or the lowest point in the relative pitch of a tone. In this case, learners could also wrongly split *ShangSheng* into two parts, namely *QuSheng* and *YangPing*, futher missing the pitch at the lowest tone point. Therefore, for them, biases like putting the tonal domain of *ShangSheng* in the wrong place or spliting *ShangSheng* in two halves, *QuSheng*'s scale didn't fall down to the lowest point as expected, as well as *YangPing*'s scale wasn't risen up expectedly are actually common things.

In addtion to phonetic biases caused by being unable to ascertain the highest and lowest relative pitch points, another widespread tone bias is that learners may mistake the Chinese tone of a certain syllable, for example *ShangSheng* as phonemes owned by its initial consonant and final vowels separately, rather than the shared pitch pattern of the two, which could lead them to pronouncing a *ShangSheng* syllable with a falling-rising-fallingrising tone pattern. As this falling-rising-falling-rising pattern is a little similar with the writing shape of the Chinese character *ji* which is pronounced as *ji*, we call it as *ji*-type tone bias. Therefore, tone biases like *QuSheng*'s scale didn't fall down to the lowest pitch point and *YangPing*'s scale wasn't risen up expectedly are mainly due to the negative transfer of Comorian multilingualism.

Patin (2016) pointed out that the Comorian language is one of the few languages that still has tonal characteristics in the Eastern Bantu family of Niger-Congo family. And to be more specific, the Comorian language is actually a language with only one right-step rising tone. The pitch curves distribution of Comorian students' rising tones in both the Comorian language system and the Chinese interlanguage samples (corresponding to “2k” and “2” respectively in Figure 5) showed that both the two tones have roughly the same pitch variation amplitude and their tone domains are both lower than that of the *YangPing* tone in Mandarin Chinese.

Obviously, the bias of *YangPing*'s scale being pronounced not high enough is brought by the transfer of mother tongue as well as the absence of teacher's teaching assistance. Without teachers' help, learners could only use the ascending tone in their mother tongue as a substitute for Chinese *YangPing* tone. It could also be noted that the Comorian language system and the Chinese language system both use the symbol ´ to represent their rising tones, though their rising tones are very different in scale, which means that when learning the Chinese rising tone, students could also be interfered by the spelling of Chinese *PinYin*. To be specific, the Chinese ´ symbol could remind them of the similar one from their mother language system,which could make it very difficult to mistake the rising tone in Chinese as the one in Comorian.

As for Comorian learners’ *YangPing* tone and *ShangSheng* tone are very similar to each other in both the tone pattern and the tone domain, this is mainly due to the interference of adjacent tones. Besides, the bias of local Chinese beginners' *QuSheng*’s pitch curve can not fall down to the lowest

point as expected (see line 4, Figure 5) can be reflected by both the tone domain and the tone pattern. On the one hand, affected by the French open syllables which use the same ` symbol too, Comorian Chinese learners' intonation pitch range of Chinese *QuSheng* is also very narrow, vertically spanning only two pitch bands, further causing *QuSheng*'s high ending-point in pitch (see "4f" and "4" in Figure 5). On the other hand, the *QuSheng* pitch pattern of these 22 students is in the form of an inflection marked by 545 in tone value (originating from *so-fa-so* scale in music), which may be caused by our *QuSheng-after-ShangSheng* sampling method. Since *ShangSheng* tone is sampled before *QuSheng* tone, students would inevitably pronounce *QuSheng* tone according to *ShangSheng*'s inflective tone pattern. In monosyllabic samples, Comorian Chinese learners' phonetic biases on four tones are mostly related with their inability to determine the highest and lowest pitch points of certain tone patterns. If not corrected timely, these monosyllabic tone biases would affect tones of their adjacent syllables, thus affecting the overall pitch pattern in the speech flow. For example, as was shown by pictures in Appendix II, within a *ShangSheng-ShangSheng* disyllable, the second *ShangSheng* was pronounced within a narrow pitch range and a high pitch starting point. In addition, when pronouncing this kind of disyllables, local students also ignored that the first *ShangSheng* should have been pronounced in a changed tone as was ruled by Chinese *PinYin* Scheme, instead of pronouncing every *ShangSheng* completely.

