

Alternation of Syllable-initial /l/ and /n/ in Sichuan Dialect and Its Transfer to English Pronunciation

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Abstract — This paper investigates the details of alternation of syllable-initial /l/ and /n/ in Sichuan dialect and the transfer to corresponding English pronunciation. The evidences were obtained in the speech of Sichuan-dialect and English bilinguals. Based on the F2 differences of these two sounds, this paper hypothesized the possible influence from the articulation place of the following vowel.

The subjects comprised eight Sichuan-English bilinguals in North Carolina State University or in China. The data consists of a number of key words designed to capture the target sounds in a variety of phonological environment. With the help of acoustic analysis by Praat and statistic analysis by R, according to the differences between F2 values in /l/ and /n/, the final results confirmed the former hypothesis. To be specific, if the following vowel is a non-low vowel, there is more possibility for the correction of syllable-initial /n/ and if it's a low vowel, there is more possibility for the correction of syllable-initial /l/.

Keywords— *syllable-initial /l/ and /n/ alternation; Sichuan dialect; articulation place; Sichuan English; transfer*

I. INTRODUCTION

One of the typical phonetic features of Sichuan dialect is the syllable-initial /l/ and /n/ alternation, which is shared by many southwest Guan, such as Chongqing and Wuhan dialect. The phenomenon is also detected when Cantonese speakers speak English. Wong and Setter [1] point out “one of the inter-language phonological features of Cantonese-speaking ESL learners of Hong Kong is that syllable-initial /l/ and /n/ are not distinct [2, 3, 4, 5]”. They also mentioned that this kind of phonological shift has only been documented as yet in Hong Kong Cantonese speakers. However, according to the author's own observation, the alternation also occur among Sichuan speakers.

II. LIT REVIEW

In Sichuan dialect, the alveolar nasal /n/ and the lateral approximant /l/ are not distinct. The consonant /n/ of Sichuan dialect corresponds to a nasal consonant /n/ and a lateral approximant /l/ in standard Mandarin [6, 7, 8]. The nasal /n/ and the lateral /l/ are considered to be in free variation in Sichuan dialect [7]. There is not much study done on the alternation of

nasal /n/ and lateral /l/ in Sichuan-speaking ESL learners, but there are studies on the same alternation of Cantonese-speaking ESL learners. The merging of Syllable-initial /n/ and /l/ in Hong Kong Cantonese are reported as “a widespread unconditioned merging among young speakers” [1].

The role that one's native language plays in the acquisition of a second or foreign language has always been of interest to linguists. Earlier discussion of language transfer often attributed a learner's difficulty in learning a second language to differences between his/her native language and the target language. The Contrastive Analysis Hypothesis [9] argued that target language forms that were different from the equivalent forms in the native language would be difficult to learn. But Odlin [10] suggested that there was evidence showing that differences between languages did not always lead to learning difficulties. Eckman [11] suggests the Markedness Differential Hypothesis (MDH), predicting not only the areas of difficulty for second language learners, but also the relative degree of difficulty on the basis of a systematic comparison between native and target languages and markedness relations stated in Universal Grammar. Chan [12] used MDH studied the acquisition of English word-final consonants by Cantonese ESL learners in Hong Kong.

Hung's study [4], through comprising 15 undergraduates at the Hong Kong Baptist University, covered segmental phonology — in particular the underlying phonemic system of Hong Kong speakers, and the phonetic realizations of its phonemes in different phonological environments. In his studies on the syllable-initial /l/ and /n/ alternation in Hong Kong English, he questioned whether the interchange happens with equal frequency both ways and whether it is subject to any phonological conditions. The results suggest that the presence of a nasal in the same syllable increases the likelihood of an initial /l/ being pronounced as a nasal, just as it decrease the likelihood of an initial /n/ being pronounced as a non-nasal --- some sort of “nasal harmony” or “nasal spreading” so to speak. For example “lame” is most frequently pronounced with initial /n/, which is mirrored that “name” is least frequently pronounced with initial /l/. However, with the lack of any clear phonological pattern in their alternation, the fact suggests that /l/ and /n/ are probably in free variation in Hong Kong English in the onset of a syllable.

