

An Error Analyses on Chinese Natives' Perceiving of the Terminal Plosives

Man-ni Chu

University of Nijmegen and National Tsing-Hua University

mannichu@gmail.com

1. Introduction

The aim of the study is to investigate how Chinese natives with or without unreleased terminal plosives backgrounds perceive the four-way contrasts. How they categorize the sound which does not exist in their language system; furthermore which plosive they get confuse most, meaning they make most errors. Xiamen Chinese, four-way contrasts in terminal plosives, /p/, /t/, /k/, and /ʔ/; Longyian Chinese, /p/, /t/ and /k/, and Shantou Chinese, /p/, /k/ and /ʔ/, all belong to Southern Min dialects. It has been observed that the terminal plosives in Chinese dialects are phonetically not released, which is one of the important cues to determinate place of articulation of stops (Malecot 1958). Thus, the previous vowel formants are significant to final stops identity. Ladefoged (1975) stated that the formants of the vowel (e.g., F2 and F3) are the mark land to differentiate the terminal plosives in terms of the place of articulation. Specifically, the F2 and F3 decrease when next to /p/; they are marked as the 'velar pinch' in /k/; however, F2 and F3 are fairly steady when before or after the /t/. There is still no precise description on /ʔ/'s interaction with the adjacent vowel, but it is frequently occurred as all-phonemes of /t/. Thus, its effects on the formants are supposed to be the same as /t/-steady. Presumably, acoustically /t/ and /ʔ/ are the hardest to be distinguished from one to another. Chang, Paluce, and Ohala (2001) stated that the auditory factors are the primary reason to lead to the confusion asymmetries. Hume et al (1999) showed that, across vowels and languages, the dorsal and labial consonants are highest on the salience ranking when compared with the coronals. Thus, a perceptual experiment is conducted to see how natives perceive their terminal plosives and how the confusion matrices distribute.

2. Methods

All materials were recorded by a native speaker of Tainan, which also have the four distinctive terminal plosives, in CoolEditor Pro 2.0 with 44.1 kHz sampling rate and 16 bit quantization level. In the CaC structure, where C- is /t/ and /k/ and -C is /p/, /t/, /k/ and /ʔ/ since those words do exist in Tainan dialect. There were total 2 (C-) x 4 (-C) x 3 (times) = 24 stimuli. Before the experiment, subjects were trained to recognize the IPA. All sounds, presented in random order controlled by the computer software, were showed on the computer screen for subjects to choose one corresponding item out of the four. 14 natives of Xiamen, 12 of LongYian and 17 of ShanTou participated in the experiment.

3. Results and Discussion

The results showed that natives of Xiamen, which has four-way contrasts, tended to confuse /p/ with /k/ and /t/ with /p/; natives of Longyian, does not have /?/, tended to confuse all its terminal plosives with /k/ and natives of Shantou, lack of /t/, tended to confuse /k/ with /t/. In short, the unmarked consonant /t/ was the most difficult one to Xiamen and Longyian. In adopting Ohala's (1990) claim that when making the recognition, people rely on the [release] feature more on /t/ than others, /p/ and /k/, the unreleased final stops /t/ is to be recognized.

	xah	xap	xat	xak
xiamen				
xah	65.47619	11.90476	7.142857	15.47619
xap	8.333333	11.90476	5.952381	73.80952
xat	10.71429	52.38095	15.47619	21.42857
xak	17.85714	25	26.19048	30.95238
longyian				
xah	8.333333	27.77778	27.77778	36.11111
xap	19.44444	30.55556	9.722222	40.27778
xat	20.83333	25	22.22222	31.94444
xak	6.944444	27.77778	31.94444	33.33333
shantou				
xah	43.13725	11.76471	23.52941	21.56863
xap	15.68627	65.68627	7.843137	10.78431
xat	16.66667	19.60784	33.33333	30.39216
xak	22.54902	26.47059	27.45098	23.52941

One explains why /t/ is easily to be perceived as /p/ instead of /k/ because /p/ and /t/ share the same distinctive feature [diffuse] where /k/ is [compactness] in Jakobson, Fant & Hall(1954), who also claimed that the [grave] feature to distinguish /p/ and /k/ from /t/, the [acute] feature. The above statement can also explain why Xianmen and Longyian subjects confused /p/ with /k/ rather than /t/.

The other finding is /?/ is hard for Longyian natives, whose system lacks /?/. One can argue that subjects are not familiar with this particular foreign sound resulting in having difficulty in categorizing. However, why natives of Shantou, which is a /t/-less language, can recognize /t/ perfectly? One explains lies on there is an asymmetry between /?/ and /t/, where

the former only appears in coda position, is a combatively marked consonant, where /t/ appears in onset or intervocalic positions in Shantou, which is unmarked. The wider distribution of /t/ in Shantou makes /t/ to be easily recognized by Shantou natives. Nevertheless, Shantou natives confused the /k/, which showed that the percentage in each category is approximate 25. This can be explained by the phenomenon observed by Householder (1956:242) "that /k/ with some suicidal features in the stop makes the sounds more like either of the others than like itself."

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