

THE ANCIENT INITIAL "VOICED" CONSONANTS IN MODERN WU DIALECTS

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ABSTRACT

The Ancient Initial 'Voiced' Consonants in Modern Chinese Wu Dialects have phonetically become completely voiceless consonants when they are in isolated monosyllabic words or in the first syllable of polysyllabic words. However, in running speech, they conditionally alternate between typical voice and complete voicelessness.

INTRODUCTION

Phonologically, the most important feature of the Modern Chinese Wu Dialects is the retention of the Ancient Initial Voiced Stop Consonants (i.e. 井, 定, 群, etc.) in its consonant system. The stop consonants of Wu can be divided into three categories: voiced, voiceless unaspirated, and voiceless aspirated /h/. This division is well known in the linguistic circle both in China and overseas. However, what is the phonetic value of the I.V.C. in Wu is a controversial issue in the linguistic circle.

Before the 1920's, linguists did not seem to distinguish phonological category from phonetic (or physical) nature of the I.V.C. They tended to believe that there must exist vocal cords vibration during the pronunciation of these consonants. In the 1920's, the famous linguists Liu Fu and Zhao Yuan Ren /2/ suggested that the voiced consonants of Wu are not really voiced, but begin with a voiceless sound and finish with a voiced glide. They are marked with the diacritic /h/, such as /p^h, t^h, k^h/. It means that there is not vocal cords vibration during the closure, but a whiff of voiced breath between stop release and following vowel(s). Bernhard Karlgren /3/ regarded this breath as a slight 'voiced aspiration', and directly transcribed it with the diacritic /' /, such as /b', d', g'/. Since then, the above statements have become the dominant theory. Early in the 1980's, in order to exam the real nature of this so-called 'voiced glide', the present author

investigated these consonants in the Chang Yinsha dialect of Wu with spectrographic analysis. The result /4/ showed that there is not any 'voiced glide' or 'voiced aspiration' between the stop release and following vowel(s) when these consonants are in isolated monosyllabic words or in the first syllable of polysyllabic words, but the tone pattern of these syllables is quite different from that of those syllables beginning with corresponding voiceless consonants. In running speech, on the other hand, the phonetic value of the I.V.C. conditionally alternate between typical voice and complete voicelessness. The condition of this alternation is the syllables tone pattern. When it is pronounced with a 'Yang' tone (阳调) /*/, the real value of the I.V.C. is complete voicelessness; when it is pronounced with a 'Yin' tone (阴调) /*/, or neutral tone, the value of the consonant is typical voice. In spite of above evidence, linguists of the traditional school are still sketical to what the spectrograms showed. Later, the above result was verified by the measurement of the air flow through the glottis, supraglottal pressure and subglottal pressure /**/. Fig.1 (see p.2) shows a few recordings of these air flow and air pressure with the related spectrograms. There the word /dao/稻 begins with /d/ of the I.V.C. Both the air flow and the air pressure recordings and the spectrograms show clearly, that in the isolated word or in the first syllable of the polysyllabic word /dao za/稻柴, the value of /d/ is the same as the corresponding voiceless /t/ in word /tao/ 岛, but the syllable keeps its 'Yang' tone. While in the polysyllabic word /qie dao/ 轴稻, the 'Yang' tone of the syllable changes to neutral tone which is the same as that of syllable /tao/ 岛 in /qie tao/ 轴岛, and the value of /d/ becomes typical voice. Since 1983, the present author has investigated about 15 subdialects of Wu, recorded about 30 speakers' utterances, including isolated words, short sentences and conversations. The spectrograms of these utterances show that the situation of the I.V.C. in these dialects is almost



Fig.1 The records of (a) air flow through glottis, (b) subglottal pressure, (c) supraglottal pressure with (d) the related spectrograms.

the same as it is in Chang Yinsha dialect. On the bases of the above investigations, we posit two hypotheses. First, if we view the situation from isolated words, the phonetic value of the I.V.C. in Wu has become completely voiceless, its abstract distinctive function in a word has been taken over by the 'Yang' tone pattern of the syllable. Secondly, if we view them from running speech, the value of the I.V.C. alternate between voice and voicelessness. In this case, distinctive role of the I.V.C. in a word is played by the phonetic value of the I.V.C. or by the 'Yang' tone pattern of the syllable, and this regular alternation seems to be dependent on the stress type of relevant syllable in speech.

EXPERIMENTS

In order to test above hypotheses, a perception test and a synthesized speech test, as well as a spectrographic analysis were carried out.