David C.S. Li [13] mentioned the phonemic distinction between

syllable-initial /l/ and /n/ in English is often undifferentiated by Cantonese-L1 (but less typically Mandarin-L1) learners of English, with /n/ being pronounced as /l/. Li explained this phenomenon by the fact that in Cantonese /n/ and /l/ are treated as variants with no risk of miscommunication. However, there is no detailed study or explanation in this paper.

Bley and Schiel [14] studied the language transfer of Cantonese speakers to German as their L4, specifically the /l/ and /n/ replacement. As the result, they found that /l/ and /n/ replacement in German L4, occurs not only in the syllable onset, but also the syllable coda, mainly the syllable coda and cluster. And the result suggests that in the speech of some informants /l/ and /n/ are not contrastive, neither in the syllable onset nor in the syllable coda.

There are also other studies on phonetic transfer in Cantonese-Hong Kong English bilinguals done by Chan [15, 16, 13]. But his concentration is mainly on phonological systems as a whole instead of a specific aspect.

III. RESEARCH QUESTIONS

Based on the previous study, the present study hypothesized the possible influence of the articulation place of the following vowel to the differences of F2. The research questions are as follows:

- Is there any transfer of syllable-initial /l/ and /n/ alternation in Sichuan dialect to Sichuan English?
- Is the articulation place of the following vowel influential to the alternation of syllable-initial /l/ and /n/ in Sichuan Dialect?
- If it is, is it the same reason of the /l/ and /n/ alternation in the syllable onset in Sichuan English?

IV. METHODOLOGY

The study invited 8 native Sichuan speakers as the subjects: three of them are in North Carolina State University (NCSU), two of which are females and have been in America for four months, the rest one is male and has been here for 4 years. Other five speakers are all university students in China, who have never been abroad. All of them began studying English systematically from junior high school, which means at least eight years English study for non-English majors, and 10 years for English majors.

The speech data consists of two parts, Sichuan dialect and English. The words and paragraphs were chosen in order to include words that contained the target sounds. The recordings are done by individual. The speakers were asked to read all the words, sentences and paragraphs in Sichuan dialect and in English in normal speed. In case there is any mistake, they were inquired to repeat the task.

For the questionnaire, it basically aims to explore the personal and social backgrounds of the subjects, for instance, age, gender, hometown, and major etc. The acquisition background, such as language exposure, language environment, learning facilities, and self-identified learning difficulties especially in

pronunciation, are also listed in questionnaire.

Acoustic analysis was used in dealing with the speech data. Words in Sichuan dialect and English were transcribed in a broad phonetic transcription. The phonetic analysis software, Praat, was used to do acoustic analysis in this study. The program R is used to do the statistic study. To be specific, mainly t.test was applied in the data.

Ladefoged [17] proposed “laterals differ from nasals in that their formants (particular the second formant (F2) more readily show distinctions among them””. The spectrogram (Figure 1 below) shows the target /n/ which pronounced by native English speaker in the data. It can be seen that F2 is near 2000Hz, to be specific, 1877 Hz according to the slice shown. Compared with nasal /n/, it can be seen that F2 of lateral /l/ is much lower, at about 860Hz.