Thus, the bias that the *ShangSheng-ShangSheng* disyllable $hao^{214}xiang^{214}$ wasn't pronounced as $hao^{35}xiang^{214}$ as expected is undoubtedly brought by students' overuse of the phonetic rules in their target language. As for the inability to determine the beginning and ending pitch point of each tone in the continuous speech flow, it is mainly because of teaching four tones without helping students understand what the scale is in advance, the narrow pitch range of tones in French and Comorian languages, as well as the lacking of phonetic exercises. To be specific, teaching four tones directly without letting students know what scales are is not friendly to Chinese learners with mother languages without tones, because in languages without tones, pitch changes can't represent any meaning changes. Secondly, both the Comorian tone and the French tone span only two pitch bands vertically (see figures in Appendix II), which causes low endings of rising tones as well as high endings of falling tones when pronouncing Chinese four tones in monosyllabic samples, further leading pitch patterns to deviating from the right trajectory within the disyllabic speech flow. Thirdly, except repeating mechanically, there is no other forms of exercises to help establish the concept of scales and comprehend tone variation rules of Chinese phonetics, so local Chinese learners could only misuse the phonetic pattern of languages they have mastered, such as Comorian and French, to imitate Chinese four tones.

5. Teaching Treatment Suggestions

5.1 Treatments for Articulation Positioning Biases

The key to correct biases on three Chinese *i* vowels lies in how to manage to raise and pull forward these Chinese learners' articulating positions, and to let them know how to differentiate palatal *i* from tongue-tip *i*. On the one hand, there are many ways for teachers to help these students raise and pull their articulating positions of the palatal *i* vowel. Above all, standard speech demonstration of the Chinese palatal *i* should be offered in class. Secondly, applications like Praat which are specialized in analyzing sounds could also be used to supervise and improve the pronunciation of the Chinese palatal *i*. In addition, teachers can also correct students' phonetic biases on palatal *i* once every two weeks so as to help them review and better take in what they've learnt. On the other hand, students' tongue-tip *i* biases could be well corrected by directly teaching tongue-tip *i* vowels within collocations like *zi, ci, si, zhi, chi, shi, and ri* because beginners could memorize these syllables directly as exceptional conditions where the Chinese *i* vowel doesn't have a sound. In this manner, when learning the three Chinese vowels, students don't have to figure out which are tongue-tip *i* vowels and which is the palatal one, and the only thing they need to do is remember that there are only two pronunciational situations for the *i* vowels in Chinese. One is that the vowel *i* needs to be pronounced

with a high and front tongue position in most cases, and the other is that the vowel *i* doesn't have any sound when it is behind intial consonants *z*[ts], *c*[ts^h], *s*[s], *zh*[tʂ], *ch*[tʂ^h], *sh*[ʃ] and *r*[ʐ]. As for how to correct biases of *TuanYin* phonemes *j*[tɕ], *q*[tɕ^h], *x*[ɕ] being articulated as *JianYin* phonemes *z*[ts], *c*[ts^h], *s*[s], the most important thing is to enable them to differentiate *TuanYin* phonemes from *JianYin* phonemes in pronunciation. It is asserted that when teaching Chinese *JianYin* phonemes and *TuanYin* phonemes, the three tongue-tip *JianYin* phonemes, namely *z*[ts], *c*[ts^h], *s*[s], should be taken as referencing positions for pronunciation, using gestures to simulate specific tongue position of each *CaYin* and *SeCaYin* (see Figure 9), since tongue-tip *JianYin* phonemes' flat tongue position is much easier to find, compared with its *TuanYin* phonemes and post-tongue-tip counterparts.

In this way, based on the flat tongue positions of three *JianYin* phonemes (including *CaYin* and *SeCaYin*), when the tip of the tongue rises, one will pronounce post-tongue-tip *JianYin* phonemes. For example, rising the tip of the tongue against the hard palate when articulating *JianYin* phoneme *s*[s], one will actually pronounce post-tongue-tip *JianYin* phoneme *sh*[ʂ]. However, if one's tip of the tongue when pronouncing *JianYin* phonemes falls, with the front tongue-face part against the front hard palate, *TuanYin* phonemes will be articulated as a result.

For example, take the changing of tongue shapes from *JianYin* phoneme *z*[ts] to *TuanYin* phoneme *j*[tɕ] as an example. When one lower the tip of the tongue while pronouncing *JianYin* phoneme *z*[ts] with the front tongue-face part against the hard palate, *TuanYin* phoneme *j*[tɕ] will be pronounced as a result.

