

The Articulation of the Coronal Sounds in the Peking Dialect

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Abstract

This paper investigates the articulatory characteristics of the syllable-initial coronal stop ‘d’, fricatives ‘s sh x’, affricates ‘z zh j’ and approximant ‘r’ in the Peking dialect. Palatograms and linguograms show that the syllable-initial (i) ‘d’ is apico-laminal denti-alveolar [t]; (ii) ‘s z’ are laminal alveolar or denti-alveolar [s ts]; (iii) ‘sh zh r’ are apical postalveolar or pre-palatal [ʃ tʃ ʐ]; and (iv) ‘x j’ are anterodorsal postalveolar or alveolo-postalveolar [ʃ tʃ ʐ]. The findings in this study constitute evidence against the claim that ‘sh zh r’ and ‘x j’ in the Peking dialect are retroflexes and palatals, respectively. The findings also show that it is necessary to include the information about lingual contact, otherwise the description of the articulatory properties of the coronal sounds in question will be incomplete.

1 Introduction

In the Peking dialect, often referred to as the Old Peking dialect, the coronal consonants represented in the official Pinyin romanization as ‘d t n l z c s’, ‘zh ch sh r’ and ‘j q x’ are divided into three groups according to place of articulation in the classic works by Karlgren ([5, 6]) and Chao ([2, 3]). In Karlgren, ‘d t n l z c s’, ‘zh ch sh r’ and ‘j q x’ are apico-dental, apico-prepalatal and dorso-alveolar, respectively. In Chao, ‘d t n l z c s’ are described as dental, with no specification of the contact on the tongue; ‘zh ch sh r’ as retroflex “made with the tip of the tongue curled back against the roof of the mouth” (Chao [2], p.20); and ‘j q x’ as palatal “made with the flat part of the tongue – the tip being free – against the palate” (Chao [2], p.20). Both of Karlgren and Chao have not presented any experimental data.

A more recent work on the articulation of the syllable-initial voiceless fricatives and affricates in

the Peking dialect ([10]) based on tracings of X-ray photographs as well as palatograms from three speakers has reported that ‘s’ is articulated with the tip of the tongue touching the upper frontal teeth or the alveolar ridge; ‘sh’ “does not have the tip of the tongue curled up and backwards” instead “the upper surface of the tip of the tongue” forming a constriction “at about the center of the alveolar ridge” (Ladefoged and Wu [10], p.271); and ‘x’ is articulated with the front part of the tongue body forming a constriction in the place between the places in ‘s’ and ‘sh’ and it is not a palatalized version of ‘s’ and ‘sh’. As for the affricates ‘z zh j’, they are similar to the respective fricatives ‘s sh x’ in articulation.

Due to difficulty in interpreting the tracings of the tongue in the X-ray photographs and unavailability of linguograms for a more precise description of the lingual contacts for the sounds analyzed in [10], Lee [11] obtains both palatograms and linguograms of the syllable-initial fricatives ‘s sh x’, affricates ‘z zh j’ and approximant ‘r’ of the Peking dialect and analyzes their spectral characteristics. In Lee’s study, the data are from the speakers in their early twenties, representing the speech of the younger generation of the Peking dialect in the late 1990s. The articulatory data show that (i) ‘s z’ are apical or laminal denti-alveolar or alveolar, i.e. [s ts]; (ii) ‘sh zh r’ are not retroflexes, but apical or upperapical postalveolar, i.e. [ʃ tʃ ʐ]; and (iii) ‘x j’ are laminal or anterodorsal postalveolar or alveolo-postalveolar, i.e. [ʃ tʃ ʐ].

The present study replicates Lee’s study ([11]) to determine the contact locations and areas on the palate and on the tongue for the coronal consonants of the Peking dialect in the speech data of the speakers of the older generation. The speech of these speakers is referred to by the natives of Peking as the Old Peking dialect. The data in this study are compared with those in the earlier publications [2, 3, 5, 6, 10, 11].

2 Method

Palatograms and linguograms of the eight syllable-initial coronal consonants, including the voiceless stop ‘*d*’, voiceless fricatives ‘*s sh x*’, voiceless affricates ‘*z zh j*’, and voiced approximant ‘*r*’, of the Peking dialect were obtained. Table 1 shows the monosyllabic test words consisting of the initial coronal consonants in question, followed by ‘*i*’, i.e. vowel /i/, which may be realized phonetically either as a homorganic syllabic approximant [ɿ] when preceded by ‘*s sh z zh r*’, or as [i] when preceded by ‘*d x j*’.