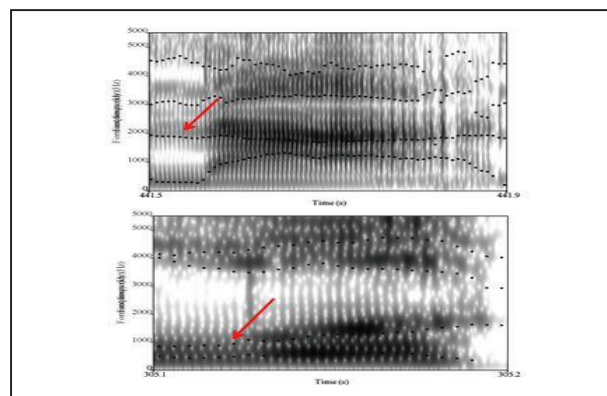


Fig.1. Target /n/ in “nine” and target /l/ in “look”

Even though other unique spectral cues of nasal /n/, such as F1 characterized as “nasal murmur” at 250 Hz, are equally important to make distinctions, it is not further discussed in this paper. Perception test was also applied in this distinguishing process. However, the majority of the “hard-to-distinguish” targets are within the range of mean F2 for both sounds. Therefore, differences between the F2 in the targets sounds are used in my study to distinguish the pronunciation.

V. ANALYSIS

In Sichuan dialect, the alveolar nasal /n/ and the lateral approximant /l/ are not phonologically distinct. The consonant /n/ of Sichuan dialect corresponds to a nasal consonant /n/ and a lateral approximant /l/ in [6, 7]. The nasal /n/ and the lateral /l/ are considered to be in free variation in Sichuan dialect [7].

Under the influence of their mother tongue, Sichuan-dialect-speaking English learners also alternate / n / and /l/ in their second language, for example, they pronounce *night* as / lait /, *late* as / neit / [6]. The alternations may hinder communication, and definitely result in a non-native accent. The phenomenon of non-distinction of /n/ and /l/ among Sichuan-dialect-speaking English learners is a straightforward case of L1 transfer. Since the understanding of inter-language phonology has improved

over the past decades, it helps us to do research about language transfer. ‘Such a case of L1 language transfer is worth investigating because this shows how intricate inter-language systems can be. It is not simply transfer of a segment from L1 to L2 or the inability to produce a certain segment in L2 because of its absence in learner’s L1. It is the transfer of a reorganization mechanism in L1 to L2, merging two contrastive phonemes in L2 as if they were in the phonological system of the learners’ L1’ [1].

Five points of F2 were measured using Praat script. The nuclear F2, which is at 25% point of the whole duration, is further analyzed in this study.

After analyzing the recordings using Praat, the mean of F2 in syllable-initial /n/ and /l/ in Sichuan dialect (SD) and Sichuan English (SE) are showed in Table 1.

TABLE I. MEAN F2 VALUES AND STANDARD DIVIATION OF SYLLABLE INITIAL /l/ AND /n/ IN SD AND SE

	SD		SE	
	/n/	/l/	/n/	/l/
Mean F2	1741	1645	1715	1484
(SD)	(356)	(330)	(367)	(276)

Significant differences are found between SD /l/ and SE /l/ (p-value < 0.001), and SE /n/ and SE /l/ (p-value < 0.001). The over results suggest that great negative transfer is found from SD to SE in the F2 of syllable-initial /n/, but not for /l/. The distribution of syllable-initial /l/ in SE and SE showed a significant difference. Not only the mean of F2 decreases from 1741 to 1484, but also the distribution, with a reduced standard deviation, is more centered.

As showed in the table, it can be seen that the difference between average F2 value of syllable initial /n/ and /l/ is not as large as the difference showed in the Figure 1. Moreover, because of lack of study on F2 of lateral /l/, the mean F2 is used in this current study to mark the correctness of /l/. Based on average value measured in Table 1, if the F2 value of syllable-initial /n/ is greater than 1741 in SD, it is considered as the right pronunciation (n+), while if the F2 value is less than 1741, it is considered as the tendency of /l/-like pronunciation (n-). Same roles are applied to mean F2 values in other pronunciation. One significant point here is that the purpose of classifying different figures are not to make an absolute judgment, but rather to make a clearer tendency in the following analysis. The result of the numbers and percentage of the mis/pronounced syllable-initial /l/ and /n/ is showed Table 2.