Of course, students don't need to learn phonology systematically in order to learn the Chinese phonetics. Instead, they just need to understand Chinese *JianYin* phonemes and *TuanYin* phonemes are integrated results of certain tongue shape changes, and know how to change these tongue shapes to pronounce the *TuanYin* phoneme or the *JianYin* phoneme they want. For example, falling the tongue tip of the Chinese phoneme c[ts^h], one pronounces *TuanYin* q[tɕ^h], while rising the tongue tip of it, one pronounces the post-tongue-tip *JianYin* ch[tʂ^h], and that's enough. However, it should be noted that only emphasizing the voiced feature and the specific tongue position when teaching Chinese *TuanYin* phonemes, on the one hand, could help correct phonetic biases of *TuanYin* phoneme pronunciation, while on the other hand, also risks aggravating the problem of *SeCaYin* phonemes being pronounced lacking an effective air-blocking initial stage, which is made by only paying attention to the *CaYin* stage after the air blockage while pronouncing *SeCaYin* phonemes.

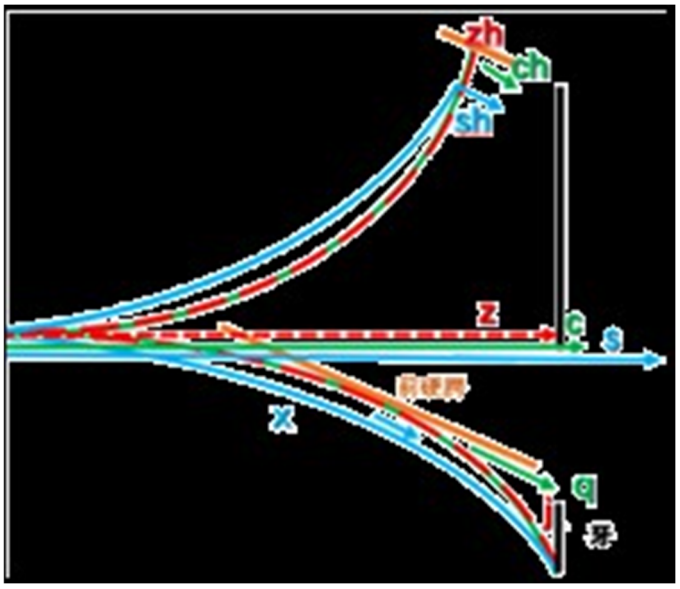

Figure 9. Benchmark-referencing Teaching

5.2 Treatments for Articulation Method Biases

Biases like unaspirated *tā, chǎo* being pronounced as *shǎo, dou* being pronounced as *du*[tu], *Xiūxi* being pronounced as [ɕiyɕi] or [ɕiuɕi] are all related to the interference of Chinese *PinYin* Scheme. This kind of bias could be corrected by improving Chinese *PinYin* Scheme, such as improving the *PinYin* provincial writing rules to make Chinese *PinYin* easier to recognize when writing and pronouncing (Xiaobing Zhou, 2007). Videos, hand gestures and other more intuitive methods could also be used to make Comorian Chinese beginners understand that when pronouncing the Chinese *r* phoneme, they just need to upturn the tongue tip instead of fluttering it as accustomed. As for the bias of voiced *zhāozhā*, we need to let them know that the Chinese initial consonant *zh*[tʂ] is an unvoiced phoneme so they don't have to vibrate their vocal cords in pronunciation. Considering that the bias of *SeCaYin* being pronounced lacking an effective air-blocking initial stage is because of ignoring the air-blocking stage and paying too much attention to the unvoiced phase after it, the key to correct it lies in how to make these Comorian Chinese beginners pay more attention to the unvoiced feature as well as the air-blocking initial stage of Chinese *SeCaYin* phonemes. For example, through the articulation exercises of splicing stops (the air-blocking sounds) and *CaYin*(similar to the *CaYin* phase after the air-blocking stage when pronouncing *SeCaYin* phonemes), teachers can guide learners to pay attention to and further master the unvoiced feature as well as the air-blocking beginning feature of Chinese *SeCaYin* phonemes, that is, *z*[ts], *zh*[tʂ], *j*[tɕ], *c*[ts^h], *ch*[$tʂ^h$], and *q*[$tɕ^h$].