Table 1. *The test monosyllabic words with the syllable-initial coronal consonants ‘d s sh x z zh j r’ of the Peking dialect.*

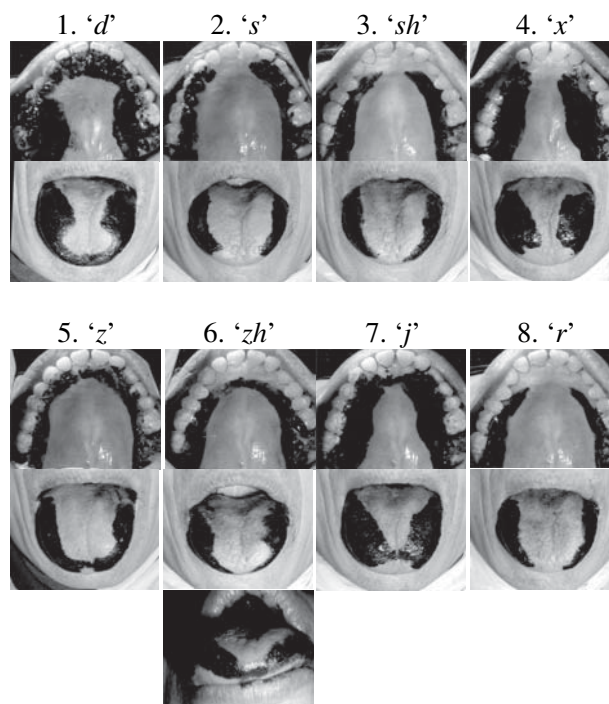
Coronal consonants		Test words
Voiceless stop	‘ <i>d</i> ’	‘ <i>di</i> ’ 低 (‘low’)
Voiceless fricatives	‘ <i>s</i> ’	‘ <i>si</i> ’ 思 (‘to think’)
	‘ <i>sh</i> ’	‘ <i>shi</i> ’ 师 (‘teacher’)
	‘ <i>x</i> ’	‘ <i>xi</i> ’ 西 (‘west’)
Voiceless affricates	‘ <i>z</i> ’	‘ <i>zi</i> ’ 资 (‘capital’)
	‘ <i>zh</i> ’	‘ <i>zhi</i> ’ 知 (‘to know’)
	‘ <i>j</i> ’	‘ <i>ji</i> ’ 鸡 (‘chicken’)
Voiced approximant	‘ <i>r</i> ’	‘ <i>ri</i> ’ 日 (‘the Sun’)

The speech data were provided by two male speakers of the Peking dialect who were in their 60s and who had lived their whole life in the city of Peking.

Direct palatography and linguography introduced in [4, 7] were adopted in this study. A liquid mixture of charcoal powder and olive oil was painted either onto the tongue or the palate of the speaker for recording the palatographic or linguographic data, respectively. Palatograms and linguograms were taken using a digital camera. To take palatograms, a mirror was inserted in the mouth of the speaker, and to take linguograms, the tongue of the speaker was photographed.

3 Results

Figure 1 to Figure 8 show the palatograms and linguograms of the eight syllable-initial coronal consonants: the stop ‘*d*’ (Figure 1), fricatives ‘*s sh x*’ (Figures 2, 3, 4), affricates ‘*z zh j*’ (Figures 5, 6, 7) and approximant ‘*r*’ (Figure 8) for Speaker 1.



Figures 1-8: Palatograms and linguograms of the syllable-initial ‘*d s sh x z zh j r*’ for Speaker 1.

The palatogram of the syllable-initial stop ‘*d*’ (Figure 1) shows that the closure starts at the base of the upper frontal incisors, extending to the alveolar ridge. The linguogram of ‘*d*’ shows that the contact is made on the tip of the tongue, extending to the blade. The stop ‘*d*’ of the Peking dialect may thus be characterized as apico-laminal denti-alveolar, i.e. [t].

For the syllable-initial fricative ‘*s*’ (Figure 2), the palatogram shows that the constriction channel is in the front part of the alveolar ridge and no contact is made on the upper frontal teeth. The linguogram shows that it is mainly the blade of the tongue that is involved in the articulation. Thus, ‘*s*’ of the Peking dialect may be characterized as laminal alveolar, i.e. [s̺].