TABLE II. THE NUMBER AND PERCENTAGE OF THE SYLLABLE INITIAL /l/ AND /n/ IN SD AND SE

	l+		l-		n-		n+	
	N	%	N	%	N	%	N	%
SD	35/68	51	33/68	49	25/47	53	22/47	47
SE	45/96	47	51/96	53	19/63	30	44/63	70

Syllable-initial /l/ and /n/ sounds are categorized into four columns according to the average F2 value. In 68 tokens of syllable-initial /l/ in Sichuan dialect, 35 of them remained the correct pronunciation while 33 of them had higher F2 values, which make them a /n/-like sound. In 47 tokens of syllable /n/ in Sichuan dialect, there is no big difference in the number of the correct pronunciation and the mispronunciation, but the number of mispronounced syllable-initial /n/ is still slightly higher than the correctly pronounced ones. 45 out of 96 tokens in syllable-initial /l/ in Sichuan English remained /l/-like sound while 51 of them tend to be /n/-like. While in 63 tokens of syllable-initial /n/, 44 of them are pronounced with higher F2 and remained /n/-like sound, the rest 19 tokens have lower F2 and altered into /l/-like sound.

To make a better illustration of the change between two languages, figure 2 is built, with the percentage of the alternation of syllable-initial /l/ and /n/ in Sichuan dialect and Sichuan English.

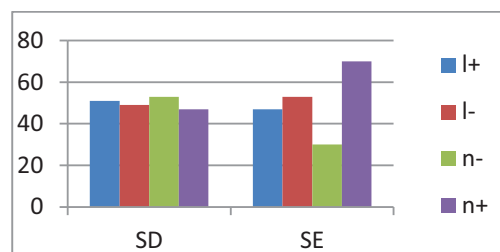


Fig.2. The change of percentage of mis/pronounced of /l/ and /n/ in SD and SE.

Figure 2 illustrates the changes of the percentage of the mis/pronunciation of syllable-initial /l/ and /n/ in SD and SE. As can be seen, there is no significant change of the proportion of mis/pronounced /l/ in two languages, for instance there are 47% /n/-like syllable-initial /l/ in Sichuan dialect and in Sichuan English, the proportion increases slightly to 53%. However, in Sichuan dialect, 53% of the syllable-initial /n/ are pronounced incorrectly, while in Sichuan English, the number reduces greatly to 30%. At the same time, correctly pronounced syllable-initial /n/ increases to 70%. There is also an interesting point that in Sichuan dialect, the mispronounced syllable-initial /n/ suffers from the highest proportion while in Sichuan English, it drops to the lowest one. The obvious manipulation could be found in pronouncing English syllables starting with /n/.

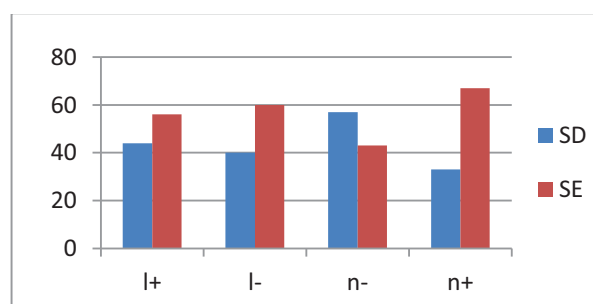


Fig.3. The percentage of SD and SE in mis/pronounced syllable initial /l/ and /n/

Figure 3 demonstrates the percentage of SD and SE in mis/pronounced syllable /l/ and /n/. It's quite interesting that in Sichuan English the proportions of correctly pronounced /l/ and /n/ are both higher than those in Sichuan dialect, which further supports the speaker's extra attention when pronouncing these two words in their second language. However, speakers also produced a higher proportion of mispronounced /l/, but not in the case of mispronounced /n/. The reason for higher percentage of both l+ and l- could be resulted from hypercorrection. In the 8 answers to the question "list the difficulties you found when learning English", five of them named the alternation of syllable initial /l/ and /n/ in Sichuan dialect. Noticing this phenomenon and paying extra attention while speaking English may potentially lead to the hypercorrect behavior. Observers' paradox may also result in the hypercorrection behavior. Because the speakers knew exactly what the recordings are for, they, especially speakers in China, tried their best when pronouncing English words to make them sound "better".