Perception Test

In this test, one female speaker of a Wu dialect pronounced 64 pairs of monosyllabic words which begin with I.V.C. and the corresponding voiceless consonants respectively; another

female native speaker of the Beijing dialect pronounced 126 monosyllabic Beijing words with the tone pattern similar to the 'Yang' tone pattern of Wu. Their recorded utterances were mixed up in random order on the same tape. Then, 13 subjects were asked to listen to the tape recording and determine which words begin with voiced consonants and which ones the voiceless consonants. The result is very interesting. Our subjects have different background and their responses are quite different, but showed the same rule operates in different aspects. The first type of the subjects, who are phonologists and familiar with the Wu Dialects, have a great degree of agreement in their responses. They judge both of those words beginning with the I.V.C. and most of the Beijing words as beginning with the voiced consonants. It seems that what is significant for these subjects is the sense of voicing, but not the presence of vocal cords vibration. It also seems to be the case, that they tend to perceive that there is vocal cords vibration during the consonant of a syllable with a 'Yang' tone, even though its spectrographic correlate is the same as that of the corresponding voiceless consonant. The second type of the subjects are both phonologist and phonetician. Their responses show inconstantly. The typical subject is a phonetician, but he has the Wu dialect background. He said he had

tried to judge these words by means of physiological or physical cues. However, he still judged about 16% of consonants of the Beijing words as voiced consonants by mistake. So it seems that he still could not avoid being motivated by the so-called voicing sense which likely to be caused by the 'Yang-like' tone pattern of these words. The third type of the subjects is a student in phonetics. At that time, he just graduated from an English department, knew nothing about Chinese Phonology and the Wu Dialects, so his judgement could only be in terms of the acoustic or physiological characteristics of these consonants. The accuracy of his judgement reaches as high as 98%. He commented that he thought almost none of these initial consonants were voiced. That is true. Actually, the value of these so-called voiced consonants here is the same as that of the corresponding voiceless consonants according to their spectrograms, and those consonants of Beijing words here are doubtlessly complete voicelessness. Why did the majority of the subjects consider that there was vocal cords vibration during the phonation of these consonants? The only explanation seems to come from the 'Yang' tone or 'Yang-like' tone patterns of these syllables. Because this tone pattern generally has either a lower pitch or a lower beginning, it is

easy to give a sense of voicing. Moreover, this pattern is always accompanied by the I.V.C. in the monosyllabic words. This is a phonological rule of Wu. Consequently, the subjects who are familiar with the sounds of Wu are used to this rule. Ones they hear a syllable with a 'Yang' tone, they will naturally identify its initial consonant as being voiced, as if there exists vocal cords vibration during the phonation of the consonant.

Synthesized Speech Test

The data in this test come from the spectrographic measurement of the voiceless consonants, vowels and the tones of Wu. A procedure of synthesis by-rule /5/ is used to produce the test samples. First, the consonant and vowel data and the 'Yin' tone data were input to a computer, consequently, a syllable with a 'Yin' tone was produced and it sounded like a word beginning with a voiceless consonant in Wu. Secondly, while the consonant and vowel data remained constant, but a 'Yang' tone data replaced the 'Yin' tone data. As a result, a syllable with a 'Yang' tone was produced and it sounded just like a word beginning with the I.V.C. in Wu. Followed this procedure, we got a series of word pairs. In 1985, the tape recording of these words

