

A socio-phonetic analysis of Taiwan Mandarin interview speech

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Abstract

This paper presents results of a socio-phonetic analysis of Taiwan Mandarin by using a corpus of questionnaire-based interview speech. Questions were asked to collect data of the interviewee's background of language use, socio-economic status, and internet access in different regions of Taiwan. Two typical dialect-influenced pronunciation errors, the deletion of /w/ before /o/ and the delabialization of /y/ were analyzed with the associated socio-economic factors and the degree of dialect exposure. The degree of dialect exposure (Southern Min) and the studied pronunciation variants are statistically correlated with the accuracy rate. But no direct correlation was found between the pronunciation variation and the socio-economic factors.

Index Terms: Sociophonetics, Taiwan Mandarin, interview speech

1. Introduction

Sociolinguistic research traditionally focuses on how languages are produced and perceived in social context. Attentions have been paid to different facets of research lines such as social stratification, language contact, change, and variation [1, 2]. Sociolinguistic factors include primarily educational background and economic status. However, language contact would result in speaking with an accent influenced by dialects in a multilingual society. Linguistic properties of the mother tongue influences the pronunciation, the selection of words, the structure of sentences and the interpretation of discourse meaning in the use of the second language. Therefore, in our study, we designed an index to represent the degree of dialect exposure. It will be used to investigate the influence of dialect on the pronunciation of the official language. Furthermore, with growing interests in the acoustic properties of speech, a new research field "socio-phonetics" integrates methodologies of acoustic analysis into the sociolinguistic research field [3]. With quantified measures, empirical evidence obtained from sociolinguistic studies gains in-depth insight into how individuals use language in society, especially on how they speak. This paper presents a study, in which pronunciation variants are examined in terms of socio-economic factors and the degree of dialect exposure.

2. Sociolinguistic background in Taiwan

2.1. Population

The population of Taiwan is composed of four distinct ethnic groups. Taiwan is a multilingual society, with the majority of the population speaking more than one language. The percentage of population of each group is as follows [4]:

- Southern Min people (71%) immigrated to Taiwan from southern Fujian Province in mainland China several

centuries ago. Their native language is the Southern Min dialect of Chinese.

- Mainland Chinese (15%) came from different provinces in mainland China after the World War II. They speak their own Chinese dialect, but mainly use Mandarin for communication in Taiwan.
- Hakka people (12%) came from Guangdong province in the same time period as the Southern Min people and speak the Hakka dialect.
- Aboriginal people (2%) have been in Taiwan for thousands of years. There are now officially thirteen Formosan languages spoken in Taiwan.

Taiwan Mandarin used in this paper refers to the official language spoken in Taiwan, which is the same language as Beijing Mandarin. But due to historical, linguistic, political and social reasons, these two languages gradually distinguish themselves in pronunciation, stress pattern, word use, and sentence structure [4, 5]. As the Nationalist government officially promoted Mandarin to be the official language in Taiwan, the so-called "Mandarin Language Policy", after they came to Taiwan in 1949, use of dialects in schools and public places and institutions were strictly prohibited. Although this language policy was lifted in 1987 [6], Southern Min is mostly used on private occasions, whereas Taiwan Mandarin is used for formal events such as conferences, business, schools, and political affairs. Especially, in metropolitan cities, young people speak only Taiwan Mandarin for both private and public communication. They cannot speak Southern Min fluently, even if they originate from a Southern Min family. In middle and southern Taiwan, Southern Min is more frequently used within family and also in official events. To study how the pronunciation of Taiwan Mandarin is influenced by socio-economic and dialectal factors the speakers are exposed to, we conducted a socio-phonetic analysis.

2.2. Vowel systems

In this paper, we deal with three cities located in middle Taiwan, where the dominant dialect is Southern Min. We illustrated first the differences of Taiwan Mandarin and Southern Min vowel systems in Figure 1. Please note that Southern Min is a group of Chinese dialect, i.e. there are several variants of Southern Min spoken in different regions in Taiwan. The sound system of Mandarin varies due to different phonological considerations of phoneme systems [7]. For example, /w/ in the word *guoyu* /kwo y/ can be considered as (1) a segmental feature, (2) a glide, or (3) part of the diphthong /uo/ under different phonological considerations. In this paper, we regard /w/ as a glide. Figure 1 summarizes the vowel system of Taiwan Mandarin and Southern Min as proposed in [8], [9] and [10]. Please note that the same IPA symbol used for Southern Min and Mandarin may not be exactly the same speech sound as located in the chart of Figure 1. The purpose of the chart is to illustrate the main

differences of vowels in these two languages. We notice that Southern Min does not have the rounded front vowel /y/, and has two variants of mid-back vowels /o, ɔ/. In some of the Southern Min variants, /o/ and /ɔ/ are merged into one phoneme. Taiwan Mandarin has only one rounded mid-back vowel /o/ which shares similar vocalic qualities with /o, ɔ/ in Southern Min. The glide /w/ which is not explicitly shown in the vowel chart cannot appear in a prenuclear position before /o/ in Southern Min, as Taiwan Mandarin does. These features will be investigated in our socio-phonetic analysis.