However, there are differences between Sichuan dialect and Sichuan English on the percentage of the correct pronunciation of syllable-initial /l/ and /n/, but the linear model designed to study whether there is significant differences in the two language environments, or if there is significant transfer of Sichuan dialect to their English pronunciation shows the $Pr(>|t|) = 0.409$ with Sichuan dialect as the reference level.

In the next step, I am going to study the possible relation between place of articulation and syllable-initial /l/ and /n/ alternation. Figure 4 show the F2 distribution of syllable-initial /l/ and /n/ in Sichuan dialect and Sichuan English, together with the articulation place.

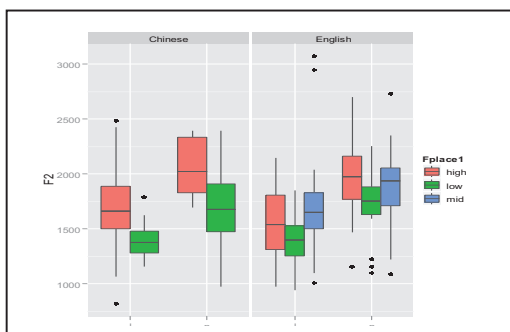


Fig. 4. The influence of articulation place of the following vowels on F2 values in syllable-initial /l/ and /n/. (Fplace1=articulation place)

As showed in Figure 4, in Sichuan dialect, syllable-initial /l/ followed by a low vowel has the lowest F2 distribution in the graph. Syllable-initial /l/ followed by a high vowel and syllable-initial /n/ followed by a high vowel have the similar distribution in F2 values in the data. Syllable-initial /n/ followed by a high vowel has the highest F2 value distribution in Sichuan dialect. The boxplot showed above proves that the articulation place of the following vowel has a great influence on the F2 value of syllable-initial /l/ and /n/ and thus may lead to the alternation

between them, especially when syllable-initial /l/ followed by a high vowel and syllable-initial /n/ followed by a low vowel.

Similar pattern is found in Sichuan English when articulate syllable-initial /l/ and /n/, which also shows that place of articulation of the following vowels has significant influence on F2 value of syllable-initial /l/ and /n/, and further leads to the mis/pronunciations. In Sichuan English, the following mid vowels are also studied, but due to the lack of mid vowels in Sichuan dialect data, more recordings are still need to be done.

In the next place, author studied the F2 distribution of the correctly pronounced and mispronounced syllable-initial /l/ and /n/ according to the articulation place of the followed vowels in both Sichuan dialect and Sichuan English, as showed in Figure 5.

It is found that in all of the four categories, syllable-initial /l/ and /n/ F2 values are greater if it's follow by a high vowel than that when followed by a low vowel. There is only one exception, which is the mispronounced syllable-initial /n/ in Sichuan English. The F2 value of /n/ followed by a low vowel is higher than it followed by a high vowel. Therefore I checked the data and find out that 7 out of 11 tokens of the high vowels following the mispronounced syllable-initial /n/ are in unstressed syllables, such as in "learning" and "organic". Therefore, whether the syllable-initial /l/ and /n/ is in the stressed syllable or unstressed syllable is another factor that may influence the F2 value of /l/ and /n/ and may further influence the alternation in Sichuan English. However, the further analysis of rhythm of Sichuan dialect shows the PVI is about 0.4, which suggests, like Mandarin, it's a syllable-timed language. Therefore, the comparative study in Sichuan dialect and English on this issue needs to be further analyzed, which unfortunately, is beyond the scope of this present paper.