For the syllable-initial fricative ‘*sh*’ (Figure 3), the constriction channel is in the back part of the alveolar ridge. The lingual contacts are on both sides of the tongue, tapering off along the edges toward the center of the apex. The articulatory contact pattern suggests that the tip of the tongue is curled upward and backward during ‘*sh*’. Since the underside of the tongue is not involved, the curling gesture is to a lesser extent than that of a typical sub-apical retroflex ([1, 8]). Thus, the fricative ‘*sh*’ of the

Peking dialect may be characterized as apical postalveolar, i.e. [ʃ] rather than retroflex. The difference between the fricatives 's' and 'sh', i.e. [s̺] and [ʃ] of the Peking dialect, is therefore in the location of the constriction channel, which is more in the front part of the alveolar ridge for the alveolar [s̺] than for the postalveolar [ʃ]. However, the opposite is true for the lingual contact, which is more on the back part of the tongue for the laminal [s̺] than for the apical [ʃ].

For the syllable-initial fricative 'x' (Figure 4), the constriction channel is formed with the contact made between the back part of the alveolar ridge and the front part of the dorsum. Thus, 'x' of the Peking dialect may be characterized as anterodorsal postalveolar or palato-alveolar [ʃ̺].

For the syllable-initial affricate 'z' (Figure 5), similar to the fricative 's' (Figure 2), the palatographic contact is on the alveolar ridge. The lateral lingual contacts for 'z' extend to the tongue tip, however, no contact is made on the center of the tongue tip. Thus, both the affricate 'z' and fricative 's' are basically laminal alveolar, i.e. [t̺s̺] and [s̺].

The affricate 'zh' (Figure 6) and fricative 'sh' (Figure 3) are also similar, in that, for both sounds the constriction is made by contacting the tip of the tongue with the back part of the alveolar ridge. There is a minor difference between 'zh' and 'sh', in that, the lingual contact shifts slightly forward and mainly the apical edge of the tongue that is involved during 'zh', as compared to 'sh'. The apical postalveolar articulation for 'zh' suggests that the tip of the tongue is curled upward and slightly backward during the articulation. Such an articulatory gesture differs from the typical sub-apical retroflex gesture ([1, 8]). Thus, it is appropriate to treat the affricate 'zh' as apical postalveolar, i.e. [t̺ʃ̺], rather than retroflex.

As for the affricate 'j' (Figure 7), it is similar to the fricative 'x' (Figure 4), in that, the constriction contact on the palate is located in the back part of the alveolar ridge and the lingual contact is on the front part of the anterodorsum, although compared to 'x' the lingual contact for 'j' shifts slightly forward toward the blade of the tongue. Basically, 'j' is anterodorsal postalveolar or palato-alveolar, i.e. [t̺ʃ̺].

There is a great deal of similarity palatographically between 'z zh j' [t̺s̺ t̺ʃ̺ t̺ʃ̺] and 's sh x' [s̺ ʃ̺ ʃ̺], respectively, although the constriction locations on

the tongue tend to be slightly more fronted for the affricates than the corresponding fricatives.

As for the approximant 'r' (Figure 8), it is similar to 'sh' palatographically and linguographically (Figure 3), that is, for both 'sh' and 'r' the constriction channel is in the back part of the alveolar ridge, formed with the tip of the tongue. Also similar to 'sh', the underside of the tongue is not involved during the contact. Thus, the approximant 'r' of the Peking dialect may also be characterized as apical postalveolar, i.e. [ʃ̺], rather than retroflex.

As for the articulatory data (*the palatograms and linguograms not presented here*) for Speaker 2 in this study, they are summarized in Table 2 together with those for Speaker 1. As can be seen, the patterns of the palatographic and linguographic contacts for the two speakers are similar, although there are some minor differences between them and they are mainly in the contact on the palate. For instance, while 'z' is alveolar for Speaker 1, it is denti-alveolar for Speaker 2; and 'r x j' are postalveolar for Speaker 1, but 'r' is pre-palatal and 'x j' are alveolo-postalveolar for Speaker 2. The articulatory data from the two speakers show that the eight syllable-initial coronal consonants in the Peking dialect may be divided into four groups according to their places of articulation, i.e. 'd' [t̺]: apico-laminal denti-alveolar; 's z' [s̺ t̺s̺]: laminal alveolar or denti-alveolar; 'sh zh r' [ʃ̺ t̺ʃ̺ ʃ̺]: apical postalveolar or pre-palatal; 'x j' [ʃ̺ t̺ʃ̺]: anterodorsal postalveolar or alveolo-postalveolar.