Different from vocabulary and grammar knowledge which emphasize more on comprehension, phonological knowledge can only be acquired after many times of listening and speaking practice. Therefore, the phonetic teaching stage of teaching Chinese as a second language should focus more on elaborate teaching and numerous exercises [5]. Specifically, we can practice Chinese phonemes by dictation. This exercise is centered on the interaction between teachers and students or among students themselves, and could give full play to the phonetic advantage of Chinese learners with phoneme language backgrounds, and to the synergistic effect of interpersonal interaction to gradually narrow the Chinese pronunciation gap of both participants [20].

5.3 Treatments for Tone Biases

To correct local students' tone biases, it is necessary to firstly use the method created by Yuanren Zhao, a famous linguist in Chinse, to help learners establish the concept of scales. This method uses the number from 1 to 5 to mark the five different scales in music, namely do, re, mi, fa, further marking the Chinese tone values. With this method, *YinPing*, the first tone, also the high-and-flat tone, is marked as a 55 tone; *YangPing*, the second tone, also the rising tone, is marked as a 35 tone; *ShangSheng*, the third tone, is marked as a 214 tone; *QuSheng*, the fourth tone, also the falling tone, is marked as a 51 tone. In this regards, Ye Nan (1999) asserts that Chinese teachers can practice students' tone scales via singing with words or changing tones [6]. To be specific, single phonemes should be used firstly to practice the four single tones and then corresponding words could be further used to practice tones and tone variations in the continuous speech flow.

Secondly, Chinese four tones should be taught following the order from easy to difficult. For native English speakers who also have the problems of *YangPing*'s scale couldn't be risen up, *QuSheng*'s scale couldn't be fallen down to the lowest, as well as *ShangSheng*'s pitch pattern going wrong, Bisong Lv (1994) suggested that the Chinese four tones should be taught following the *YinPingQuSheng-YangPing-QuSheng* sequence [2]. Yunjia Wang (1995) suggested that the order of difficulty of the four-tone acquisition could also be determined by the number of biases [3]. As it has been said above, statistics of tones from the 22 speech samples have demonstrated again that the specific sequence of acquiring Chinese four tones, from easy to difficult, is the *YinPing-QuSheng*-Yang Ping-*ShangSheng* one.

Teaching practices also found that the *YinPing-QuSheng-YangPing-ShangSheng* teaching sequence is more beneficial to help the native speakers to acquire the four tones of Chinese more smoothly than *YinPing-YangPing-ShangSheng-QuSheng* teaching sequence do. Both the single tone biases in monosyllables and the out-of-tone biases in the speech flow are caused by the inability of

Comorian Chinese learners to ascertain the highest and lowest relative pitch point of each tone pattern. Therefore, correcting the out-of-tone biases in the speech flow needs to start from correcting the single-tone biases. However, out of the speech flow, it is meaningless to simply correct every single tone bias. After all, the Chinese four tones are relative pitch, and the continuous speech flow is the main carrier of these four tones. Following the principle of teaching semi-*ShangSheng* (with a 211 tone value) before teaching the full *ShangSheng* [2], we believe that the *ShangSheng* biases could be corrected easily. After all, the tone pattern of semi-*ShangSheng* (211) is the same as the tone pattern in both local learners' mother tongue system and medium language system. Besides, semi-*ShangSheng* is also very suitable to serve as a transitional medium for *ShangSheng* teaching because it is much easier and more practical than the full *ShangSheng*.

As for *YangPing*, biases of single *YangPing* being pronounced with a low articulation position and *YangPing* deviating from the right tone trajectory in the speech flow could both be ameliorated by training the tone-pronouncing habits of the middle-rising tone [6]. Still, it should be noted that the four-tone teaching is meaningful, but teaching without practicing is totally meaningless. After all, students need to take in what they've learnt, especially those phonological contents which need lots of practice, via various exercises. In this paper, it is suggested that activities like singing Chinese songs, performing Chinese dramas, describing pictures, storytelling and other training forms can all help students remember the four single tones, sharpening their general perception of Chinese phonetics.

6. Conclusion

Common phonetic biases of Comorian Chinese beginners have been found based on acoustic analyses results. To figure out why they have made such biases, we analyzed phonetic features of their mother tongue, their educational language, and their target language. As a result, these phonetic biases are mostly due to the negative transfer of their multilingual background. And finally, for each of these biases, various teaching treatments have been put forward so as to promote the phonetic teaching part of teaching Chinese as a second language.