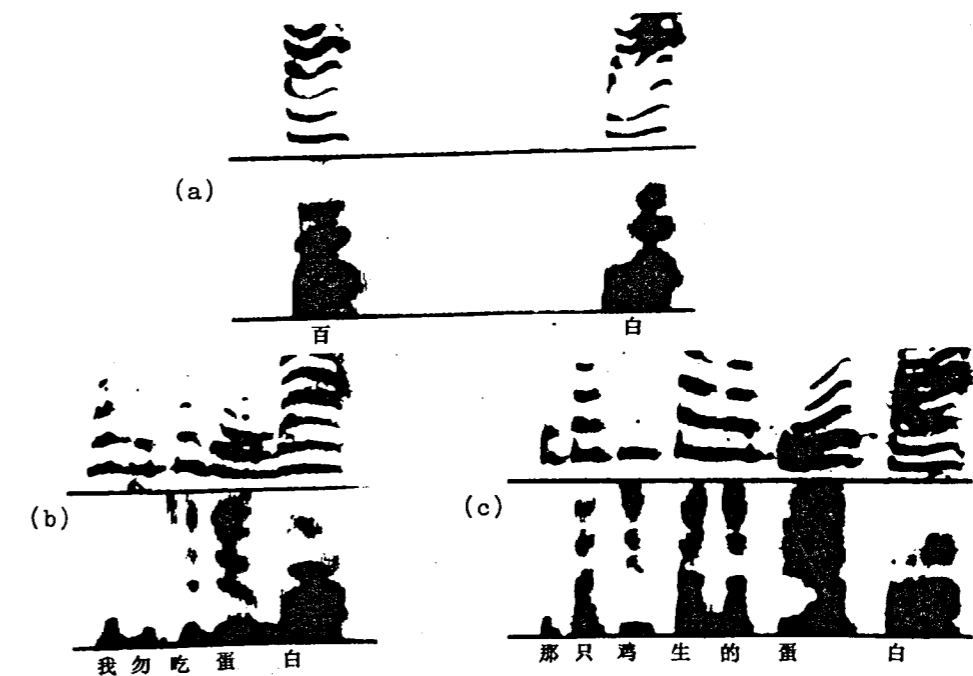


Fig.2 The spectrograms of (a) the monosyllabic word 白 (white) and 百 (hundred), (b) the sentence 我勿吃蛋白 (I dislike to eat albumen), (c) the sentence 那只鸡生的蛋白 (the egg laid by that hen is more white).

was played at the Third Meeting of the Linguistic Society of China, and the audience was asked to judge them without any knowledge of the source of these sounds. As the result, those linguists did judge those words with a 'Yang' tone as beginning with voiced consonants. This result indicates that the sense of voicing which perceived by these audience is caused by the 'Yang' tone of the syllable, instead of the value of the initial consonant.

Experiment of Running Speech

In this experiment, a series of syllables beginning with the I.V.C. were put in comparative context of different sentences, to observe how the variation of phonetic value of the I.V.C. depend on the changes of the syllable's tone and stress type. This test involved several subdialects of Wu, Fig.2 (see p.3) is a sample of this variation. Here the /b/ of /ba/白 is an I.V.C., and the /p/ of /pa/百 is the corresponding voiceless consonant. When they are pronounced in isolation, the spectrographic correlates of the /b/ and the /p/ are the same. It means that the I.V.C. /b/ is voicelessness. However, when the word is in running speech, the value of the /b/ varies. In sentence (b), as you might have noticed there is obvious voice bar during the closure of /b/ in /diə ba/ 蛋白 as shown in its spectrogram, it is typical voice. But in sentence (c), the spectrographic correlate of /b/ in /diə ba/ 蛋白 is the same as that of /b/ or /p/ in (a), it is completely voiceless. Compare (b) and (c), we can see that what causes this variation is the different changes of tone and stress in this two sentences. In sentence (b), /diə ba/ 蛋白 is a disyllabic word, the syllable /ba/ is unstressed and its 'Yang' tone has changed to be 'Yin' tone. In this case, the distinctive function of the 'Yang' tone has lost, and it must be replaced by something else. Consequently, the feature of voice becomes necessary; In contrast, the /diə ba/ 蛋白 in sentence (c) is a subject-predicate structure, the syllable /ba/ 白 is the predicate here and has to be stressed, so the 'Yang' tone pattern remains unchanged and keeps its distinctive function, therefore, the value of /b/ need not be changed in this case. This example supports our second hypothesis and clearly indicates that the alternation of the I.V.C.'s value in running speech regularly matches the changes in tone and stress type of those syllables where they located. This alternation can be formalized by the following rules:

$$\begin{array}{l} \text{I.V.C.} \xrightarrow{\text{C}} [-\text{voice}] / \# \xrightarrow{\text{V}} \text{V} + (\text{CV}) \text{O} \# \\ \text{I.V.C.} \xrightarrow{\text{C}} [+ \text{voice}] / \text{V} \xrightarrow{\text{V}} [-\text{stress}] \end{array}$$

Here the zero in (CV)O means the numbers from zero to any other integer, so the #—V+(CV)O # means any isolated monosyllabic or polysyllabic words. The

V+— [-stress] means the I.V.C. is in running speech and must be in an unstressed syllable.

CONCLUSION

This paper has tried to clarify two points about the I.V.C. in Wu. First, spectrographic analysis indicates that the I.V.C. in the Modern Wu Dialects has become completely voiceless. They are just the retention of the abstract distinctive category of the original phonological 'voice' rather than real physiological vocal cords vibration. Our perception test and the synthesized speech test show that the voicing sense of these syllables is caused by the 'Yang' tone pattern and motivated by the perceptual mechanism. Secondly, in running speech, there are alternate variants between typical voice and complete voicelessness. The condition of this alternation is the rule of the tone sandhi and the stress type in particular subdialects.

NOTES

- /*/ The 'Yang' tone is called 阳调 in Chinese and the 'Yin' tone is 阴调. Generally, the 'Yang' tone has either a lower pitch or a lower beginning, while the 'Yin' tone has a higher pitch or a higher beginning in Wu.
- /**/ This test was taken under Prof. P. Ladefoged's guidance in 1983.

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