Table 2. *Palatographic and linguographic contact locations of 'd s sh x z zh j r' of the Peking dialect for Speaker 1 and Speaker 2.*

	Speaker 1	Speaker 2
'd'	apico-laminal denti-alveolar [t̺]	apico-laminal denti-alveolar [t̺]
's'	laminal alveolar [s̺]	laminal alveolar [s̺]
'z'	laminal alveolar [t̺s̺]	laminal denti-alveolar [t̺s̺]
'sh'	apical postalveolar [ʃ̺]	apical postalveolar [ʃ̺]
'zh'	apical postalveolar [t̺ʃ̺]	apical postalveolar [t̺ʃ̺]
'r'	apical postalveolar [ʃ̺]	apical pre-palatal [ʃ̺]
'x'	anterodorsal post- alveolar [ʃ̺]	anterodorsal alveolo- postalveolar [ʃ̺]
'j'	anterodorsal post- alveolar [t̺ʃ̺]	anterodorsal alveolo- postalveolar [t̺ʃ̺]

4 Discussion

A comparison of the articulatory data from the older generation of the speakers of the Peking dialect in this study with those from the younger generation in Lee [11] shows that there is an agreement between the two generations in the contact pattern on the palate for the coronal consonants, while the contact patterns on the tongue differ slightly. For 's z', they are alveolar or denti-alveolar, i.e. [s ts] for both generations, however, in terms of lingual contact they are laminal for the older speakers, but apical or laminal for the younger speakers. Similarly, 'sh zh r' are postalveolar, i.e. [ʃ tʃ ʐ] for both generations, however, linguographically they are apical for the older speakers, but apical or upperapical for the younger speakers. As for 'x j', they are postalveolar or alveolo-postalveolar, i.e. [ʃ tʃ] for both generations. Again the difference is in lingual contact, as they are anterodorsal for the older speakers, but apico-laminal, laminal and anterodorsal for the younger speakers. Nevertheless, for speakers of either generation, since both 'sh zh r' [ʃ tʃ ʐ] and 'x j' [ʃ tʃ] are postalveolar sounds, apicality functions as a distinctive feature distinguishing the two groups of postalveolar sounds. This supports the view proposed in [4] that linguographic property may be phonologically distinctive.

The palatographic and linguographic data obtained in this study are in general similar to the descriptions given in Chao [2, 3] and Karlgren [5, 6] as well as the findings presented in Ladefoged and Wu [10]. There are however two differences between Chao [2, 3] and this study. First, the articulatory data in this study show that 'sh zh r' are postalveolar sounds, involving the tip or the apical edge of the tongue, but not the underside of the tongue. This differs from the typical sub-apical retroflexion ([1, 8]). It follows that 'sh zh r' which are described as retroflexes in [2, 3] may not be appropriate. Ladefoged and Maddieson [13] suggest using a subscript dot beneath the symbol for a less retroflexed tongue shape. Since the diacritic is not an accepted IPA notation, 'sh zh r' of the Peking dialect transcribed as [ʃ tʃ ʐ̣] representing apical postalveolar sounds may be appropriate. Second, the palatographic data in this study show that for the syllable-initial 'x j' of the Peking dialect, the contact location is in the back part of the alveolar ridge and it may extend forward to the front part of the alveolar ridge rather than backward toward the palate. Thus, 'x j' are postalveolar or alveolo-postalveolar [ʃ tʃ] rather than palatal as described in

Chao [2, 3]. However, the findings of linguographic contacts for 'x j' in this study are similar to the descriptions given in [2, 3], i.e. it is the blade and/or the anterodorsum, not the tip, of the tongue is involved in the contact.

5 Conclusion

This paper has presented the palatographic and linguographic data of the coronal consonants of the Peking dialect. The data from the speakers of the older generation in this study and those from the speakers of the younger generation in [11] differ mainly in lingual contact, and they are in agreement with the experimental data reported in [10]. The findings in this study and [10, 11] constitute evidence against the claim that in the Peking dialect 'sh zh r' are retroflexes and 'x j' are palatals made in [2, 3]. As for 'sh zh' [ʃ tʃ] and 'x j' [ʃ tʃ] in the Peking dialect, the only difference between the two groups of sibilants is in lingual contact. This shows it is necessary to include the linguographic information in the description of the articulatory property of the coronal sounds in the Peking dialect.

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[Acknowledgment: This study was supported by the SRG Grant (#7002064) from the City University of Hong Kong.]