In this paper, it has been believed that the multilingual background brought by the influence-limited mother language mentioned above, as well as Chinese *PinYin* Scheme could largely affect local beginners' Chinese phonological acquisition, finally leading to their various phonetic biases analyzed above. For example, Comorian Chinese beginners may mistakenly Chinese phoneme *r* as a trill due to the negative transfer of their mother language, which was earlier affected by the Arabic trill *r*. Besides, biases like three Chinese *i* vowels being pronounced with tongue positions neither high nor front enough, Chinese *ou*[əu] being pronounced as [u], as well as Chinese *u* being pronounced as [y] are mainly due to the negative transfer of their mother tongue, which was earlier affected by French vowel pronunciation.

To deal with these biases, some teaching treatments such as teaching Chinese four tones following a *YinPing* (1st tone) -*QuSheng* (4th tone) -*YangPing* (2nd tone) -*ShangSheng* (3rd tone) sequence, putting three Chinese *i* vowels within two cases, one being pronounced while the other not, as well as highlighting the initial air-blocking stage of Chinese affricatives have been put forward. Besides, exercises like dictating Chinese toned syllables have also been considered as a good way for Chinese learners from phoneme language systems.

However, it is still to be confirmed with future experimental studies whether there is indeed a correlation between *the teaching language* and the second language phonological acquisition, as it is hard to assert that it is totally the teaching language, not the language which had once contacted and deeply influenced their mother tongue that has interfered their second phonological acquisition. In this paper, it is believed that it is the Comorian phonetics which is deeply affected by French and Arabic that has interfered local beginners' Chinese phonological acquisition.

Note

All the applicants have been offered appropriate rewards (500FC/person) for their participation in this research. We had reminded them that their private information will only be collected for academic use before the investigation and all of them have participated in the research willingly with the witness of other teachers at the Confucius Institute.

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Appendix I: Monosyllabic and Disyllabic Test Tables

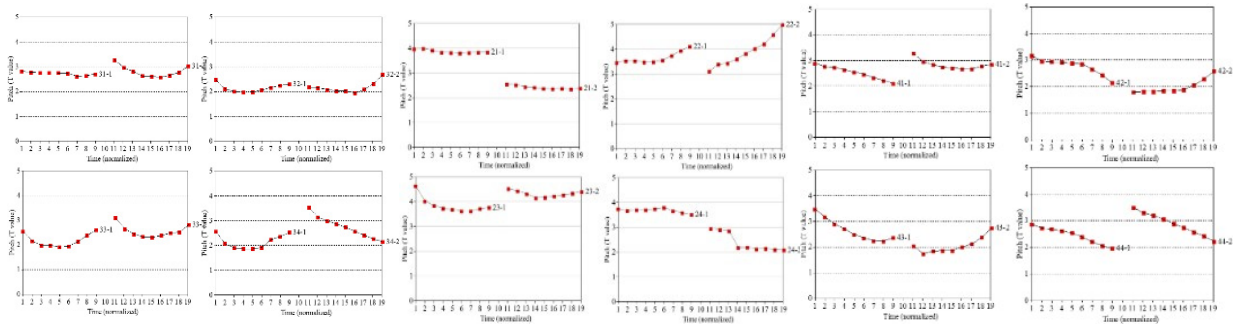
Table 3. Monosyllabic Test Sheet

CaYin and SeCaYin syllables	*jiā*	*qiā*	*xiā*	*zā*	*cā*	*sā*	*zhā*	*chā*	*shā*
Three Chinese i vowels	*jī*	*qī*	*xī*	*zī*	*cī*	*sī*	*zhī*	*chī*	*shī*

Table 4. Disyllabic Test Sheet

Former / **Latter**	***YinPing*+~**	***YangPing*+~**	***ShangSheng*+~**	***QuSheng*+~**
~+YinPing	*zhaozha*	*zuotian*	*xihuan*	*zaishuo*
~+YangPing	*zhaoren*	*zhuotiao*	*haowan*	*zailai*
~+ShangSheng	*zhengchao*	*biezou*	*haoxiang*	*tiaowu*
~+QuSheng	*Zhenzheng*	*meiqu*	*haoxiang*	*zaijian*

Appendix II: Comorian Chinese Learners' Mean Disyllabic Pitch Figures



***ShangSheng*-~ Disyllabic Figure** ***YangPing*-~ Disyllabic Figure** ***QuSheng*-~ Disyllabic Figure**

Figure 10. Comorian Chinese Learners' Mean Disyllabic Pitch Figures