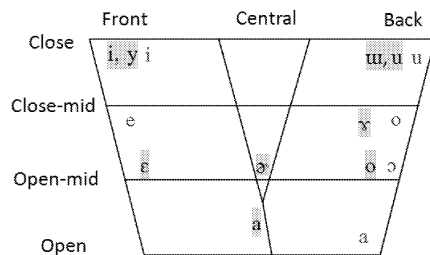


Figure 1: Plain vowels in Taiwan Mandarin and Southern Min (Mandarin vowels are shaded.)

3. Method and data

3.1. Questionnaire-based interview speech

Data used for this study are extracted from a corpus constructed in a sub-project of the National Digital Archives Project (2007-2012) [11]. We elicit speech data by asking interviewees questions about their socio-economic and linguistic backgrounds, their access to the internet as well as their international exposure. We use the natural speech data collected via the interviews to study socio-phonetic characteristics of Mandarin spoken in Taiwan. Based on the transcribed contents of the interviews, a database is constructed with the socio-economic information and acoustic features which are extracted from the recording of the interviews. In combining the methodologies of sociolinguistics, acoustic phonetics and corpus linguistics, we aim to examine the socio-economic factors to what extent they are related to pronunciation variation.

We thus designed three different types of questions for the interview.

- Language use: Questions are asked about which languages the interviewee speaks and uses for daily communication.
- Socio-economic background: Questions are asked about where the interviewee was born and grew up, their education level, salary level, and working experiences lasting over six months.
- Internet use and international experience: Questions are asked about how often the interviewee uses the internet and whether the interviewee has ever had international experience.

The aim of the project is to collect interviews from all 25 administrative regions in Taiwan. We went to where local people would go such as parks, post offices, or banks, and chose the interviewees randomly. The target group is subjects between 20 and 40 years old. Recorded interviewees who were older than 40 or younger than 20 years old were not included in our database. The interviews were recorded by using the Sony Hi-MD MZ-RH1 digital recorder and the Sony

ECM MS907 microphone due to transportation reasons. The interview contents are transcribed using Praat [12]. Acoustic features are then accordingly extracted from the labeled boundary information.

3.2. Data and factors for analysis

We used the data of 80 already processed interviews from the abovementioned corpus for our analysis. The interviewees originate from three cities in middle Taiwan: Jiayi, Taizhong, and Zhanghua. Taiwan Southern Min is the dominant language in these three cities. In the interview, we asked a series of questions about the language use of the interviewees. Specific questions were asked to collect targeted items which have the phonetic structures we intend to use for further phonetic analysis. In the questions, we intentionally and consistently use “*guoyu*” (literally *national language*) to represent the official language used in Taiwan, i.e. Taiwan Mandarin. All interviewees would have to produce this lexical item in the context of the interview several times. In this way, we collected naturally spoken lexical items for the study of pronunciation variation and its relationship to social factors. Table 1 summarizes the data statistics we used for this study.

Table 1. *Data summaries.*

Region	# of interviewees	# of <i>guoyu</i>
Jiayi	28	118
Taizhong	18	187
Zhanghua	34	168
Total	80	473

For later analysis, we investigated the relationship between the pronunciation variants of *guoyu* and the following socio-economic factors: gender (female, male), age group (20-30, 31-40), region (Jiayi, Taizhong, Zhanghua), education level (college, high school, postgraduate), status of profession (employed, house wife, intern, military service, others, students, trainees, unemployed), salary level (0, below 30K, 30K-50K, 50K-80K, above 80K, others), frequency of internet use (none, seldom, usual, frequent, others), and international experience (yes, no).

3.3. Quantification of degree of dialect exposure

In order to quantify the degree of dialectal influence, we specifically designed an index to represent it. In Taiwan, 70% of the population learns Taiwan Southern Min as their first language. However, the extent of acquaintance of Southern Min and the frequency of using it may vary from region to region, and from family to family. A common phenomenon in a Taiwanese family is that Taiwan Mandarin is used while talking to the siblings, and Southern Min is used while talking to the parents. In a dialect-speaking family, Southern Min is the only language used for communication. Thus, we quantify the degree of dialect exposure by two criteria: how Southern Min is used for communicating with the parents and the siblings. If Southern Min is the only language used for communication, it is given 1 point. If Southern Min and Taiwan Mandarin are both used, it is 0.5 point. If no Southern Min is used, it is 0. For interviewees without siblings, it is also scored 0. According to the answers the interviewees provided, we calculated the sum of the scores given for the communication language to the parents and to the siblings. For example, an interviewee, who uses only Southern Min to his/her parents and siblings, is scored the highest 2 for

Southern Min exposure. An interviewee, who uses only Taiwan Mandarin to communicate with his/her parents and siblings, receives the lowest score 0.