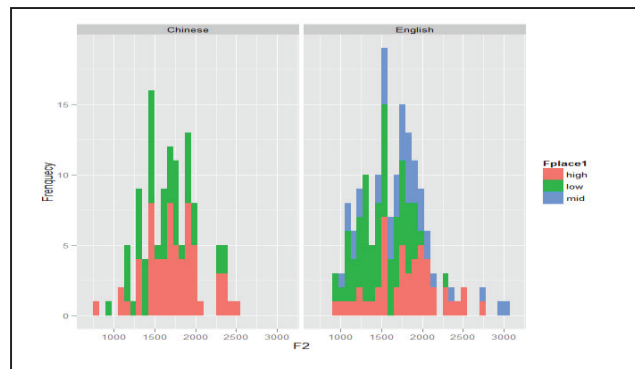


Fig. 5. The frequency change of three different vowel types with the increase of F2.

As showed in the figure above, with the rise of F2 values, the change of frequencies of three different vowel types change accordingly. In both languages, with increased F2 values, frequencies of high and mid vowels drop while that of low vowels rise. To make a clearer view of the pattern, a boxplot was made to show the change in four categories.

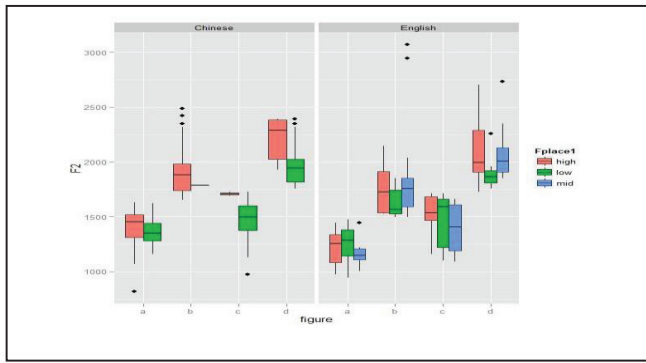


Fig. 6. The F2 change from l+ to n+ (l+, l-, n-, n+ are replaced by a, b, c, d)

Another perspective of the data I want to look into is the number and the change of proportion of vowels with different place of articulation in the four categories. A bar chart in figure 6 is made by using R. The number of following high vowels reduces from l- to l+, with the decrease of the F2 value of syllable-initial /l/, while the number of following low vowels increases in Sichuan dialect. From n- to n+, the number of following high vowels increases with the increased F2 value. In Sichuan English, same pattern of following high/low vowels changes is found in syllable-initial /n/, but the syllable-initial /l/ shows a different pattern. With the decreasing F2 value from l- to l+, the number of the following vowels instead of increase shows a decrease, which is different from the pattern in Sichuan dialect.

Due to the small corpus of the data, percentage of the change of following vowels with different place of articulation is more valid than the change in numbers. Therefore, more attention is devoted to the change of percentages instead of change in numbers. Failed reordering the variables to “l-, l+, n-, n+” in R, which is also accorded to the increase of the F2 values, I made the graph by using Excel.

The change of percentage of the following high/low vowels in words with syllable-initial /l/ and /n/ is showed in the line graph.

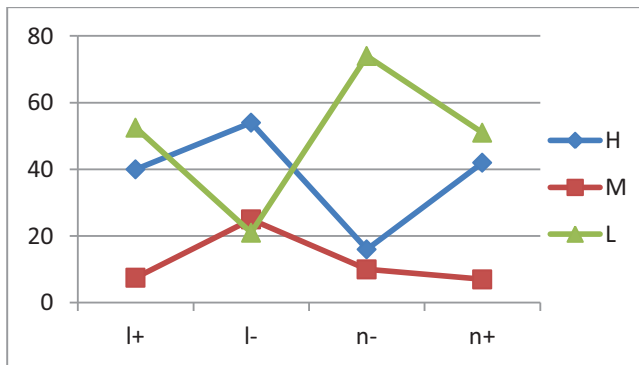


Fig. 7. Change of the percentage of high, mid, low vowels after the syllable-initial /l/ and /n/ in Sichuan dialect

It could be seen from the figure above, from l+ to l-, with the formant value going up high, larger proportion of following high and mid vowels appears, while the percentage of low vowels decreases. However, a different pattern is found from n- to n+. With the increase of F2, the percentage of high vowels increases while that of the non-high vowels decreases. In order to figure out more specific details, Figure 8 was made to show the three different articulation places in two different languages.

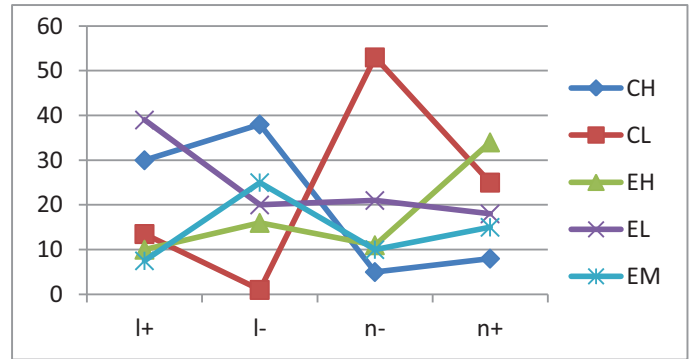


Fig. 8. Change of the percentage of high/mid/low vowels in two languages. (CH=Chinese, high vowel.)

As figure 7 shows, with the formants going up high from l+ to l- and from n- to n+, the proportion of low vowels in both Sichuan dialect and Sichuan English increases, at the same time, the percentage of non-low vowels keeps decreasing.

This result, contradicting with previous theory about free variation of syllable initial /l/ and /n/ alternation in Sichuan dialect, shows a very clear pattern that if the following vowel is a low vowel, there is more possibility for correctly pronounced syllable initial /l/ and mispronounced /n/, while if the following vowel is non-low vowel, more possibility is found to the pronunciation of correct syllable initial /n/ and mispronunciation of /l/.

VI. DISCUSSION

With the data analysis and results discussed above, there are few more things that need to be pointed out again.

The first assignable point is that this is a very small corpus, containing only 8 young speakers, well educated in English. It will be very interesting to examine more data from various ages, jobs, education backgrounds etc.

The next point is that it is inevitable to encounter the Observers' Paradox. In the process of contacting Sichuan dialect speakers, I need to explain to them the purpose of this study. This may have influence on their pronunciations to some extent.

Since Sichuan dialect is syllable-timed language, the alternation of syllable initial /l/ and /n/ in unstressed syllables in English are not discussed in this paper. This may lead to a new study in this area.

One significant point need to be pointed again is that the purpose of classifying different figures are not to make an absolute judgment, but rather to make a clearer tendency in analysis.

Equally important, even though there is no acoustically identified alternation of syllable-initial /l/ and /n/ in American English, F2 value of the syllable-initial /l/ and /n/ is also greatly influenced by the articulation place of the following vowels.

VII. CONCLUSION

Through acoustic analysis by Praat and statistic analysis by R, this current study examined the data of 8 Sichuan-English bilinguals in North Carolina State University or in China. The results of this paper show that dialect has great transfer to English pronunciation, especially in the mispronunciation of syllable initial /n/.

Secondly, by analyzing the data, the results, contradicting with previous theory about free variation of syllable initial /l/ and /n/ alternation in Sichuan dialect, it shows a very clear pattern that if the following vowel is a low vowel, there is more possibility for correctly pronounced syllable initial /l/ and mispronounced /n/, while if the following vowel is non-low vowel, more possibility is found to the pronunciation of correct syllable initial /n/ and mispronunciation of /l/.

Further research would focus on an apparent time study on this particular language phenomenon to examine if there is any variation in this particular dialect. At the same time, other languages and dialects with syllable initial /l/ and /n/ alternation are also in the research interest.

VIII. ACKNOWLEDGEMENTS

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