3.4. Glide deletion and delabialization

We mentioned previously that the two apparent differences between vowels in Taiwan Mandarin and Southern Min are the glide /w/ before /o/ and the rounded high front vowel /y/. If the glide /w/ before /o/ is deleted and /y/ is delabialized to its unrounded counterpart /i/, it is likely to be classified as a Southern Min accented pronunciation. We took thus these two features as our main research criteria for describing pronunciation variants. Figure 2 illustrates the spectrogram of four different pronunciation variants of *guoyu* extracted from our corpus. Figure 2a is an example of a correctly pronounced token of *guoyu*. Figure 2b shows that /w/ is deleted before /o/; Figure 2c illustrates the delabialized /y/; and Figure 2d is a combined type of these two errors. For our analysis, we used the rate of the /w/ deletion and the delabialized /y/ in *guoyu* produced by the 80 interviewees as quantified indices to analyze their relationship with the other factors.

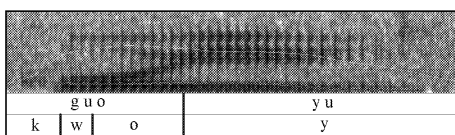


Figure 2a: Correctly pronounced (/kwo y/)

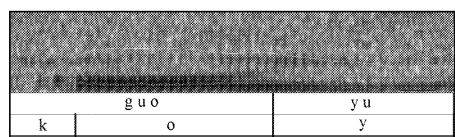


Figure 2b: Deletion of /w/ before /o/ (/ko y/)

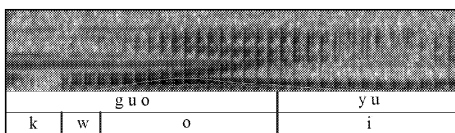


Figure 2c: Delabialized /y/ (/kwo i/)

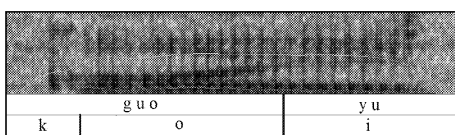


Figure 2d: Combined errors (/ko i/)

4. Result

4.1. Accuracy rate of *guoyu*

A token of *guoyu* is regarded as correctly pronounced, if the onset, the glide, and the nuclei can be distinctively perceived by the labelers and identified in the spectrogram. The percentage of the tokens pronounced correctly over the total number of tokens is the accuracy rate. We found that the accuracy rate is statistically correlated with the rate of glide deletion, the rate of delabialization, and the degree of dialect exposure: the Pearson correlation coefficients -.571, -.668, and -.279, $p < 0.01$ for all three tests. For the two pronunciation error types, a negative correlation with the accuracy rate was expected, as their relation is supposed to be complementary to some extent. More interestingly, the degree of dialect exposure is also negatively correlated with the accuracy rate.

This implies that the more the interviewee is exposed to a Southern Min speaking environment in his/her family, the less likely that he/she pronounces the item correctly. Table 2 gives the frequency analysis of the accuracy rate of each dialect exposure group. Figure 3 shows the means of accuracy rate of *guoyu* of the five groups of dialect exposure. A global tendency of the negative correlation is illustrated in Figure 3.

Table 2. Accuracy rates

Degree of dialect exposure	Mean	N	Std. deviation
0	89.1	13	21.9
0.5	94.8	12	9.5
1	82.9	23	23.3
1.5	84.4	16	25.4
2	69.9	16	26.8
Total	83.4	80	23.6

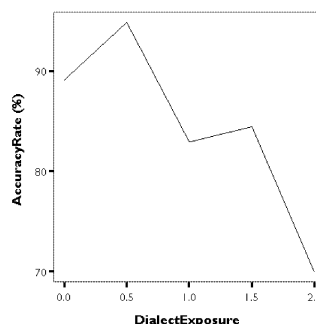


Figure 3: Accuracy rate vs. dialect exposure.

However, no statistically significant correlation was found between the accuracy rate of *guoyu* with the above mentioned socio-economic factors. This may be possibly due to the lack of samples. When the project is completed, more data can be used to repeat the same analysis to find out whether there is any relation between the pronunciation and socio-economic factors.

4.2. Degree of dialect exposure

In the analysis above, the degree of dialect exposure proves to be a meaningful indicator correlating with the frequent phonological errors influenced by the differences between Taiwan Mandarin and Southern Min. Therefore, we further examined the correlation between the degree of dialect exposure and other factors. Results suggest that the delabialization of /y/, the education level, and the frequency of internet use are statistically correlated with the degree of dialect exposure (the Pearson correlation coefficients are .221, -.267, -.205, $p = 0.02, 0.01, \text{ and } 0.03$). More concretely, the result shows that the more a speaker is exposed to Southern Min, the lower the education level is and the less frequently he/she uses internet. This reflects the relationship between social strata and dialect environment. There is a socio-economic difference of living standards between the northern and the middle-southern cities of Taiwan. For the two typical errors which Southern Min-accented speakers often make (the /w/ deletion before /o/ and the delabialization of /y/), only the delabialization of /y/ is found positively correlated with the degree of dialect exposure. That is, the more a speaker uses Southern Min, the more likely that he/she makes the

delabialization error. Figure 4 illustrates the distribution of the five dialect exposure groups in terms of the means of the delabialization rate.

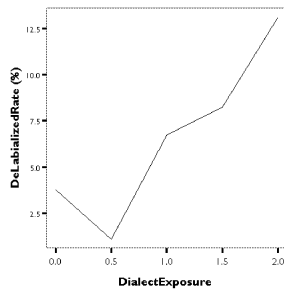


Figure 4: *Delabialization rate vs. dialect exposure.*

4.3. Formants of correctly pronounced /o/ and /y/

In Figure 4, the 0.5 group has the lowest delabialization rate, and the 2.0 group the highest. So we further investigated whether the degree of dialect exposure has any relation with the acoustic properties of the correctly produced /o/ and /y/ in the target item. Using the labeled information in Praat, we automatically extracted the F1 and F2 values from the point where the largest intensity value is measured. Figure 5 shows the distribution of /o/ and /y/ produced by speakers in groups 0.5 and 2, suggesting that once the vowels are correctly produced, no clear distinction was found in terms of their acoustic properties. Nevertheless, the formant values of /y/ are relatively centered, but the distribution of /o/ shows a greater degree of diversity than that of /y/, especially in terms of the F2 values. Focusing on the pronunciation of /o/ in Taiwan Mandarin, it is possible that the two variants /o, ɔ/ in Southern Min result in a wider variation span of F2 values while pronouncing /o/ in Taiwan Mandarin. We need further studies on whether the merging of /o/ and /ɔ/ is a common trend in Taiwan or the merging actually results from the dialectal influence of Southern Min. We will also undertake a comparison study on the acoustic properties of /o, ɔ/ in Southern Min with the Taiwan Mandarin /o/ with more data.

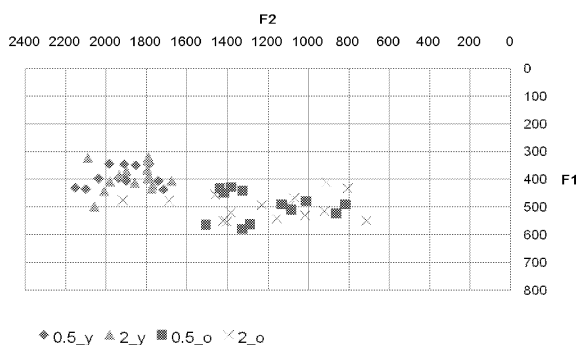


Figure 5: *Formant values of correctly pronounced /o/ and /y/.*

5. Discussion

This paper investigated the influence of dialect (Southern Min) on the official language (Taiwan Mandarin) by defining

phonologically predicted error types and the degree of dialect exposure. By using the quantified metric representing the degree of Southern Min exposure, the results of our study show that in natural speech, the rates of correctly producing *guoyu* and of the two dialect-influenced phonological errors can be quantified and analyzed with linguistic and sociolinguistic factors. We did not find any socio-economic factor which is correlated with the mentioned dialect-influenced phonological errors and the degree of dialect exposure in the current study. More data will be included to examine the socio-economic factors again. The formant values of /o/ are more dispersed than those of /y/. In particular, the F2 values of /o/ vary to a great extent, possibly due to the difference of /o, ɔ/ in Southern Min which shares similar phonological properties with /o/ in Taiwan Mandarin. Thus, it results in a wide range of F2 values while pronouncing /o/ in Taiwan Mandarin.

6. Conclusions

The study shows that acoustic-phonetic representations, phonological features, and the degree of dialect exposure can be quantified and analyzed with socio-economic factors. The degree of dialect exposure is preliminarily tested in this study. It can be improved by considering more sociolinguistic factors such as languages used for work or for communication with other family members. Nevertheless, the degree of dialect exposure has proved to be a relevant and important index for sociolinguistic studies.

7. Acknowledgements

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8. References

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